International Festival of Art, Science and Technology Cibervisión 2002 (Madrid, March 2002)

Cibervisión 02: Fluid Dynamics

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Abstract: Present day society faces a reality that cannot be explained by determinist or mechanistic models, which are little more the representation of a dialogue that reflects our own thought process and conditions the way we see things. The frontiers and divisions that we create originate in our thoughts, so that the processes of science cannot reach the things themselves, only the relationships between them. From such a situation spring transdisciplinary approaches and systemic thought, representing a new vision, a new multidimensional, independent dialogue of interconnected processes. This approach reflects a complex, emerging state which cannot be explained merely from the sum of its parts but which is better explained from the organizing relationships existing between them.

We are faced by an ambiguity that swings between representation of either a deterministic world or an arbitrary world entirely at the whims of chance, although this ambiguity should be considered not as an annoying aspect of the catastrophe of our perception but as a way forward towards emotions, that is, as a permanent cultural value. Systems theory, relativity, quantum mechanics and cybernetics underlie the transition of an art of objects towards an art of processes. Art is increasingly becoming a system that generates evolutionary processes, whose point of reference is no longer the surface of the natural and material world but the structural and functional base of its evolution. The objective of proposals of this kind is not merely to generate new aesthetic and formal processes but also to put forward a critical analysis of our construction of reality.

Humanity is made up of an irregular tapestry of relations involving six thousand million individuals who are co-evolving within an ecosystem of limited resources. The complexity of contemporary experience, the diversity of sensibilities and outlooks that intermingle within this tapestry, together with the vertiginous process of transformation in which we are immersed on a global scale, have generated countless tensions and uncertainties. "In order to understand this we must overcome mono-sectoral, linear technical schemas. We have to place ourselves in a totally different hermeneutics if we wish to grasp this new reality." (José Vidal Beneyto).

For instance, if we place ourselves on a geological, evolutionary timeline—bearing in mind that life on Earth appeared some 4,000 million years ago and Homo Sapiens only some 40,000—it is clear that we are the latecomers to the biosphere: one could almost say a "work-in-progress"

ISSN 1695-5951
Legal deposit B-52019-2002
Original title: *Cibervisión 02: Dinámicas Fluidas*

that has barely begun. We find ourselves in an "evolutionary dawn", believing that we dwell in a reality that is, in fact, merely the representation of a dialogue that reflects our own thought process and conditions our outlook. It is a relational process that flows between the individual and the collective, between our internal reality and external reality, the consequence of whose encounter is perception. It is a flow from which the diversity of cultures that constitutes the phylogenetic memory, the memory of the human species, has emerged.

If we follow the trail of this dialogue, we could go back in time as far as the initial exchanges of information effected by the first micro-organisms that inhabited the planet. Thanks to those primitive bacterial interactions, we enjoy the atmosphere that surrounds us today. It is not in vain that "technologies such as genetic engineering and the globalisation of communications, that we consider the most advanced achievements of our modern civilisation, have been utilised by the planetary network of bacteria for thousands of millions of years as a means of regulating the planet." (Fritjof Capra).

However, the communication flow that articulates human relations currently manifests signs of serious interference, and there is a growing discontinuity and loss of harmony with the environment of which we form a part. According to the physicist David Bohm, "the true crisis does not consist of the facts that confront us, but of the thought that has engendered them. (...) One of the difficulties of thought is its tendency to fragmentation. All the frontiers and divisions that we make originate in thought."

What happens is that we often ignore the fragmentary nature of our mental constructions and place them in the category of "real". We go on to use them as the foundation for the majority of our opinions, beliefs and behaviours. Thus, fragmentation spreads like a shock wave, impregnating the contemporary human condition, from one's own individual conscience to the currents and structures of collective thought. Nevertheless, events engulf and crack our thought reality, making plain the extent of our alienation. What is appearing today "is a mediating description located between two alienating representations: that of a deterministic world and that of an arbitrary world subject to pure chance. (...) In the process of steering a narrow course between blind laws and arbitrary events, we distinguish new horizons, new questions and new risks." (Ilya Prigogine).

In counterpoint to this fragmentary outlook, systems theory, the dynamics of fluids and the emergent sciences of complexity propose a new dialogical, multidimensional, interdependent vision of interconnected processes. "Under the broad umbrella of complexity, we find a fascinating world of interlaced concepts, terms and instruments bubbling away, opening up new perspectives in almost all fields of knowledge. Dynamics, non-linearity, irregularity, order, chaos are just some of them, behaving as parts of an indivisible whole." (Andrés Fernández Díaz).

This renewed vision demands a rereading of history through countless fluctuations and bifurcations. As Antonio Escohotado points out, "the protocalculus of Democritus and Archimedes admits only to turbulent trajectories, not schematic ones, whereas its modern version—introduced by Newton and Leibniz—does the opposite, representing phenomena as simple, regular, periodic lines." Where the scientific renaissance wished to formalise a mechanics of solids, Epicureanism took fluid dynamics for granted. Where the West discovers dualities in linear time, oriental philosophy focuses on polarities, or extreme states of the same thing, in cyclical time.

This fluctuating course of attitudes and thoughts illustrates a resonant, non-linear cartography that, with few differences, connects the "everything flows" of Heraclitus and the whirlwinds of Leonardo with the I Ching book of mutations; and Baudelaire's ideas of correspondences with the fuzzy logic of Lofti Zadeh or the "everything is flow" of David Bohm. Memories and knowledge that regenerate and intermingle in a common present, both changing and perpetual, simultaneous and ambiguous.

An ambiguity that is described by the physicist Guiseppe Caglioti as "an intrinsic, interwoven aspect of the very process of perception. Each act of perception culminates in a dynamic instability of the interiorized image, where an incoherent quantity of sensorial stimuli coincides

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Legal deposit B-52019-2002
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with coherent visual thought. If perception is a basic ingredient of life, we should look on this ambiguity not so much as a troublesome aspect of the perceptive catastrophe, but as a trajectory orientated towards the emotions, and it can therefore be considered as a permanent cultural value."

For centuries, Western science has been very reticent about the turbulence and unpredictability of flows, "given that there is no way of subjecting these realities to precise measurement, or of rendering their behaviour as a determinist equation." (A. Escohotado). However, when engineering acquired efficient techniques for calculating currents, when they remained constant—a sum of knowledge that goes back to the nineteenth century, when understanding of the movements of liquids and gases was at the forefront of physics—enormous amounts of money were invested in the design of aeroplanes, turbines, propellers, submarine hulls and other forms that move through fluids. Researchers were concerned with circulation through blood vessels and heart valves; with the evolution of explosions; with vortexes and whirlwinds, flames and shock waves. What is more, according to James Gleick, in his publication on "Chaos" (2), the problem of the atomic bomb, which was theoretically a question of nuclear physics, had largely been solved before the project commenced, and what bedevilled the scientists assembled at Los Alamos was in fact a question of fluid dynamics.

Furthermore, in the 1930s, organicist biologists, Gestalt psychologists and ecologists formulated the key criteria of systemic thought, whose essential properties are the properties of the whole that belong to none of the parts separately—they emerge from the organisational relations between them. The part is merely a pattern within an inseparable network of relations. Systemic thought is therefore contextual thought. The material universe is seen as a dynamic network of interrelated events. Within this development of systemic thought, the processual aspect was emphasised for the first time by Austrian biologist Ludwig von Bertalanffy at the end of the thirties and later explored in cybernetics in the forties.

During the Second World War, what is known as systemic analysis arose out of military operations research. During the fifties and sixties, systemic thought had a great influence on engineering and business management to provide solutions to the practical problems of organisation and administration in large companies.

However, systems theory suffered its first failures and its limitations were made evident in the field of biology, due to the lack of mathematical techniques for dealing with the complexity of live systems. Only the discovery of the new mathematics of complexity, and the emergence of the concept of self-organisation succeeded in giving new momentum to the application of systems theory that, together with the development of microelectronics, were to have such a profound effect on transforming the most diverse branches of the social and natural sciences.

We can find certain resonances and coincidences between these concepts and some of the most innovative artistic manifestations of the past century. Scientific discoveries of the time were the subject of discussion in artistic and intellectual circles, elevating "the identification art/life to one of the most important theses of the twentieth century, by way of dadaism-futurism-surrealism or constructivism, up to the present day." (Simón Marchán). The vital experiences of the avant-garde were profoundly affected by the unrest and uncertainty in the social, economic and cultural, as well as political, spheres. The art of those times presents a vivid portrait of rebellion against hegemonic canons and established values. The central perspective breaks down, and eyes are turned to the multiplicity of simultaneous, apparently unconnected, irrational and random processes. The beginnings of a new aesthetic of non-equilibrium and complexity is formulated. The reaction against mechanistic and deterministic ideas is perceptible in the outpouring of new non-linear, ambiguous and processual forms of action and representation. This aesthetic, formal and conceptual approach to a conception of life beyond equilibrium corresponds to the new concepts and models mentioned above, that emerge from the different branches of science.

Marcel Duchamp himself, one of the most emblematic figures in twentieth century art, was profoundly influenced by the ideas of Henri Poincaré. This French mathematician and physicist is considered to be one of the precursors of the theory of dynamic systems and the

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Legal deposit B-52019-2002
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mathematics of complexity that would be developed some decades later. In his time, Poincaré anticipated a kind of unpredictability, almost as marked as that which the meteorologist Eduard Lorenz was to describe in the 1960s as the "butterfly effect" (James Gleick). Poincaré's conclusions that "science cannot grasp things in themselves, but only the relationships between things," and that "outside those relationships, no knowable reality exists," (Janis Mink) could be considered as one of the keys to understanding not only emergent scientific research but also the new concepts that underlie the art of a whole era.

Both in science and in art, chaos has been considered as more than just an idea or a theory. It has been seen as a working method, an approximation to the model of life and source of creative processes. In fact, chance and randomness became constituent elements in the artistic practice of both abstract art and action art. As the artist Antonio Saura states in his notes on space and gestures, "in abstract expressionism, whether figurative or otherwise, the forms or preliminary structural schemas are destroyed in order to be organised anew in a rhythmic complex, obeying an unconscious, organic geometry that attempts the unification of the whole torrent of the picture (in its ebb and flow) in a single biological pulsation." (Simón Marchán). Saura explains his pictures from the standpoint of a new "mathematical-biological structuration, flowing like a continuous, organic river" ruled by the turbulence, vortexes and whirlpools of the fluid, dynamic structures of the image.

The attitude of rupture, the innovation of concepts, and experimentation with new materials and technologies that characterise the artistic avant-garde of the early twentieth century continue to evolve during the second half. Nevertheless, there is a significant distinction between the first period and the second. The avant-garde centres its plastic and visual investigation on redefining space: political, social and cultural space as much as physical space. "Openings and limits, perforations and movable surfaces carry the periphery to the centre and displace the centre outwards. A constant fluctuation sideways and upwards, radiating, multilateral, announces that man has taken possession—insofar as his human ability and conceptions allow—of the insubstantial, invisible but nevertheless omnipresent space." (László Moholy-Nagy).

In contrast, the great challenge for art in the second half of the century is not only to assimilate the new perceptions of space but rather to address the emergent appraisals of time, understood as the raw material of plastic and visual construction and expression. Time begins to occupy a crucial place in all attempts to build a bridge between fields of experience and the physical dimensions of the material world. Systems theory, relativity, quantum mechanics and cybernetics underlie the transition from the art of the object to the art of the process.

On the other hand, a relationship between messenger (body/material) and message (sign/information) characterises the emergent audiovisual culture of electronic art from the 1960s onwards. "When you make a film, you dye the chemicals with nature through the lens. But in television, there is no direct relationship between reality and picture, just code systems. So we got into time," explains Nam June Paik (Edith Decker) in relation to the electronic image. It is true that the video camera codifies the recorded image in abstract values that are then decodified at the moment of projection. During this process of abstraction, the videographic image becomes independent of the original input and changes into an image structured in time. "While light is the basis of material life, time is the indispensable, immaterial substance within which all existence flows. (...) But the element time is also a material that we can load, modulate and program in its flow," affirmed the mathematician and pioneer of infographic creation, Michael Noll, in 1967 (Simón Marchán).

This modulation of time, understood as programming, becomes the structural basis of the new artistic manifestations of recent decades. The artist's interest no longer centres only on the construction of forms, volumes and objects but on the processes intrinsic to their creation, on the architectures of the living and on the codes of formation and growth of living systems. The referent ceases to be the surface of the natural and material world, and becomes the structural and functional basis of its evolution. This occurs in the works by Yoichiro Kawaguchi and Karl Sims: two of the artists who were pioneers in the simulation of particles and in the application of algorithms of artificial evolution and self-organising processes to infographic creation in the 1970s and 1980s.

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Legal deposit B-52019-2002
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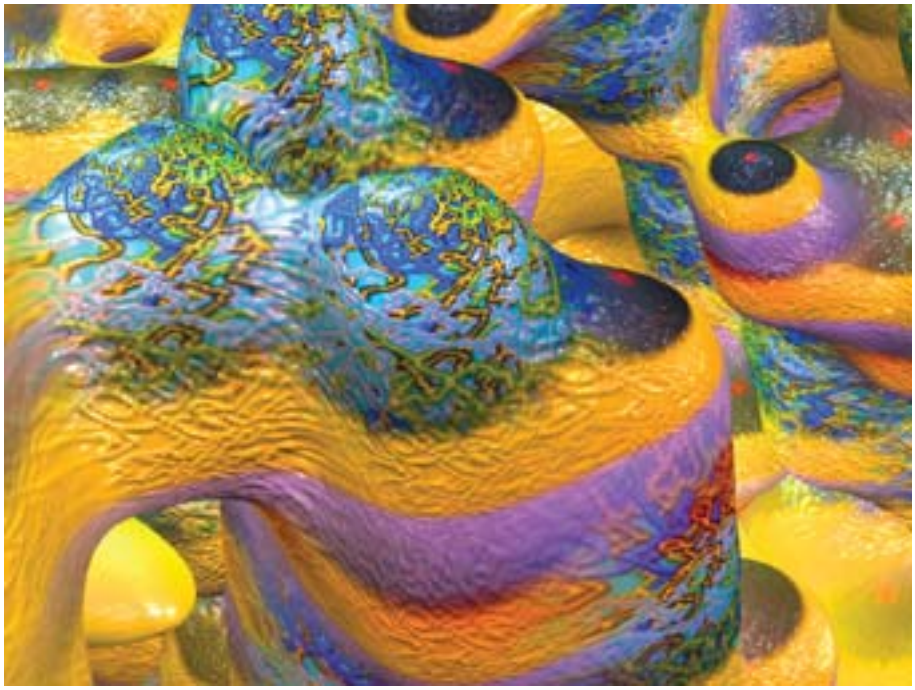
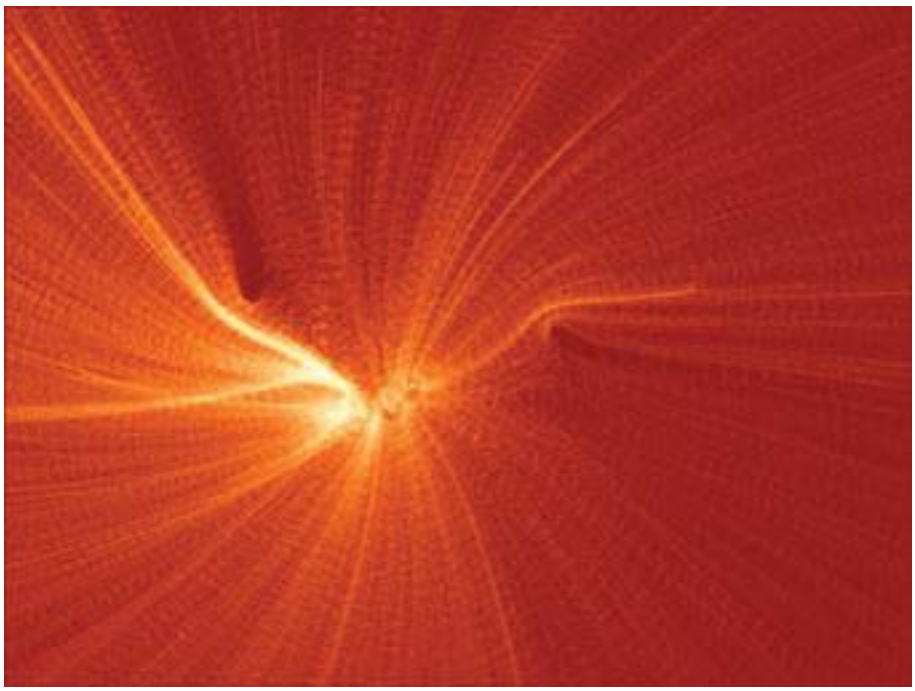


Yoichiro Kawaguchi

During the nineties, these image generating systems became structures open to interaction between the work and the spectator/user. Subsequently, as the artist Golan Lewin explains, art is increasingly becoming a generating system of evolutionary processes. The work is based on the creation of software and operative systems developed specifically by the creator; but the images will appear and evolve with the participation and interaction of the user with the system. Such is the case of the Virtual Reality installation by Agueda Simó. It is inspired by mathematical concepts such as attractors (stable states in dynamic systems) and fractal geometry, from which he goes on to generate immersive, organic microworlds that transform themselves and evolve visually and sonorously in interaction with the user.



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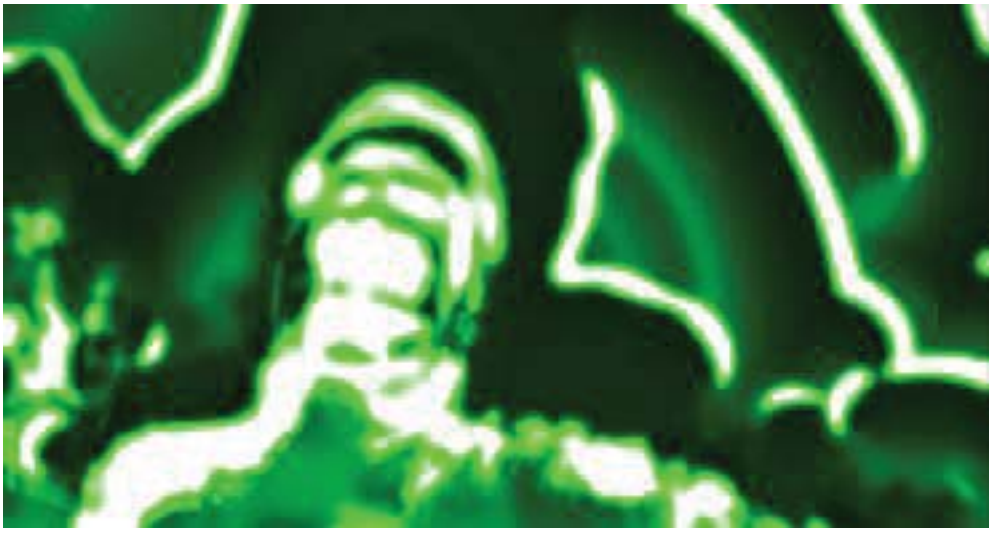
Golan Lewin

Hans Diebner and Sven Sahle have produced a simulation of a neuronal network that makes it possible to experience the alteration and transformation of its global pattern through the external stimuli generated by the presence of the public.

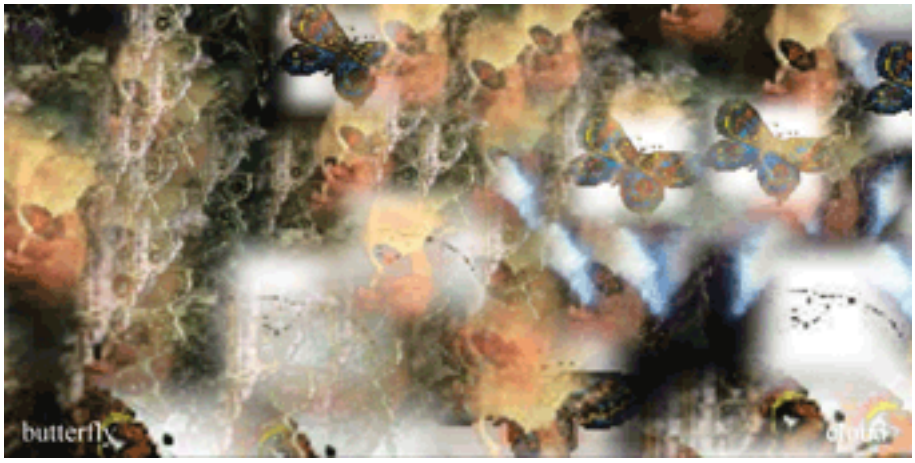


Hans Diebner

The collective Transnational Temps offers innovative transversal, hyper-textual maps for navigating through a world of ideas, concepts and facts, the relationships between which are revealed in a constellation of interconnected variables, and open, evolutionary systems are also what are proposed by the work of the collective Uru.

The aim of this kind of projects is not only to generate new formal and aesthetic processes. They also present a critical analysis of the construction of reality. As Peter Weibel explains, "the aim of the social construction of art is participation in the social construction of reality."

Reference to what is real is profoundly influenced by the media flow. The screen has become the world, invading public and private spaces, sweeping the wealth and poverty of an interconnected world along in its current. In the installations by Rafael Lozano-Hemmer, Christa Sommerer, Laurent Mignonneau and Roberto López Gulliver, Donatella Lundi, or Sachiko Kodama and Minako Takeno, it is apparent how this media and communicational flow affects our perception and connects us with that ephemeral, immaterial space of the informational "non-place".



Christa Sommerer

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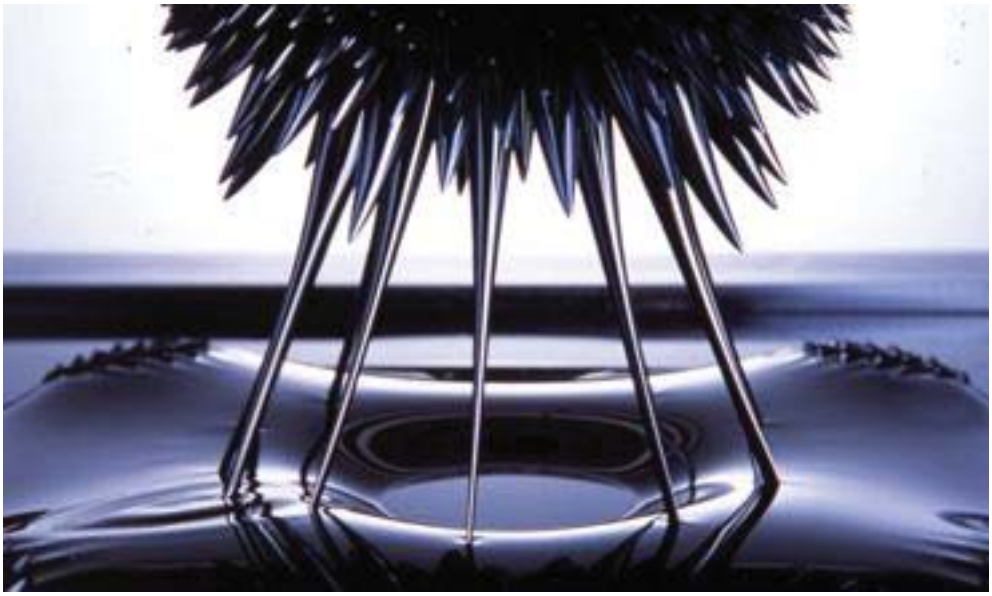

Sachiko Kodama

Flows also correspond to the interior landscapes of the human body. The work of both Dominic Buttermore and Daniel Canogar displays a vertiginous immersion in the interior of our body where, as Canogar says, "order derives from the profound chaos that we house within our organism, where we discover that the complexity of the cosmos is located within ourselves."

The correspondence between internal flows and the external world also underlies the action of *Circo Interior Bruto* ("Gross Domestic Circus"). This collective examines the problematics of pollution and epidemics, of a fragile, hazy existence on a raft drifting in a sea of uncertainties. Someone says, "It's been days since we scanned the horizon for terra firma. What's the use of a patch of firm ground to someone who can't see the difference between their limits and their environment, someone who's in the constant process of becoming someone else? We have no future but speculation."

It is unquestionable that we are going through moments of turbulence and uncertainty, where borders disintegrate, supports topple over and we feel dizzy from the vertigo of the extreme, the unknown. The deterministic and mechanistic models which we attempt to use as guides are inadequate to deal with this new contemporary situation. The different fields of knowledge and diverse disciplines have made a tremendous effort to build their own bunkers and guard their perimeters. Thus, they have defined their territory by excluding everything that they consider foreign, thereby distorting their own perception and causing their protagonists to forget. It is as if an amnesic branch were to forget about the tree that sustains and nourishes it. A situation that provides an excellent medium for attitudes of confrontation, exclusion and hostility to proliferate.

Nevertheless, finding one's way through these territories of uncertainly constitutes a challenge for all those who decide to participate in the evolutionary and cultural process facilitated by transdisciplinarity: a term that evokes a fluid, weightless "intermediate state" that finds a fertile medium in cyberspace. To treat this state as just one more label would be to annihilate its potential. Only from its "weightlessness" can it exercise that catalytic, dynamizing "trans-" function of the "informational substances" that gravitate within the limits of conventional fields of discipline: in those zones remote from equilibrium where, as Ilya Prigogine points out, "things happen." Owing to this, transdisciplinarity is not a category. It contains a dynamic meaning that spans categories. It implies a new attitude. It reflects a complex, emergent state that refuses to be explained merely as the sum of its parts. It represents an open, polyphonic, dynamic and evolutionary perspective. A being among things that "does not designate a localisable relationship that goes from the one to the other and is reciprocal, but a perpendicular direction, a transversal movement that sweeps the one and the other along, stream without beginning or

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end that undermines both banks and gathers speed in the middle." (Deleuze and Guattari).

Within this new context, so-called globalisation acts as an amplifier of tensions and the communications media acquire enormous prominence. The encounter of the new global media with the forces generated by the action of thousands of organisations around the world has overtaken conventional frameworks of reference. It is an unpredictable situation that provides a space for social creativity. In fact, global civil society reacts like a multiple, heterogeneous organism. It inspires synergy between individuals and collectives who interpret the crisis as an opportunity to create a new space for co-existence and "different", sustainable prosperity: a change of attitude that produces new forms of active, participative dissidence in the face of a mercantilist invasion that tends to commodify and put everything that falls into its clutches—beings, ideas, feelings or emotions—up for sale. It also refuses to accept the role of the merely passive consumer/spectator of a unidimensional, totalizing model of reality that fails to show solidarity and tends to occupy all the available space.

In effect, ever since the mid-nineties, the new Net culture has been articulated through numerous initiatives and projects. In the first European Encounter of Medialab Madrid, directed by Technologies To The People, some of the most renowned protagonists from Amsterdam, Barcelona, Berlin, Brussels and London talk about their experiences and knowledge relating to the different self-organising processes of this Net culture. Within this context, both Inke Arns and Eric Kluitenberg agree on the organicity and implicit fragility of the Net system. And just as in micro-biology, these self-organising systems can be observed to follow the patterns of an evolutionary process, that usually acquires a critical mass from which they spread out and restructure in new configurations. In fact, "recent research suggests that the networks of molecules in a cell, of species in an ecosystem, and of people in a social group, can all be woven on the same mathematical loom as Internet and the World Wide Web." (George Johnson).

Of relevance to this is the claim by Lynn Margulis that "the formation of new composite entities through the symbiosis of previously independent organisms has been the most powerful and important evolutionary force (#). Life did not conquer the globe with battles but with alliances." But all this undoubtedly requires audacity and imagination, "not as a source of deception and illusion, but as an ability to perceive what one does not know, to intuit what one cannot understand, to be more than what one can know." (William Irwin Thompson).

It is well-known that in moments of severe crisis, in extreme situations, mechanisms are unleashed that transcend the sphere of the rational. Fissures open up through which an atavistic, vital and creative impulse flows, which, channelled by intuition, is able to find its way through the thick fog of uncertainty. Cultural institutions and agents, museums and exhibition spaces of contemporary art and culture face the challenge of orientating themselves and navigating in this new context.

All in all, it offers an emergent, tentative and exploratory scenario where the definitions and functions of curators, artists, cultural agents, institutions, public and/or users break down before the realisation of new projects able to harmonise and transmit the impulse of the present. In fact, these heterogeneous research groups—artists, scientists, technical experts and thinkers—collaborate and behave like "enzymes"—the catalysts of cellular processes—for the purpose of processing and "metabolising" concepts and ideas, images and sounds, emotions and feelings, with which to draw up new cartographies.

In many cases, these are proposals that overflow and broaden the context and conventional concept of art. A striving for comprehension demands a willingness to experiment. This furthers the interaction of processes and disciplines and, when successful, creates a kind of revelatory synchronicity.

The new space/time maps of the migratory flows of people, animals or the quantity of unrecyclable rubbish in certain geographical areas, put forward by the young collective UHF; or the fluctuating, variable cartographies generated by urban flows, as displayed in the interactive work of Ursula Damm, are indicative of a reality marked by multiple, superimposed and

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complementary landscapes. A new perception that is also apparent in the work of Eugenia Balcells.

These new scenarios of present day art tend towards the horizontal: they are ubiquitous and plural, open and dialogical. Their dynamics make them impossible to classify within a preconceived framework. It is a situation that recalls the primordial soup, in which the first molecules began to self-reproduce and cooperate, behaving as creative, dynamic clusters, giving origin to life. In that original ocean, error was, as today, the motor of evolution. Accepting error involves the challenge of the experimental: discovering and developing new skills for plunging in and navigating through the fluid dynamics of uncertainty. One of the major challenges of the new Net society.

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Published on: December 2002

Recommended citation
OHLENSCHLÄGER, Karin (2003). "Cibervisión 02: Fluid Dynamics". *Artnodes*, issue 2 [article online].
DOI: http://dx.doi.org/10.7238/a.v0i2.682

Original title: *Cibervisión 02: Dinámicas Fluidas*

ISSN 1695-5951
Legal deposit B-52019-2002