

Art as Research Process

By: **Mariano Sardòn**

My first encounter with digital technology took place when studying physics and working at a Plasma Physics lab at the University of Buenos Aires. There I assembled experimental devices used to measure the physical characteristics of plasma in equipments called "plasma focus". This process is known as "plasma diagnosis". I also studied the appearance of x-rays and neutrons during the hydrogen fusion in plasma and electric breakdown of gases.

Science had taught me to look at nature with a detached, analytical eye, but at the lab I was usually overcome by the visual and tactile aspects of the work I was doing.

I started painting while I was studying physics. With time I came to realize that my painting was close to the scientific process I had come to know so well. I found this surprising for I thought, based on what I had been taught, that science and art had little in common. I used to paint on steel and aluminum sheets, they slightly blurred the viewer's reflection. The viewer's surroundings were faintly recognizable on the metallic surface. Everything became sufficiently hazy so that the viewer had to recompose the reflected image of him or herself. The reflections and the light would partially hide the painting itself, forcing the viewer to move in order to understand it completely. These are some of the features of my early works I would later develop in interactive pieces.

Since then, and for a long time now, I've explored the links between my lab experience and my artistic practice. Art and Science are considered distant areas of human development that involve different and even opposed processes and capabilities. Yet I didn't feel this way towards Art and physics, I saw similarities and common grounds.



"Untitled".
Transfer and acrylic on stainless steel.
110 cm x 40 cm, 1999.

During my final years there, the lab had become the place where I studied art. In time I abandoned physics and painting turned into installation, video, video installation. Still what I had experienced in Science was increasingly involved in my artistic practice. Those elements of science which I held on to interested me primarily for their aesthetic value.

I started working with sensors, interfaces and computer codes in the year 2000. My first works of this sort aimed at bonding different things in the world, creating interactions between what wouldn't normally bond.

During 2001 and 2002 UCLA granted me a scholarship to research interactive art through digital technology and immersive environments applied to Performing Art at their Film, TV and Theater Department. There I found stimulating grounds to explore the convergence of Art, Science and Technology. In the works I developed at UCLA I applied models of interaction used in physics to create art works. There I developed the technology for my works as part of my aesthetic exploration.

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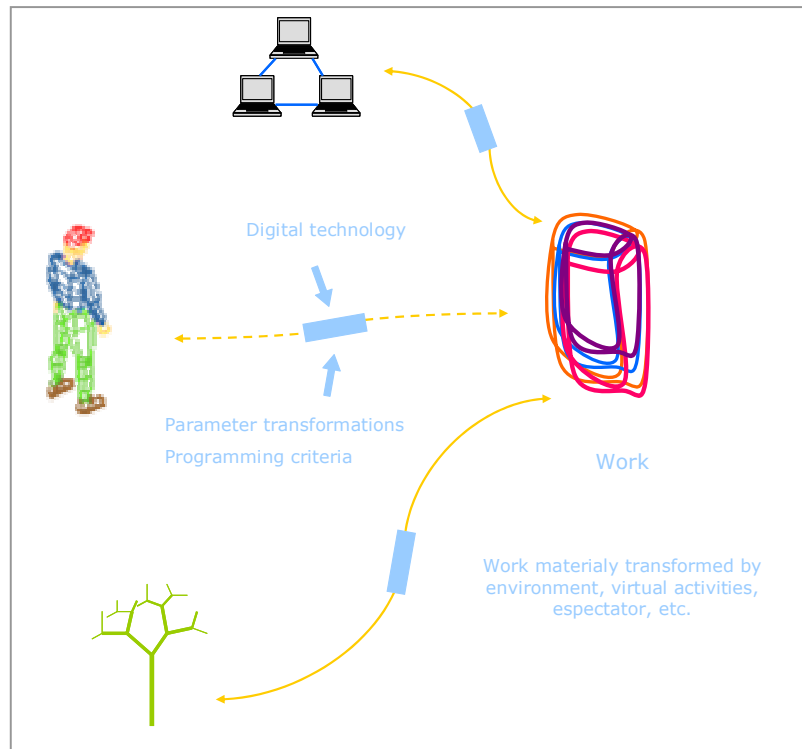
Through the years I've come to realize that every technological device carries with it a certain conception of the world. When technology becomes part of an artwork so does everything it represents, as well as the rules it abides for. Many aspects of the artistic process are modified when scientific concepts and procedures are introduced. Suddenly the artist is faced with multiple tasks that demand him or her to perform different roles: researcher, engineer, programmer, etc. These new practices that become a part of the artist's work offer a remarkable opportunity to inquire about creativity.

For instance, one of the notions that should be reviewed is that of the artwork as a closed object with a given shape. Instead, digital technology based Art can be thought of as an ever-changing



Big test tubes full of water allow a slow rain of drops that fall over hot metal plates. Aleatory texts are projected due the evaporation of drops. 2001

system, since the object is being constantly redefined by the viewer. The artist articulates a number of interfaces, digital technologies, analog mechanisms, and organic materials merge to compose a system that can be manipulated by the participants. Unlike what is expected of the viewer in traditional art, in an interactive environment the role is closer to that of a user, moreover a “performer”. The artwork unfolds dynamically as the participants establish new relationships with its formal elements.



The results of an interactive artwork should be sought beyond the object for it is simply a temporary state that can be modified by the users.

Similarly conceptual artists regarded the idea as the artwork itself, applying the notion of art piece to a process of critical research over any sphere of human interest. Conceptualists proposed a different way for art to approach the world, by looking into it with an enquiring eye. This is perhaps what interactive and conceptual art have in common, they are both committed to a practice that is more interested in broadening the possibilities of an artistic process of exploration and less object oriented.

The artistic practice that incorporates digital technology explores ways to express shapes and actions, ideas, concepts and points of view; as a result of an artistic process of investigation closely

related to science and technology. Yet, the defining characteristic in the case of an interactive artwork is not its formal aspect but the way in which ideas, logical arguments and mathematical operations interlace too.

The viewer's participation is fundamental to an interactive artwork. The artist defines an initial set of rules and opens up the game for the viewer to start playing. The viewer manipulates the formal elements that constitute the work, arranging new relationships between them. This reconfigures a shape, which evolves away from the control the artist can exert over it. The artist specifies parameters and models relationships through the codes that will rule interaction and allow shapes to auto generate both in time and space. From the initial configuration of rules in an artistic process of this kind, dynamic shapes will emerge. The unpredictability of the shapes the system will take on ensures that the artwork remains unfinished.

The actual substance that is manipulated in this process is information, which is intangible. A flow of data, impossible to grasp, which lacks a shape, but, in spite of it, can be outlined to take a form. This principle was first suggested by Aristotle. In artworks that incorporate digital technologies a shape emerges from the initial rules of interaction structured by the artist. The relations established with the system constitute a mesh where codes, materials and dynamic shapes emerge through interaction. It could be viewed as some sort of dynamical system.

Two examples concerning these issues are "**Books of Sand**" (Exhibited at Daum Museum of Contemporary Art right now) and an older work called "**a=b**".

a = b is an installation in which the movement of the Museum's visitors interact with texts stored in a database. People's trajectories in a certain region of the Museum are transformed into paths of characters and words that mimic their movements and compose a text structure. The letters representing individuals' paths are dynamically etched using the text stored in the database and projected on to a large wall in an exhibition room. People are embedded in an immersive environment constituted by a chain of processes made possible by digital technology. The



random component of the installation is the unforeseeable dynamics of the texts stored in the computer, which stay hidden. Through his or her actions: walking, standing still, gliding, jumping, the visitor tries to determine a plot.

The whereabouts of the people walking through the museum is captured by a tracking system with a video camera (computer vision). Their coordinates are transmitted via the Internet to another computer that processes the texts that are projected in real time.

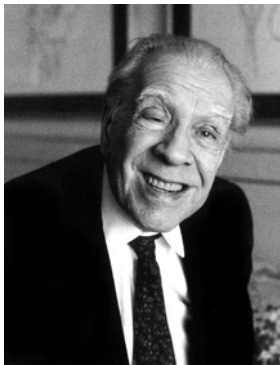
a = b attempts to blur the line that separates an artwork from the person who experiences it. It's a work conceived as an unfinished "system" that establishes a relationship between space and people. Its shape is determined by the peoples' interaction as a group. Each individual does not have complete control over the triggered texts. The viewer's reading and perception depends on those of others. Using the system as medium, texts are altered and created by the visitor's as a whole. Forcefully everyone in a certain place is part of an interaction.

Books of Sand is an interactive installation that models a relationship between the movement of the visitor's hands and hypertexts taken from the Web. Each installation consists of a glass cube filled with sand. When the visitors touch the sand with their hands, projected codes retrieved from the Web, seem to arise from within the cubes. Interacting with the movement of the hands, the text flows like



a liquid, spills through the skin and slowly disappears.

The specific codes retrieved from the web in these installations, are those that make up the websites containing writings by Jorge Luis Borges. In his short story titled "The book of



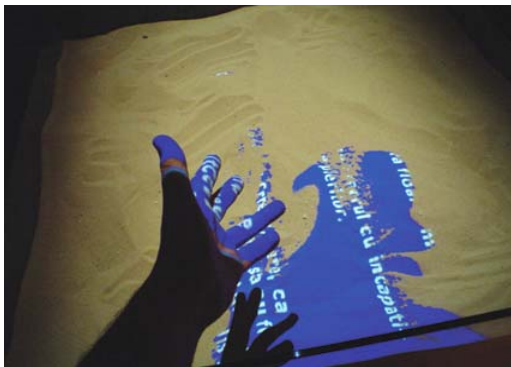
El Libro de Arena (The Book of Sand)
Jorge Luis Borges.
1889 – 1986



Sand", he describes an infinite book with no beginning and no end. A countless array of pages numbered at random each time it is opened, never the same. The writing is impossible to follow and only reveals fragments of itself as the pages slip uncontrollably through the reader's eager fingers.

Correspondingly, the Web is an immense, dynamic network, connecting people worldwide. HTML codes are text formatted files scattered in time and space, inapprehensible as a whole, in perpetual change, the most complex and unpredictable text ever written.

In **Books of Sand** hardware and software compose a structure built on a mathematical abstraction, the very same elemental that constitutes the foundation of digital data. A sequence of codes is triggered at random as each viewer touches the sand. A camera captures images of the hands in the sand, which are analysed by a real time image processing software developed by



Laurence Bender, a collaborator of mine. The sequence of images captured by the camera is conceived as a set or array of numbers. Mathematical operations applied to the pixels extract what moves or appears in the image field. Once the significant data of the movement of hands in each image is retrieved, the information is mapped on texts kept in a database. Finally, the processed information from the camera is mapped to the HTML code texts and a moving text image emerges. This is projected on the sand so that it interacts with the movement of the hands.



The cubes in **Books of Sand** are interfaces involved in a tactile game; the sand is the background substance for the unfolding of the hypertext of which the web's vast dynamical memory is constituted. The cubes enclose in a confined space a fragment of the infinite information flowing through the web.



In **Books of Sand** the viewer has the possibility of handling what is immaterial, can grasp an instant of it in the fist of a hand.

Developing this kind of work has more in common with scientific procedures that model the world, than with a traditional object oriented artistic practice. It is comparable to the work of a scientist who models a system of particles that adopt emerging dynamics through mutual interaction. Hence, the system's evolution depends on the one hand, on the interaction between its parts and on the other, on the relationship it establishes with its environment. If the rules of interaction are modified, then the emerging shapes will change. In this sense, this kind of art and certain scientific practices share the same model of organization. The way in which scientists model nature and artists model interactive artworks can be easily associated. Certain notions of contemporary science are clearly a part of this type of artistic practice. Many artists work with generative algorithms, cellular automata, complex dynamical systems and other computer paradigms. They incorporate

concepts and practices commonly used in biology, physics and technological science to model nature.

The most interesting resemblances and dissimilarities between art and science take place in their exploration processes. Artists approach to research is different from that of scientists; who like and technologists strive toward objectivity; while artists cultivate their idiosyncratic subjectivity as a major feature of what they do. Generally the artist's discoveries occur not on the formal level, employing the rules of language or mathematics, but on the level of sensations and the unconscious perception of movement and spatial orientation arising from stimuli within the body itself.

The work of art stands in necessary contact with the unknown (jumping forwards without necessarily having a background foundation) whereas scientific discovery constantly annexes the unknown to the known (one consciously takes a forward step based on precedents).

Nonetheless, artistic valuing of creativity and innovation may result in alternative methods, driving the research process into unexpected directions, this is also true of the scientific approach. Both science and art share many ways of proceeding such as observation, structured speculation, visualization, exploitation of analogy and metaphor, experimental testing.

Art could work as research using systematic investigative processes to develop new technological possibilities or to discover useful new knowledge or perspectives. Artistic processes could even become a field of technological exploration; artistic input may lead the scientist or engineer to consider a problem from a different perspective. Alternative ways of presenting data dynamics may be explored; for instance: weather sonification, market visualization and sonification, web activity visualization, subatomic particles sonification, etc. Those are all fields that have awakened both scientific and esthetic interest in the past years.



I worked on these issues in my recent work **Stochastic Cultures**.

Stochastic Cultures gathered data concerning the use of the mouse and keyboards of the computers at the Museum of Latin American Art of Buenos Aires (MALBA). A central computer received the data via the Internet from the museum's computers. A series of algorithms decoded and processed the information, feeding the installation an enormous amount of random characters. Thus, the installation constitutes an open system which is permanently trying to rearrange itself. The sound is composed by overlapping layers of sound; each respond to a different keyboard. An algorithm, based on statistical criteria, attempts to form write words and phrases by random permutations of characters.



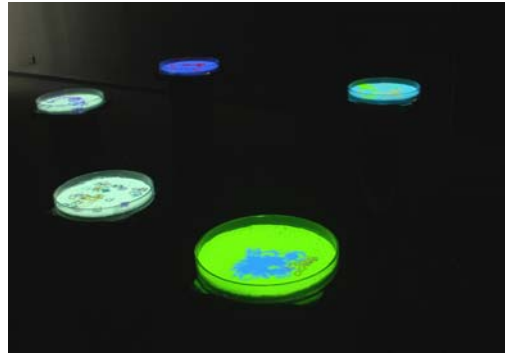
The character flow and sound produced by the keyboards are displayed in a room. The words and characters are projected on petri dishes full of sugar. The sounds and texts are processed in real time. If the system is allowed to enough time, it will become an organic system that might develop some kind of organization in terms of words and sound patterns.



One of the most interesting aspects of the work is that it highlights local and scattered actions that would otherwise be impossible to observe as a global event. The term stochastic is applied to situations in which because of the large number of elements involved individual behaviours cannot be observed, but only considered as a whole. The artwork is spread through the museum, it originates in the parts

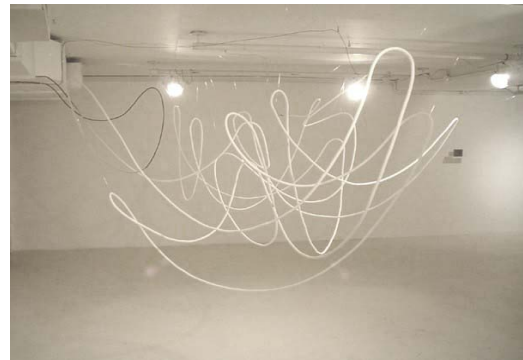


of it that remain off boundaries to the general public. The artwork expresses the movement and activity of the museum's staff, it illustrates the way people inhabit the building.



I'm interested in the bonds participants establish with an artwork of this kind, how they explore and experience it. I think of it as a learning process, a way to approach and understand the surrounding world. When the viewers investigate my works sight is no longer enough, they need to involve their bodies as well.

In this way I try to encourage a playful attitude in the viewer as he or she relates to the artwork and through it constructs the world. A natural phenomenon experienced through a lab device in a scientific experiment also requires that this relation between precept and affection take place. Through experience nature and its representation is understood as a human construction. Through experience events are granted meaning and significance.



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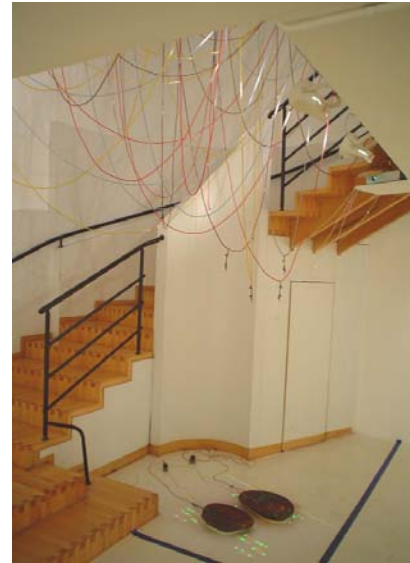
Absolute Zero is an exhibition in which I worked with related objects and installations as a complete system. In it water is presented in its different states. Temperature and heat are included as formal elements. The exhibition pieces sway between human



representations of the world and natural phenomena itself as aesthetical experience.

Several cubes made of glistening aluminium, tidily lined against the wall, are heated or cooled at different temperatures. A frozen tube runs through the gallery space, covered in ice.

A tangle of transparent tubes hanging from the ceiling to the floor, contain colored liquids that minutely spill drops over hot metal plates. Each evaporation event scatters many characters. A software tries to order such a characters in a text.



Interactive artworks are open systems that allow us to expand the traditional notions of art and creativity. They offer a chance to examine stagnant categories under a new light. The idea of artist and viewer as having opposite roles and importance in the artistic process is discussed through these artworks. Additionally, interactive artists dismiss the supposed fact that the specificity of a discipline prevents it from entering another sphere of knowledge. They prove that art and science can combine in the creation of a system, to render one of many possible configurations of the world. In this context interactive art can also function as a lab device that exposes nature, unravels it, trying to model and shape it unsuccessfully.





These interactive environments that merge technological and artistic practices constitute learning experiences. The participant explores the artwork through play, symbolic interpretations or any other means and knowledge is involved in the experience. Because interactive artworks are built through the participant's actions, they bring forth their way of relating to what is unknown. This constitutes a revealing realization. The art piece becomes an expression not only of the artist but also of

the viewer. The interactive artwork is a celebration, a way of sharing.

In this sort of hybrid practices, somewhere in between art and technology, an interaction can be established amongst practically everything as part of work of art. Interactive art like science, allows perception to build circumstantial conceptions of the world; as reason and spirit reconfigure ideas of it through words.

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