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Is There Love in the Telematic Embrace?

By Roy Ascott

The past decade has seen the two powerful technologies of computing and telecommunications converge into one field of operations that has drawn into its embrace other electronic media, including video, sound synthesis, remote sensing, and a variety of cybernetic systems. These phenomena are exerting enormous influence upon society and on individual behavior; they seem increasingly to be calling into question the very nature of what it is to be human, to be creative, to think and to perceive, and indeed our relationship to each other and to the planet as a whole. The “telematic culture” that accompanies the new developments consists of a set of behaviors, ideas, media, values, and objectives that are significantly unlike those that have shaped society since the Enlightenment. New cultural and scientific metaphors and paradigms are being generated, new models and representations of reality are being invented, new expressive means are being manufactured.

Telematics is a term used to designate computer-mediated communications networking involving telephone, cable, and satellite links between geographically dispersed individuals and institutions that are interfaced to data-processing systems, remote sensing devices, and capacious data-storage banks.¹ It involves the technology of interaction among human beings and between the human mind and artificial systems of intelligence and perception. The individual user of networks is always potentially involved in a global net, and the world is always potentially in a state of interaction with the individual. Thus, across the vast spread of telematic networks worldwide, the quantity of data processed and the density of information exchanged is incalculable. The ubiquitous efficacy of the telematic medium is not in

doubt, but the question in human terms, from the point of view of culture and creativity, is: What is the content?

This question, which seems to be at the heart of many critiques of art involving computers and telecommunications, suggests deep-seated fears of the machine coming to dominate the human will and of a technological formalism erasing human content and values. Apart from all the particulars of personal histories, of dreams, desires, and anxieties that inform the content of art's rich repertoire, the question, in essence, is asking: Is there love in the telematic embrace?

In the attempt to extricate human content from technological form, the question is made more complicated by our increasing tendency as artists to bring together imaging, sound, and text systems into interactive environments that exploit state-of-the-art hypermedia and that engage the full sensorium, albeit by digital means. Out of this technological complexity, we can sense the emergence of a synthesis of the arts. The question of content must therefore be addressed to what might be called the *Gesamtdatenwerk*—the integrated data work—and to its capacity to engage the intellect, emotions, and sensibility of the observer.² Here, however, more problems arise, since the observer in an interactive telematic system is by definition a participator. In a telematic art, meaning is not something created by the artist, distributed through the network, and received by the observer. Meaning is the product of interaction between the observer and the system, the content of which is in a state of flux, of endless change and transformation. In this condition of uncertainty and instability, not simply because of the crisscrossing interactions of users of the net-

work but because content is embodied in data that is itself immaterial, it is pure electronic *difference*, until it has been reconstituted at the interface as image, text, or sound. The sensory *output* may be differentiated further as existing on screen, as articulated structure or material, as architecture, as environment, or in virtual space.

Such a view is in line with a more general approach to art as residing in a cultural communications system rather than in the art object as a fixed semantic configuration—a system in which the viewer actively negotiates for meaning.³ In this sense, telematic networking makes explicit in its technology and protocols what is implicit in all aesthetic experience where that experience is seen as being as much creative in the act of the viewer's perception as it is in the act of the artist's production.⁴ Classical communications theory holds, however, that communication is a one-way dispatch, from sender to receiver, in which only contingent “noise” in the channel can modify the message (often further confused as the meaning) initiated at the source of transmission.⁵ This is the model that has the artist as sender and therefore originator of meaning, the artist as creator and owner of images and ideas, the artist as controller of context and content. It is a model that requires, for its completion, the viewer as, at best, a skilled decoder or interpreter of the artist's “meaning” or, at worst, simply a passive receptacle of such meaning. It gives rise to the industry of criticism and exegesis in which those who “understand” this or that work of art explain it to those who are too stupid or uneducated to receive its meaning unaided. In this scenario, the artwork and its maker are viewed in the same way as the world and its creator. The beauty and

truth of both art and the world are “out there” in the world and in the work of art. They are as fixed and immutable as the material universe appears to be. The canon of determinism decrees prefigured harmony and composition, regulated form and continuity of expression, with unity and clarity assured by a cultural consensus and a linguistic uniformity shared by artist and public alike.

The problem of content and meaning within a telematic culture gives added poignancy to the rubric “Issues of Content” under which this present writing on computers and art is developed: “issue” is open to a plurality of meanings, no one of which is satisfactory. The metaphor of a semantic sea endlessly ebbing and flowing, of meaning constantly in flux, of all words, utterances, gestures, and images in a state of undecidability, tossed to and fro into new collusions and conjunctions within a field of human interaction and negotiation, is found as much in new science—in quantum physics, second-order cybernetics,⁶ or chaology,⁷ for example—as in art employing telematic concepts or the new literary criticism that has absorbed philosophy and social theory into its practice. This sunrise of uncertainty, of a joyous dance of meaning between layers of genre and metaphoric systems, this unfolding tissue woven of a multiplicity of visual codes and cultural imaginations was also the initial promise of the postmodern project before it disappeared into the domain of social theory, leaving only its frail corpus of pessimism and despair.

In the case of the physicists, the radical shift in metaphors about the world and our participation in its creation and redescription mean that science’s picture window onto reality has been shattered by the very process of trying to measure it. John Wheeler uses this analogy succinctly:

Nothing is more important about the quantum principle than this, that it destroys the concept of the world as “sitting out there,” with the observer safely separated from it by a 20-centimeter slab of plate glass. Even to observe so minuscule an object as an electron, he must shatter the glass. He must reach in. He must install his chosen measuring equipment. It is up to him whether he shall measure position or momentum . . . the measurement changes the state of the electron. The universe will never afterwards be the same. To describe what has happened one has to cross out that old word “observer” and put in its place “participator.” In some strange sense the universe is a participatory universe.⁸

In the context of telematic systems and the issue of content and meaning, the parallel shift in art of the status of “observer” to that of “participator” is demonstrated clearly if in accounts of the quantum principle we substitute “data” for “quanta.” Indeed, finding such analogies between art and physics is more than just a pleasant game; the web of connections between new models of theory and practice in the arts and the sciences, over a wide domain, is so pervasive as to suggest a paradigm shift in our world view, a redescription of reality and a recontextualization of ourselves. We begin to understand that chance and change, chaos and indeterminacy, transcendence and transformation, the immaterial and the numinous are terms at the center of our self-understanding and our new visions of reality. How then, could there be a content—sets of meanings—contained within telematic art when every aspect of networking in dataspace is in a state of transformation and of becoming? The very technology of computer telecommunications extends the gaze, transcends the body, amplifies the mind into unpredictable configurations of thought and creativity.

In the recent history of Western art, it was Marcel Duchamp who first took the metaphor of the glass, of the window onto the world, and turned it back on itself to reveal what is invisible. We see in the work known as *The Bride Stripped Bare by Her Bachelors, Even*, or *The Large Glass*, a field of vitreous reality in which energy and emotion are generated from the tension and interaction of male and female, natural and artificial, human and machine.⁹ Its subject is attraction in Charles Fourier’s sense,¹⁰ or, we might even say, love. *The Large Glass*, in its transparent essence, always includes both its environment and the reflection of the observer. Love is contained in this total embrace; all that escapes is reason and certainty. By participating in the embrace, the viewer comes to be a progenitor of the semantic issue. The glass as “ground” has a function and status anticipating that of the computer monitor as a screen of operations—of transformations—and as the site of interaction and negotiation for meaning. But it is not only through the Glass that we can see Duchamp as prophetic of the telematic mode. The very metaphor of networking interaction in a field of uncertainty, in which the observer is creator and meaning is unstable, is implicit in all his work. Equally prophetic in the Glass is the horizontal bar that joins the upper and lower parts of the work and serves as a metaphor for the all-around viewing, the inclusive, all-embracing scope of its vision. This stands in opposition to the vertical, head-to-toe viewing of Renaissance space, embodied in the Western pictorial tradition,

where the metaphor of verticality is employed insistently in its monuments and architecture—emblems often as not of aggression, competition, and dominance, all ways of a tunnel vision. The horizontal, on the other hand, is a metaphor for the bird’s-eye view, the all-over, all-embracing, holistic systems view of structures, relationships, and events—viewing that can include the ironic, the fuzzy, and the ambiguous. This is precisely the condition of perception and insight to which telematic networking aspires.

Perhaps the most powerful metaphor of interconnectedness and the horizontal embrace in art before the advent of telematic media is to be found in the work of Jackson Pollock.¹¹ Here the horizontal arena, a space marked out on the surface of the earth, is the “ground” for the action and transformation that become the painting itself. Pollock created his powerful metaphors of connectedness by generating fields of intertwining, interweaving, branching, joining, colliding, crossing, linking lines of energy. His space is inclusive and inviting, his imagery carries a sense of anonymity of authorship that embraces the viewer in the creation of meaning. Nothing in painting could be more emblematic or prophetic of the network consciousness emerging with the telematic culture.

This provenance of telematic culture, as spiritual or transcendent in its force as the Navajo sand painting to which it, in turn, owes allegiance, is perhaps more readily understood if we are able to see the ubiquitous spread of computer communications networks across the face of the earth as constituting what in many esoteric traditions of both East and West would be called a “subtle body”¹²—a psychic envelope for the planet, a telematic noosphere, in Teilhard de Chardin’s terms,¹³ or what Gregory Bateson would have described as “mind-at-large.”¹⁴ Peter Russell describes the emergence of a planetary consciousness:

As communications networks increase, we will eventually reach a point where the billions of information exchanges, shuttling through the networks at any one time, can create coherence in the global brain, similar to those found in the human brain.¹⁵

This suggests equally the need for a redescription of human consciousness as it emerges from the developing symbiosis of the human mind and the artificial thought of parallel distributed processing (PDP).¹⁶

If one of the great rituals of emergence into a new world—that of the American Indian Hopi—is centered around the sacred sipapu that connects to the Underworld of power and transformation, so our

emergence into the new world of telematic culture similarly calls for celebration at the interface to those PDP systems that can link us with superconnectivity, mind to mind, into a new planetary community. And just as the Hopi seek to exploit the full measure of their expressive means by joining image, music, chant, and dance into a holistic unity, so we too now seek a synthesis of digital modes—image, sound, text, and cybernetic structure—by which to recontextualize our own world, that numinous whole of all our separate realities.

The emerging new order of art is that of interactivity, of “dispersed authorship”;¹⁷ the canon is one of contingency and uncertainty. Telematic art encompasses a wide array of media: hypermedia, videotex, telefacsimile, interactive video, computer animation and simulation, teleconferencing, text exchange, image transfer, sound synthesis, telemetry and remote sensing, virtual space, cybernetic structures, and intelligent architecture. These are simply broad categories of technologies and methodologies that are constantly evolving—bifurcating, joining, hybridizing—at an accelerated rate.

At the same time, the status of the art object changes. The culturally dominant objet d’art as the sole focus (the uncommon carrier of uncommon content) is replaced by the interface. Instead of the artwork as a window onto a composed, resolved, and ordered reality, we have at the interface a doorway to undecidability, a dataspace of semantic and material potentiality. The focus of the aesthetic shifts from the observed object to participating subject, from the analysis of observed systems to the (second-order) cybernetics of observing systems: the canon of the immaterial and participatory. Thus, at the interface to telematic systems, content is created rather than received. By the same token, content is disposed of at the interface by reinserting it, transformed by the process of interaction, back into the network for storage, distribution, and eventual transformation at the interface of other users, at other access nodes across the planet.

A telematic network is more than the sum of its parts, more than a computer communications web. The new order of perception it constitutes can be called “global vision,” since its distributed sensorium and distributed intelligence—networked across the whole planet as well as reaching remotely into galactic space and deep into quantum levels of matter—together provide for a holistic, integrative viewing of structures, systems, and events that is global in its scope. This artificial extension of human intelligence and perception, which the neural nets of PDP and sophisticated remote-sensing systems provide,¹⁸ not only amplifies human percep-

tion but is in the process of changing it. The transformation is entirely consistent with the overarching ambition of both art and science throughout this century: to make the invisible visible. Even now, it must be recognized that our human cognitive processes (whether involving linear or associative thought, imaging, remembering, computing, or hypothesizing) are rarely carried out without the computer being involved.¹⁹ A great proportion of the time that we are involved in communicating, learning, or being entertained entails our interaction with telecommunications systems.²⁰ Similarly, with feeling and sensing, artificial, intelligent sensors of considerable subtlety are becoming integral to human interaction with the environment and to the monitoring of both internal and external ecologies. Human perception, understood as the product of active negotiation rather than passive reception, thus requires, within this evolving symbiosis of human/machine, telematic links of considerable complexity between the very diverse nodes of the worldwide artificial reticular sensorium.

Telematic culture means, in short, that we do not think, see, or feel in isolation. Creativity is shared, authorship is distributed, but not in a way that denies the individual her authenticity or power of self-creation, as rather crude models of collectivity might have done in the past. On the contrary, telematic culture amplifies the individual’s capacity for creative thought and action, for more vivid and intense experience, for more informed perception, by enabling her to participate in the production of global vision through networked interaction with other minds, other sensibilities, other sensing and thinking systems across the planet—thought circulating in the medium of data through a multiplicity of different cultural, geographical, social, and personal layers. Networking supports endless redescription and recontextualization such that no language or visual code is final and no reality is ultimate. In the telematic culture, pluralism and relativism shape the configurations of ideas—of image, music, and text—that circulate in the system.

It is the computer that is at the heart of this circulation system, and, like the heart, it works best when least noticed—that is to say, when it becomes invisible. At present, the computer as a physical, material presence is too much with us; it dominates our inventory of tools, instruments, appliances, and apparatus as the ultimate machine. In our artistic and educational environments it is all too solidly there, a computational block to poetry and imagination. It is not transparent, nor is it yet fully understood as pure system, a universal transformative matrix. The computer is

not primarily a thing, an object, but a set of behaviors, a system, actually a system of systems. Data constitute its lingua franca. It is the agent of the datafield, the constructor of dataspace. Where it is seen simply as a screen presenting the pages of an illuminated book, or as an internally lit painting, it is of no artistic value. Where its considerable speed of processing is used simply to simulate filmic or photographic representations, it becomes the agent of passive voyeurism. Where access to its transformative power is constrained by a typewriter keyboard, the user is forced into the posture of a clerk. The electronic palette, the light pen, and even the mouse bind us to past practices. The power of the computer’s presence, particularly the power of the interface to shape language and thought, cannot be overestimated. It may not be an exaggeration to say that the “content” of a telematic art will depend in large measure on the nature of the interface; that is, the kind of configurations and assemblies of image, sound, and text, the kind of restructuring and articulation of environment that telematic interactivity might yield, will be determined by the freedoms and fluidity available at the interface.

The essence of the interface is its potential flexibility; it can accept and deliver images both fixed and in movement, sounds constructed, synthesized, or sampled, texts written and spoken. It can be heat sensitive, body responsive, environmentally aware. It can respond to the tapping of the feet, the dancer’s arabesque, the direction of a viewer’s gaze. It not only articulates a physical environment with movement, sound, or light; it is an environment, an arena of dataspace in which a distributed art of the human/computer symbiosis can be acted out, the issue of its cybernetic content. Each individual computer interface is an aspect of a telematic unity such that to be in or at any one interface is to be in the virtual presence of all the other interfaces throughout the network of which it is a part. This might be defined as the “holomatic” principle in networking. It is so because all the data flowing through any access node of the network are equally and at the same time held in the memory of that network: they can be accessed, through cable or satellite links, from any part of the planet at any time of day or night, by users of the network (who, in order to communicate with each other, do not need to be in the same place at the same time).

This holomatic principle was well demonstrated during the Venice Biennale of 1986, when the “Planetary Network” project had the effect of pulling the exhibition from its rather elite, centralized, and exclusive domain in Venice and stretching it out over the face of the globe;²¹ the flow of creative data generated by the interac-

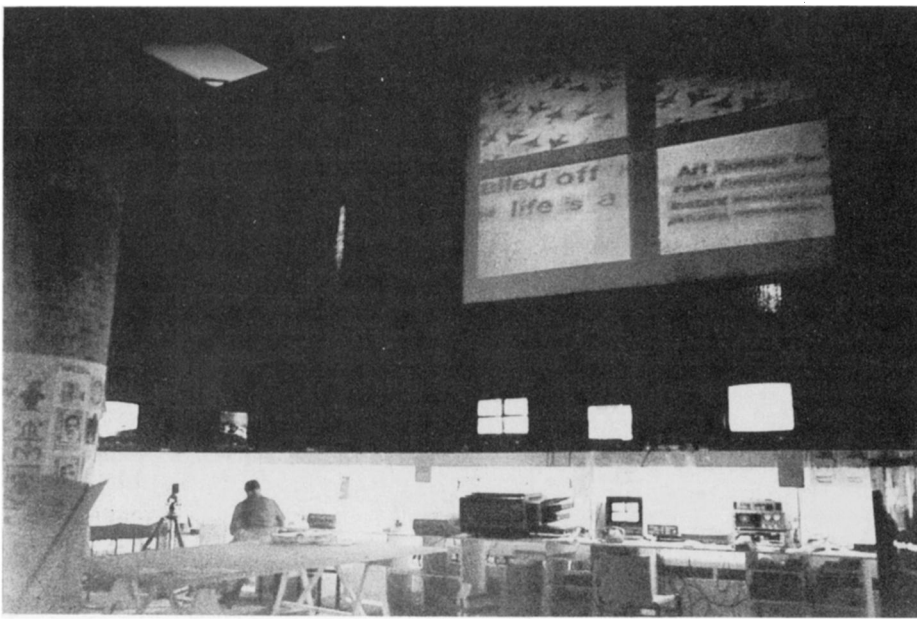


Figure 1 View of the “Laboratory Ubiqua” (planetary networking and computer-mediated systems), Venice Biennale, 1986.

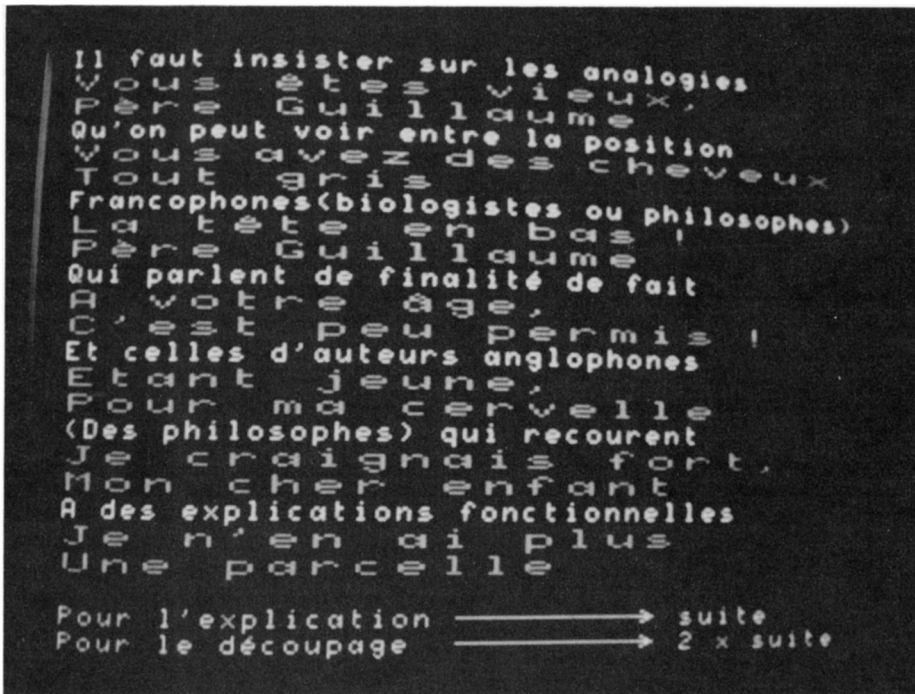


Figure 2 Roy Ascott, *Organe et fonction d'Alice aux pays des merveilles*, 1985, videotex. From the “Les Immatériaux” exhibition, Centre Pompidou, Paris, 1985.

tion of artists networking all over the world was accessible everywhere (*fig. 1*). Set within the interactive environment “Laboratory Ubiqua,” a wide range of telematic media was involved, including electronic mail, videotex, digital-image exchange, slow-scan TV, and computer conferencing. Interactive videodiscs, remote sensing systems, and cybernetic structures were also included.

On a simpler and publicly more accessible level, the telematic project devised by Art Accès for the exhibition “Les Imma-

tériaux” at the Centre Pompidou in Paris in 1985 can be cited for its effective use of a domestic terminal interfacing a public videotex service (*fig. 2*). It involved the use of the French national Minitel system as the network for on-line interaction between artists “in” the exhibition and the large population of Minitel subscribers distributed throughout the greater Paris region. In this case the cultural interface had developed from its humble beginnings as an on-line telephone-directory terminal (installed free for PTT subscribers in place of

the traditional and costly annual issue of printed directories), through its accelerated development as a consumer and marketing tool, to a games machine, a reference library, a dating service, and now an instrument of the new art.

Earlier, in 1983, for the exhibition “Electra” at the Musée d’Art Moderne de la Ville de Paris, the interface for the international telematic project *La Plissure du texte* (a planetary fairy tale created by means of a “dispersed authorship” through electronic networking) involved little more than the orthodox computer terminal and keyboard.²² A data projector carried the text to a public dimension, dramatizing its electronic presence, which was at once ephemeral and concrete. With many participants on line throughout America, Europe, and Australia, this was a perfect vehicle to involve both artists and public in the layering of texts and in the semantic ambiguities, delights, and surprises that can be generated by an interactive authorship dispersed throughout so many cultures in so many remote parts of the world. Like most telematic projects of the early 1980s, however, the project was limited to the text for technical and financial as much as for conceptual reasons.

A more elaborate and complex multimedia interface was created for the project *Aspects of Gaia: Digital Pathways across the Whole Earth* as part of the Ars Electronica Festival of Art and Technology in Linz, Austria, in 1989.²³ The transmission of digital image and sound by file transfer and the computer storage of telefacsimile material via modem, by this time economically feasible, invited the creation of a more dramatic and engaging environment for public participation. Invitations to participate in the project were e-mailed, faxed, or airmailed to “artists, scientists, poets, shamen [*sic*], musicians, architects, visionaries, aboriginal artists of Australia, native artists of the Americas.” The subject of the project was the many aspects of the earth, Gaia, seen from a multiplicity of spiritual, scientific, cultural, and mythological perspectives. An energizing stream of integrated digital images, texts, and sounds (a *Gesamtdatenwerk*) would then constitute a kind of invisible cloak, a digital noosphere that might contribute to the harmonization of the planet. In accessing the meridians at various nodes, participants became involved in a form of global acupuncture, their interactions endlessly transforming and reconstituting the worldwide flow of creative data.

Congruent with the structural form of the Brucknerhaus (site of the festival) as a metaphor of curving space-time, the public-interface installation in Linz was on two levels, reflecting the layering of material that the project was intended to generate. The upper level investigated the poten-

tial of the digital screen seen on the horizontal, large-scale format, rather than the more familiar vertical monitor presentation (fig. 3). Giving the public a bird's-eye view of images networked in from all over the planet (fig. 4), the large horizontal screens were set into "information bars" around which viewers could sit—on high stools, as if at a cocktail bar—gazing not into an alcoholic haze but into pure dataspace. The networked images that appeared were then changed by means of acoustic sensors fed to appropriate software (in the form of small microphones set on the counter top of the bar) or were modified with line and color by means of a mouse manipulated by the viewer across the counter top. Thus, interaction by voice and gesture led to the creation of new images that could then be retrieved by the computer and stored pending their eventual insertion back into the planetary network.

The interface on the lower level involved a railway track curving through a long, low tunnel that flanked the building, carrying a flatbed trolley (upholstered not unlike an analyst's couch), which enabled each participant to glide effortlessly through a darkened acoustical space, looking up at a series of flickering LED signs scrolling texts drawn from the network of inputs all over the world. This was Gaia's womb, a kind of telematic, neolithic passageway (fig. 5).

The design and production of the interface as a whole—involving the collaboration of artists and technicians working with



Figure 3 Roy Ascott, *Aspects of Gaia* (upper level), 1989, computer-mediated interactive installation. From the "Ars Electronica" exhibition, Linz, Austria, 1989.

digital sound and image, electroacoustical and mechanical structures, and software design—was achieved "remotely" by computer-conference networking among their widely dispersed geographical locations. The same telematic process of design and consultation through international networks was involved in the preparation

of *La Plissure du texte* for "Electra" and of the "Planetary Network" and the "Laboratory Ubiqua" in Venice. It is a process that is at the center of much research, development, design, production, and presentation in many fields of artistic and scientific endeavor.²⁴ It is also a process that can include the client, consumer, user, or viewer from the very start. In the telematization of the creative process, the roles of artist and viewer, designer and consumer, become diffused; the polarities of maker and user become destabilized. This will lead ultimately, no doubt, to changes in status, description, and use of cultural institutions: a redescription (and revitalization, perhaps) of the academy, museum, gallery, archive, workshop, and studio. A fusion of art, science, technology, education, and entertainment into a telematic fabric of learning and creativity can be foreseen.

To the objection that such a global vision of an emerging planetary art is uncritically euphoric, or that the prospectus of a telematic culture with its *Gesamtdatenwerk* of hypermediated virtual realities is too grandiose, we should perhaps remind ourselves of the essentially political, economic, and social sensibilities of those who laid the conceptual foundations of the field of interactive systems. This cultural prospectus implies a telematic politic, embodying the features of feedback, self-determination, interaction, and collaborative creativity not unlike the "science of government" for which, over

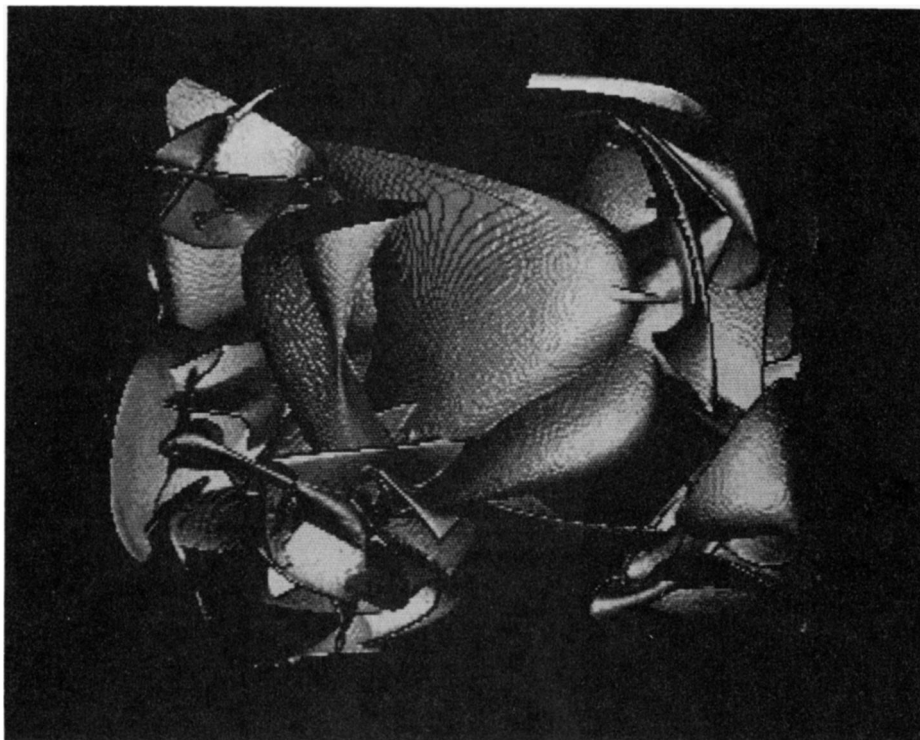


Figure 4 Miles Visman, computer-generated image for the *Aspects of Gaia* project by Roy Ascott. From the "Ars Electronica" exhibition, Linz, Austria, 1989.

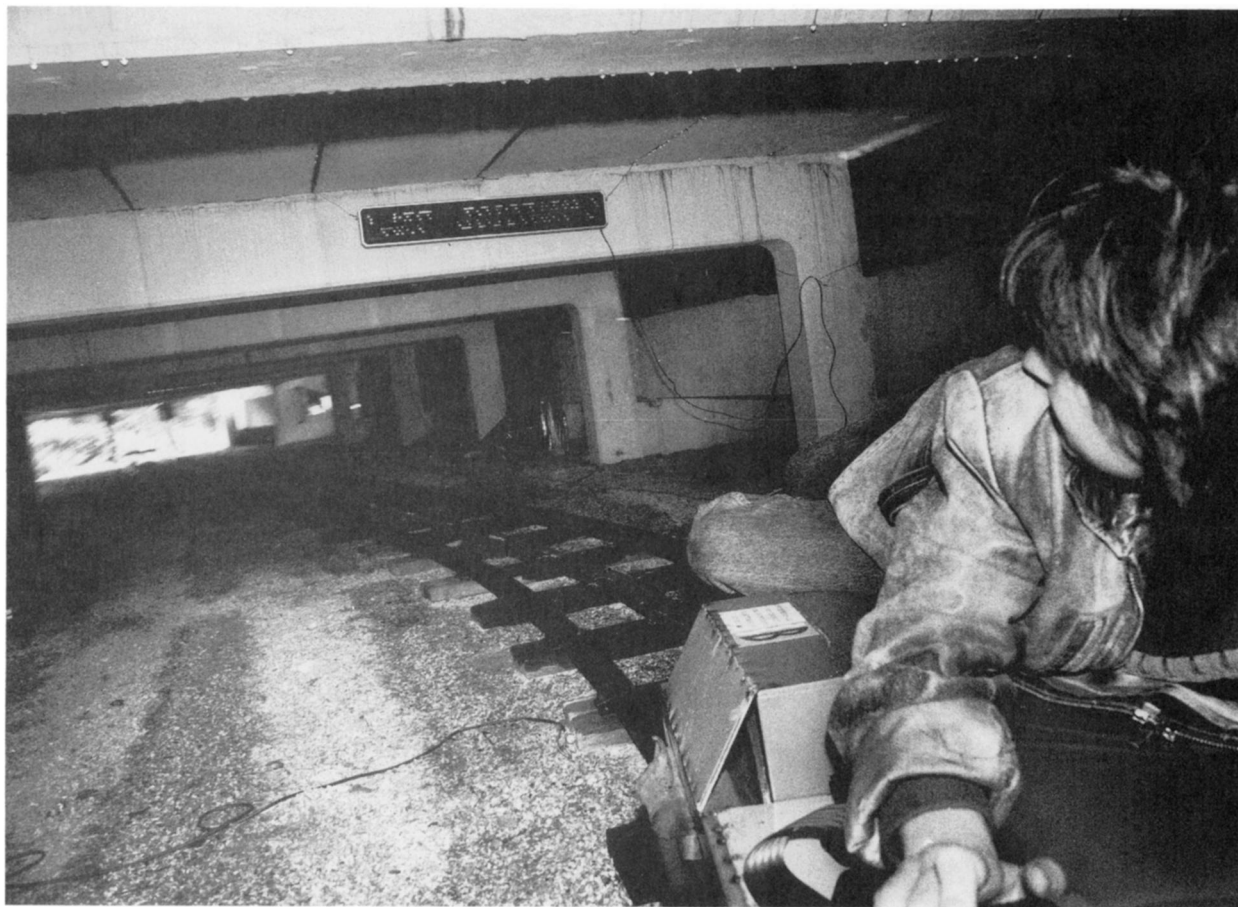


Figure 5 Roy Ascott, *Aspects of Gaia* (lower level), 1989, computer-mediated interactive installation. From the “Ars Electronica” exhibition, Linz, Austria, 1989.

150 years ago, André Marie Ampère coined the term “cybernetics”—a term reinvigorated and humanized by Norbert Wiener in this century.²⁵ Contrary to the rather rigid determinism and positivism that have shaped society since the Enlightenment, however, these features will have to accommodate notions of uncertainty, chaos, autopoiesis, contingency, and the second-order cybernetics or fuzzy-systems view of a world in which the observer and observed, creator and viewer, are inextricably linked in the process of making reality—all our many separate realities interacting, colliding, re-forming, and resonating within the telematic noosphere of the planet.

Within these separate realities, the status of the “real” in the phenomenology of the artwork also changes. Virtual space, virtual image, virtual reality—these are categories of experience that can be shared through telematic networks, allowing for movement through “cyberspace” and engagement with the virtual presence of others who are in their corporeal materiality at a distance, physically inaccessible or otherwise remote.²⁶ The adoption of a headset, DataGlove, or other data wear can make the personal connection to cyberspace—socialization in

hyperreality—wherein interaction with others will undoubtedly be experienced as “real,” and the feelings and perceptions so generated will also be “real.” The passage from real to virtual will probably be seamless, just as social behavior derived from human-computer symbiosis is flowing unnoticed into our consciousness. But the very ease of transition from “reality” to “virtuality” will cause confusion in culture, in values, and in matters of personal identity. It will be the role of the artist, in collaboration with scientists, to establish not only new creative praxes but also new value systems, new ordinances of human interaction and social communicability. The issue of content in the planetary art of this emerging telematic culture is therefore the issue of values, expressed as transient hypotheses rather than finalities, tested within the immaterial, virtual, hyper-realities of dataspace. Integrity of the work will not be judged by the old aesthetics; no antecedent criteria can be applied to network creativity since there is no previous canon to accommodate it. The telematic process, like the technology that embodies it, is the product of a profound human desire for transcendence: to be out of body, out of mind, beyond language. Virtual space and dataspace constitute the domain, previously provided by myth and religion,

where imagination, desire, and will can reengage the forces of space, time, and matter in the battle for a new reality.

The digital matrix that brings all new electronic and optical media into its telematic embrace—being a connectionist model of hypermedia—calls for a “connective criticism.” The personal computer yields to the interpersonal computer. Serial data processing becomes parallel distributed processing. Networks link memory bank to memory bank, intelligence to intelligence. Digital image and digital sound find their common ground, just as a synthesis of modes—visual, tactile, textual, acoustic, environment—can be expected to “hypermediate” the networked sensibilities of a constellation of global cultures. The digital camera—gathering still and moving images from remote sensors deep in space, or directed by human or artificial intelligence on earth, seeking out what is unseen, imaging what is invisible—meets at a point between our own eyes and the reticular retina of worldwide networks, stretching perception laterally away from the tunnel vision, from the Cartesian sight lines of the old deterministic era. Our sensory experience becomes extrasensory, as our vision is enhanced by the extrasensory devices of

telematic perception. The computer deals invisibly with the invisible. It processes those connections, collusions, systems, forces and fields, transformations and transferences, chaotic assemblies, and higher orders of organization that lie outside our vision, outside the gross level of material perception afforded by our natural senses. Totally invisible to our everyday unaided perception, for example, is the underlying fluidity of matter, the indeterminate dance of electrons, the “snap, crackle, and pop” of quanta, the tunneling and transpositions, nonlocal and superluminal, that the new physics presents. It is these patterns of events, these new exhilarating metaphors of existence—nonlinear, uncertain, layered, and discontinuous—that the computer can re-describe. With the computer, and brought together in the telematic embrace, we can hope to glimpse the unseeable, to grasp the ineffable chaos of becoming, the secret order of disorder. And as we come to see more, we shall see the computer less and less. It will become invisible in its immanence, but its presence will be palpable to the artist engaged telematically in the

world process of autopoiesis, planetary self-creation.

The technology of computerized media and telematic systems is no longer to be viewed simply as a set of rather complicated tools extending the range of painting and sculpture, performed music, or published literature. It can now be seen to support a whole new field of creative endeavor that is as radically unlike each of those established artistic genres as they are unlike each other. A new vehicle of consciousness, of creativity and expression, has entered our repertoire of being. While it is concerned with both technology and poetry, the virtual and the immaterial as well as the palpable and concrete, the telematic may be categorized as neither art nor science, while being allied in many ways to the discourses of both. The further development of this field will clearly mean an interdependence of artistic, scientific, and technological competencies and aspirations and, urgently, on the formulation of a transdisciplinary education.

So, to link the ancient image-making process of Navajo sand painting to the digi-

tal imaging of modern supercomputers through common silicon, which serves them both as pigment and processor chip, is more than ironic whimsy. The holistic ambition of Native American culture is paralleled by the holistic potentiality of telematic art. More than a technological expedient for the interchange of information, networking provides the very infrastructure for spiritual interchange that could lead to the harmonization and creative development of the whole planet. With this prospectus, however naively optimistic and transcendental it may appear in our current fin-de-siècle gloom, the metaphor of love in the telematic embrace may not be entirely misplaced.

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Notes

- 1 The neologism “télématique” was coined by Simon Nora and Alain Minc in *L'Informatisation de la société* (Paris: La Documentation Française, 1978), 2.
- 2 The German word “Gesamtkunstwerk” was used by Richard Wagner to refer to his vision of a “total artwork” integrating music, image, and poetry.
- 3 Humberto R. Maturana and Francisco J. Varela, *The Tree of Knowledge: The Biological Roots of Human Understanding* (Boston: Shambhala, 1987), 4.
- 4 Roland Barthes, “From Work to Text,” in *Image-Music-Text*, trans. Stephen Heath (New York: Hill and Wang, 1977), 4.
- 5 C. E. Shannon and W. Weaver, *The Mathematical Theory of Communication* (Urbana: University of Illinois Press, 1949), 4.
- 6 Heinz von Foerster, *Observing Systems* (New York: Intersystems, 1981), 5.
- 7 James Gleick, *Chaos* (New York: Heinemann, 1987), 5.
- 8 J. A. Wheeler and W. H. Zurek, *Quantum Theory and Measurement* (Princeton, N.J.: Princeton University Press, 1983), 6.
- 9 See Michel Sanouillet, ed., *Salt Seller: The Writings of Marcel Duchamp, (Marchand du Sel)* (New York: Oxford University Press, 1973), 7.
- 10 Charles Fourier (1772–1837). His “system of passionate attraction” (elaborated in *Théorie des quatre mouvements et des destinées générales* [Paris: Bureaux de la Phalange, 1841], 7) sought universal harmony.
- 11 Elizabeth Frank, *Jackson Pollock* (New York: Abbeville Press, 1983), 8.
- 12 David V. Tansley, *Subtle Body* (London: Thames and Hudson, 1977), 9.
- 13 Pierre Teilhard de Chardin, *The Future of Man* (New York: Harper and Row, 1964), 9.
- 14 Gregory Bateson, *Steps to an Ecology of Mind* (San Francisco: Chandler Press, 1972), 9.
- 15 Peter Russell, *The Awakening Earth* (London: Routledge, 1982), 9.
- 16 James L. McClelland, David E. Rummelhart, and the PDP Research Group, *Parallel Distributed Processing*, vol. 1 (Cambridge: MIT Press, 1986), 10.
- 17 The term was first proposed in Roy Ascott, “Art and Telematics: Towards a Network Consciousness,” in *Art Telecommunications*, ed. Heidi Grundmann (Vancouver: Western Front, 1984), 10.
- 18 Paul J. Curran, *Principles of Remote Sensing* (New York: Longman, 1985).
- 19 Stephen R. Graubard, ed., *The Artificial Intelligence Debate* (Cambridge: MIT Press, 1988).
- 20 Koji Kobayashi, *Computers and Communications* (Cambridge: MIT Press, 1986).
- 21 Roy Ascott, “Art, Technology and Computer Science,” in *XLII Esposizione Internazionale d'Arte* (Venice: Biennale di Venezia, 1986), 17. The international commissioners for the 1986 Biennale were Roy Ascott, Don Foresta, Tom Sherman, and Tomaso Trini.
- 22 Roy Ascott, “La Plissure du texte,” in Frank Popper, ed., *Electra* (Paris: Musée d'Art Moderne de la Ville de Paris, 1983), 18.
- 23 Roy Ascott, “Gesamtdatenwerk: Konnektivität, Transformation und Transzendenz,” in *Kunstforum* 103 (September/October 1989): 18 (project by Roy Ascott in collaboration with Peter Appleton, Mathias Fuchs, Robert Pepperell, and Miles Visman).
- 24 Stewart Brand, *The Media Lab* (New York: Viking Penguin, 1987), 21.
- 25 Norbert Wiener, *Cybernetics or Control and Communication in the Animal and Machine* (Cambridge: MIT Press, 1948), 22.
- 26 VPL Research, Inc., of California demonstrated “shared virtual reality” and “walk-through cyberspace” at Texpo '89 in San Francisco, June 1989.