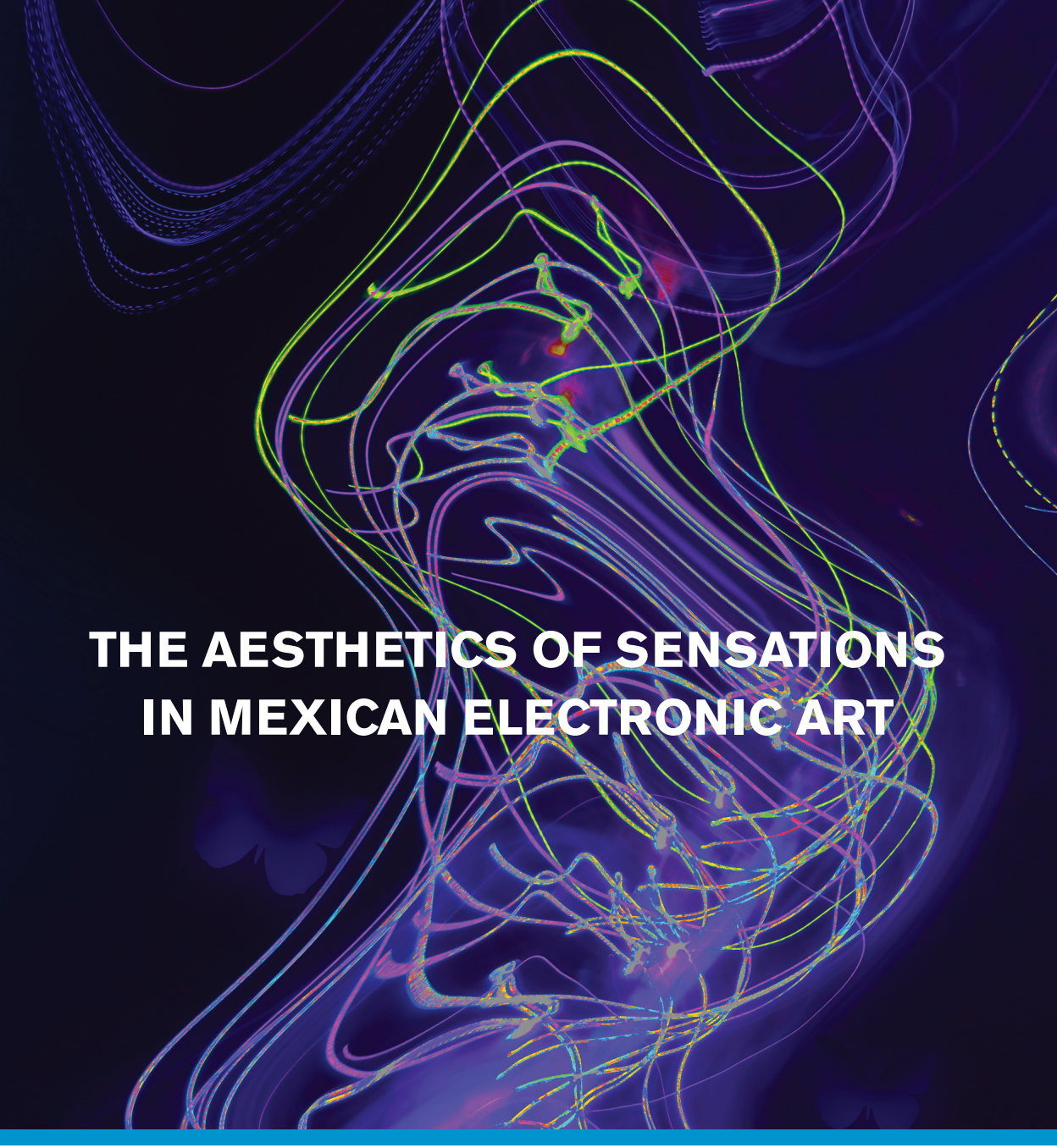

THE AESTHETICS OF SENSATIONS IN MEXICAN ELECTRONIC ART

COMUNICACIÓN CIENTÍFICA

Cynthia P. Villagomez Oviedo

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Abstract

The Aesthetics of Sensations in Mexican Electronic Art addresses the study of the origins of electronic art in Mexico, the differences between contemporary art, electronic art and digital art, taking a turn to dwell on the analysis of the fundamentals in the processes of creation with a focus on the processes of Mexican electronic artists. It also studies the role of the interaction of the public in the artistic works of electronic art and how, due to the interaction, it is possible to induce a certain range of emotions in the user. In such a way that it becomes necessary to establish thematic categories in Mexican electronic art and its works, due to the existence of an interrelation between emotions and interaction. Therefore, we have created a model for the induction of emotions in order to contribute to the understanding of this branch of contemporary art and its didactics, both inside and outside educational institutions. *The Aesthetics of Sensations in Mexican Electronic Art* is a book for art lovers, as well as for novice and experienced artists who wish to implement conscious strategies in their artistic production processes.

Keywords: Art and technology, artistic creation, emotions in art, aesthetics.

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To electronic artists Leslie García, Roberto Morales Manzanares, Fernando Palma, Arcangel Constantini, Ivan Abreu and artist Monica Mayer for their work and willingness to help.

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Thanks to my daughter Sara Sofía Parrales Villagomez.

Dedicated to Rosalinda Oviedo Garza
(1942-…), my Mother.

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Introduction

Man thirsts for novelty
is bestia cupidissima rerum novarum.

Faust[1]

A set of stylistic and thematic elements of Mexican electronic art is the subject this work addresses, together with those impressions that human beings perceive when their receptor organs are stimulated, through olfactory, visual, tactile and gustatory sensations, as well as the emotions and actions that these sensations generate.

On the other hand, in the documents consulted, art utilizing mexican technology is not included in the recorded history of art at an international level, despite the fact that for more than fifty years it has had outstanding artists and works whose ingenuity, originality and novelty have been described mainly in national books and newspapers, and have even contributed to improving technological advances. This book is also focused on showing the findings on the antecedents of electronic art in Mexico, as well as the links between these antecedents and the practice of contemporary electronic art. Therefore, its purpose is to reflect on those events that traced the path of electronic art of our days, as well as to analyze their contributions and permanence in current electronic art, with the purpose of approaching the characteristics of the creative processes of Mexican electronic artists and contribute in this way to the formation of young artists who make use of the most contemporary resources of technology, as well as to the analysis and registration of the background of the subject to contribute to the enrichment of future research.

[1] Faust's phrase "Animal anxious for new things" (Marina, 2004, p. 14).

We consider that the antecedents of electronic art have set the tone for the realization by artists of this branch of art; works with political, social and, in recent decades, environmental postures. Therefore, the critical sense of the original works of art with the use of technology has remained throughout the history of Mexican electronic art in correspondence also to the characteristics of a country whose citizens have critical positions on the national political ecosystem.

A genealogical review will be made of those artists and precursor movements in art with the use of technology, as well as in electronic art. Subsequently, the field of contemporary art, electronic and digital art will be defined according to those definitions that coincide with the Mexican scenario, in order to reach conclusions of our own in this regard. Afterwards, the fundamentals and processes of creation in Mexican electronic art will be described and analyzed; to proceed to the study of emotion and action, the categories of Mexican electronic art that have been detected, and lastly concluding with a description and analysis of the induction of emotions in Mexican electronic art.

As for the description of the characteristics of the phases of the creative process, these are based on interviews with several Mexican artists who were either born in Mexico or nationalized, highlighting as a characteristic that they have had artistic production in Mexico or most of it has been created in the country by artists such as Leslie García, Santiago Itzcoatl, Erick Meyenberg, Arcángel Constantini, Gilberto Esparza, Ivan Abreu, Rafael Lozano-Hemmer (the latter only as a reference, because although he is Mexican, he is not a reference point for Mexican electronic art because he has not developed all his work in the country, as he himself has said). Among other artists who contributed to this research at the beginning, we find creators such as Mario Aguirre Arvizu, Marcela Armas, Roberto Morales Manzanares, Rogelio Sosa, Manuel Rocha Iturbide, Diana Guzmán,[2] as well as Amor Muñoz and Fernando Palma. Therefore, the study problem is focused on the analysis of works by Mexican electronic artists such as Gilberto Esparza, Arnold Abadie, Arcángel Constantini, Amor Muñoz, Leslie García, pioneering Mexican artists of electronic art

[2] Interviews available at https://vimeo.com/user29545447

such as Pedro Meyer, Mónica Mayer, and Javier Covarrubias, among others, along with Mexican contemporary artists with digital work, such as Erick Meyenberg, foreign artists with more than 20 years of producing work in Mexico, such as Ivan Abreu; and Mexican-born artists with international production, such as Rafael Lozano-Hemmer. At present, as mentioned above, Mexican electronic art has a couple of dozen artists with more than fifteen years of career trajectory, none of whom have been studied from the perspective of the emotions they can induce in the audience of their work. Therefore, it is particularly interesting to study emotions within the framework of the global knowledge that has recently been developed on the subject.

On the other hand, knowledge about the methodological and cognitive processes of how original and novel ideas are produced in the human mind, the principles and foundations on which they are created, as well as the different phases of this process, namely, tendency, gestation and discovery, evaluation, realization, exchange and communication, as well as participation, are some of the aspects to be dealt with in this book. Also important are the reaction, interaction and emotion linked to the participation phase of the creation process. Therefore, these aspects are approached with the purpose of reflecting on the induction of emotions in the production process of developments in Mexican electronic art, and some techniques and resources on the induction of emotions will be presented.

In this regard, in recent decades a wide field of study has developed in the methodological processes of artistic activity at the crossroads between art, science and technology. However, despite its importance and transcendence, the production and dissemination of results is scarce, and in the Mexican case practically null —with the exception of a book by the undersigned published by La Librería de la Universidad Politecnica de Valencia Spain and which is freely accessible (Villagomez, C., 2017). Nevertheless, its richness is such that its study is advancing as other areas of study are also advancing; fields such as cognitive sciences and behavioral psychology, among others. It is precisely at the crossroads of these areas of study that this book focuses.

At the beginning of the process, when a research topic was being chosen, it was detected that a group of professors and foreign electronic artists were

unaware of the work of Mexican digital and electronic artists. Later, we realized that the lack of knowledge was also on the part of the Mexican public in general. It was at that point that we considered investigating the matter, recognizing the fact that, if the work was scarcely known within the field of electronic art, the processes through which it was produced were also unknown and, therefore, the works were little understood. Added to the above is the existence of aspirants to university careers in digital and electronic art with no knowledge of the discipline itself. Therefore, once the problem was detected, we proceeded to investigate electronic artists, limiting the study only to electronic artists with more than ten years of work in the field, as well as those contemporary artists with work within this branch of art. It is necessary to mention that at the beginning of the research it was very complicated to find Mexican electronic artists, first because it was necessary to define what electronic art was and then to start the search for the actors in the field, where the recommendations of the first artists found were the key to finding others.

At present, Mexican electronic art is strong in the artistic developments generated by some twenty well-known artists, plus a group of emerging artists as well. However, there are no exhibition spaces (with the exception of the Laboratorio Arte Alameda and the Museo ExTeresa Arte Actual, both in Mexico City); it should be mentioned, sometimes the works are for public spaces where the street is the showcase, and in fewer cases, the works are freely accessible on the internet. What also represents a problem is the lack of economic support. In this regard, we virtually attended the panel called "CIFO[3] & Ars Electronica:[4] Latin American media art. History and praxis", within the annual event of the Ars Electronica museum, held from September 8 to 12, 2021, and chaired by Mexican artist Rafael Lozano-Hemmer, with the participation of Mexican artists Tania Aedo, Amor Muñoz, Ivan Abreu (Cuba-Mexico), Marcela Armas and Tania Candiani, as well as Latin Americans, Eduardo Kac, Oscar Santillan and Patricia Domínguez. In the session following the panel, it was stated that one of the biggest problems

[3] The Cisneros Fontanals Art Foundation (CIFO), a non-profit organization that sponsors Latin American artists. www.cifo.org.

[4] One of the most important museums in electronic art, located in Linz Austria, has a festival of the same name that has been held annually since 1979 (https://ars.electronica.art/center/de/), in 2021 the event was virtual and in person.

for Mexican electronic artists is the lack of economic support for production, a situation that is worrying because the participants are recognized artists, even abroad. Mention was made of the federal support called the National System of Creators, which grants a monthly scholarship, but according to the artist Tania Candiani, it only serves to live on, not to produce. Therefore, it is necessary through this research to highlight the importance of Mexican electronic art and its strength as an agent of social transformation, due on the one hand to the interaction and involvement of the necessary public in the works, which allows the transmission and reflection on messages, which in the case of Mexican electronic art, are mostly focused on social and environmental problems, which makes electronic art an effective means of communication capable of contributing to the solution of the problems that currently afflict the country.

On the other hand, the role played by emotions is to enhance such communication. Due to the above, understanding the role of emotions within the works of Mexican electronic art, as well as highlighting their importance for reflection and awareness of the issues addressed by artists in this field, is the purpose of this research. Therefore, the following question derives from the above: Is it possible to create a methodology for the induction of specific emotions in Mexican electronic art developments, which ultimately reinforces the objective of several artists in raising public awareness about various issues that afflict Mexicans?

Another of the reasons for conducting a study on the methodological processes of artists in the field, as well as a methodological proposal applied to electronic art, in addition to the above, was to create the knowledge necessary to raise awareness of how to create, in order to contribute to the teaching-learning processes, not only in classroom environments, but also as a resource for both novice and experienced artists, who most of the time have been formed through communities in a *self-telic* way.[5] Thus, one of the purposes of this research is, at the end of it, to be able to reflect on the interdisciplinary methodological techniques and resources related to cognitive processes in electronic art. The feasibility of applying the study lies in

[5] A term explained by psychologist Mihály Csíkszentmihályi, in his book *Flow* (1990), as "the activity that is self-contained, that is performed not because of the hope of some future benefit, but simply because doing so is in itself the reward" (Barbero, 2009).

the dissemination of the research results among researchers and publications in the field.

Another aspect that I consider necessary to mention are the personal and professional reasons for conducting the research that led to this book. Firstly there is my personal training as a designer, making me fully aware of the creative blocks and the lack of knowledge on how to enhance the productive processes themselves. At the same time, there is my involvement as a teacher interested in the processes of creation; a concern that is complemented by a Master's degree in Creativity from the School of Design of the National Institute of Fine Arts, and doctoral studies in Visual Arts and Intermedia at the Polytechnic University of Valencia Spain; all of which led to doctoral research oriented towards artistic production in Mexican digital art. Thus it can be said that over the last twenty-four years I have been dedicated to the processes of artistic creation, of which the last fourteen have been specifically to the processes of creation in electronic art. During this journey of almost fifteen years, the hardest part of researching specifically the subject of Mexican electronic art has been the generation of knowledge itself, since there are no books and articles that delve into the subject, and what there are journalistic notes or comments on blogs, among others, which made the task difficult at the beginning. Due to the above, field research was fundamental, as well as the contact with the staff of the Multimedia Center of the National Center of the Arts, who initially provided the necessary guidance in the search for data at the beginning of this research.

Hence, the general intention of this book is to generate knowledge base for the creation of a methodology that allows the induction of specific emotions in electronic art developments, which contributes to reinforcing the goal of several Mexican artists in relation to the reflection and awareness of the public in relation to different social and environmental problems. Specifically, we seek to analyze various works of Mexican electronic art, in areas such as themes and factors for interaction, as the latter are considered resources for the induction of emotions. On the other hand, to create a model for the elicitation of emotions, based on the analysis of Mexican electronic artists and some of their works in the field of interaction and the induction of emotions; as well as to understand the role of

emotions within the works of Mexican electronic art, highlighting their importance for reflection and awareness of the issues addressed by artists in this field.

In addition to the above, hypothetically, electronic art has the capacity to communicate messages and Mexican electronic artists are interested in contributing to causing the public reflect on social and environmental issues through these messages. Therefore, it is inferred that there are probabilities that an important part of the communication process between the work and the public is due in part to the interaction, which in turn produces emotions. Through the analysis and interpretation of a set of selected works, as well as the processes of emotion induction, it is also likely that knowledge can be obtained for the creation of a model of emotion induction through interactive experiences in electronic art developments. With the purpose of generating research that evidences the importance of the participation of electronic artists as transformative agents in society, and, in this way, contribute to making visible the benefits of electronic art in the construction of the social fabric.

Thus, the research carried out for this book followed a *method* based on the logic of the inductive process (explore and describe, then generate theoretical perspectives); that is, from the particular to the general, from data to generalizations, characteristics of qualitative research.[6] With the collection of data we obtained the perspectives and points of view of the participants (priorities, experiences and meanings), as well as the analysis of the interactions between individuals, groups and collectivities. Thus, this is the type of research that was chosen:

> It focuses on understanding and deepening phenomena, exploring them from the perspective of the participants in a natural environment and in relation to the context … it is selected when we seek to understand the perspective of the participants about the phenomena that surround us, to go deeper into their experiences, perspectives, opinions and meanings; that is, the way

[6] "For example, one person is interviewed, the data obtained are analyzed and conclusions are drawn; then another person is interviewed, the data obtained are analyzed, the results and conclusions are reviewed; in the same way more interviews are conducted to understand what is being sought: that is, one proceeds case by case, data by data, until a more general perspective is reached." Hernández, R., Fernández, C., y Baptista, P. *Research methodology* (5th. Ed.). Mexico: McGraw Hill / Interamericana editores, p. 9.

> in which the participants subjectively perceive their reality. It is also recommended when the topic of study has been little explored. [Hernández, R., Fernández, C. y Baptista, P., 2010, p. 9]

Therefore, this is an interpretative type of research, due to the analysis of the works, as well as the direct or indirect observation of the interacting public and the emotional reactions that are obtained; it is necessary to mention the impressions that the artists refer to observe in the public participating in their works.

Therefore, the reader will find in this book, an analysis of and reflection on the artists studied, some of their works, their production processes and a study of various methodologies or ways to lead to the end proposed by a creative mind in the artistic production of contemporary electronic art and the intervention of emotions as a means of direct communication between artist and spectator, who is now a participant in the work.

1. Origins of Electronic Art

Cynthia P. Villagomez Oviedo[1]

According to Robert Atkins (1997), kinetic sculpture, an antecedent of the "Art and Technology" movement, emerged in the late fifties and early sixties, was an international movement that began in Europe, with artists such as Yaacov Agam, Pol Bury, George Rickey, Nicolas Schöffer, Jesús Rafael Soto, Jean Tinguely, among others. According to Atkins' description, kinetic sculpture contained moving parts, propelled by the hand, air or a motor, it began when the Dadaist Marcel Duchamp mounted the wheel of a stationary bicycle on a stool in 1913. On the other hand, the same author mentions that in 1920, Eastern European artists such as Naum Gabo and Laszlo Moholy-Nagy began to experiment with kinetic sculpture that resembled machines, where after the First World War there was a certain technological effervescence. Later Alexander Calder invented the mobile, which were fragile structures made with wire, in which a certain balance was established with different forms (Atkins, 1997, p. 107).

> Kinetic sculptures are not limited to a single style, but share germinal sources of inspiration: the twentieth century's infatuation with technology. The term encompasses a wide variety of approaches. George Rickey's constructions with metal rods that sway in the wind responding to the elements of nature. Jean Tinguely's kinetic sculptures with garbage, such as "Homage to New

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> York" (1960) that self-destructed in the *Art Garden of* the *Museum of Modern Art,* showing a satirical and dark view of the Industrial Age. [Atkins, 1997, p. 107]

Later, some artists took inspiration from the modern machinery of the time for their kinetic sculptures, experimenting with more advanced technology such as lasers and computers. However, these works made with state-of-the-art technology are technically kinetic sculptures, often considered more within the "Art and Technology" movement (Atkins, 1997, p. 107).

Due to the above, by the 1950s artistic experimentation was a constant at the international level, some of the works of Abraham Palatnik, Frank Malina and Nicolas Schöffer, could be circumscribed in the category of kinetic art as well.

Thus, electronic art emerged in the fifties and early sixties with the creation of analog machines by scientists and pioneering artists such as Abraham Palatnik and Frank Malina, who created kinechromatic devices[2] and Nicolas Schöffer, who in 1956 created "CYSP 1", a cybernetic sculpture that interacted with dancers in real time (Shanken, 2009, pp. 14-15). In the sixties also, with the irruption of computers, some engineers and scientists noticed the artistic possibilities of computers, so they began to play with the graphics produced by them, pioneers like Georges Nees, Max Bense and Michael Noll, among others, were precursors of digital art, a branch of electronic art where the computer is an essential element.

In Mexico, in the 1960s and 1970s, artists emerged who were interested in investigating phenomena such as movement and transformation. It is precisely from artists with such interests that Mexican *kinetic art*[3] emerged. According to what we consider to be the description of the exhibition held in 2012 at the Museo de Arte Moderno (MAM)[4] entitled "Cinetismo: Movi-

[2] They consisted of a plastic screen converted into the front of his devices, where he projected colors and shapes driven by electric motors, creating a luminous effect by using light bulbs. The times of the same were controlled by a console that made the changes of the bulbs. Though the user saw only the projection of colored shadows on the front of the kinechromatic device, inside there were approximately 600 meters of electric cables of different colors, which flashed 101 bulbs of different voltages, rotating several cylinders at different speeds, the light was projected through a set of lenses and shapes and a prism to refract colors.

[3] According to the Dictionary of the Royal Spanish Academy, *Kinetic* comes from the Greek kinētikós 'that moves', pertaining or relative to movement. League: dle.rae.es/cinético.

[4] Available at Arte Informado. https://www.arteinformado.com/agenda/f/cinetismo-movimiento-y-transformacion-en-el-arte-de-los-sesenta-y-setenta-60519. Accessed on October 06, 2021.

miento y transformacion en el arte de los sesenta y setenta", a curatorial project by Daniel Garza Usabiaga,[5] explains that what is known as optical art —works usually in two dimensions that explored movement and transformation— is part of the category of kinetic art, "… which also includes pieces that investigate these phenomena through the use of mechanical, light and sound components. These technological devices serve as agents of sensory stimulation that give rise to a new experience of the artwork" (Garza, 2012). So, we are already talking about the participation of the public in interactions with the pieces.

> In 1968, Mexico was fully inserted into the international kinetic art circuit. This is evident with the organization of the Olympic Games, which included an integral design strategy related to optical art and also a cultural program where the presence of kinetic art stood out. After 1968, the interest in these artistic practices continued in the country. During the seventies, for example, the MAM hosted exhibitions of artists such as Victor Vassarely, Julio Le Parc, Alejandro Otero, Rogelio Polosello, Yaacov Agam, just to mention a few. Within this context, it is not surprising that during these years kinetic art has developed significantly in Mexico. [Informed Art, 2012, par. 2]

According to Daniel Garza Usabiaga, the themes addressed by Mexican kinetic art are related to the aesthetics of the space age, or there are allusions to atomic culture. It was the post-war period and there was a certain influence in the use of machines, technology and new materials such as plastic. According to the same author, there was a moment of modernization due to the post-war period that took place in several countries, which, like any other social change, influenced art. The above was made visible through the use of non-traditional materials in the process of elaboration of the artistic object; taking into account the previous factor —according to Daniel Garza— the antecedents of kinetic art were by those artists who incorporated industrial materials, who explored movement and transformation, by considering the spectator in movement or contemplating light effects, artists

[5] We attribute this text to Daniel Garza Usabiaga, because, in the final part of it, the following appears: "The Museum of Modern Art thanks the following people and institutions…", hence the text was probably issued by the MAM as a press release.

such as Cueto, Goeritz, Siquieros; it is worth mentioning that these artists were teachers and interlocutors of the Mexican kinetic artists (Garza, 2012).

The antecedents of Mexican electronic art can also be found in the graphic art produced in 1968, also known as *Graphic Art of 1968,* produced as a result of the student movement in Mexico City. On the other hand, it is very important to mention that the "official" Graphic of 1968, that is, the one generated for the Olympic Games of that year, was influenced by kinetic art.

> For the 1968 Olympic Games, Mexico opted for an integral design solution condensed in a logo designed by Lance Wyman and Eduardo Terrazas, with optical influence and inspiration from Huichol art. In addition to this emblematic image, the cultural program of the Olympiad included the presentation of an individual exhibition by Julio Le Parc, the work of Jesús-Rafael Soto was exhibited at MAM and the MUCA in Ciudad Universitaria showed the exhibition Cinetismo which included works by Lucio Fontana, Hans Haacke, Heinz Mack, David Medalla, Len Lye, among others. INBA organized the Solar Exhibition at the Palace of Fine Arts to show contemporary art produced in Mexico to everyone visiting the country. Solar featured a series of pieces related to kinetic art. Lorraine Pinto and Ernesto Mallard, for example, won the first prizes that were included as part of the exhibition's call for entries. [Garza, 2012]

It was in this period that several artists began to produce graphic messages with technological media such as the cyclostil[6] or mimeograph for the speed of reproduction necessary to spread the ideas of the student movement. Students and teachers at art schools in Mexico City mainly based their messages on the political graphics of Jose Guadalupe Posada and Manuel Manilla,[7] which were witty and critical of the political system of their time (produced in the last two decades of the 19th century). Both artists created anthropomorphic engravings where death was caricatured; representa-

[6] "Apparatus that served to copy many times a writing or drawing by means of a special ink on a gelatinous plate". *Diccionario de la Real Academia Española* [Dictionary of the Royal Spanish Academy]. www.rae.es. Accessed on April 4, 2020.

[7] More on this at: http://www.aceroarte.com/coleccion/Manuel_Manilla.htm

tions originally known as *Garbanceras* and later as *Catrinas,* they were of skulls dressed in gala clothes typical of the *Day of the Dead* in Mexico. Posada and Manilla passed their style on to the graphics produced by artists representing Mexican Muralism, such as Jose Clemente Orozco, Diego Rivera and David A. Siqueiros, among others, who produced work after the difficult times of the Mexican Revolution in the period from 1910 to 1920. Years later in 1937 in the Taller de la Grafica Popular or TGP, artists such as Leopoldo Mendez, Pablo O'Higgins and Luis Arenal Bastar dedicated themselves to engraving in the same spirit as the muralists, with the purpose of popularizing graphics with nationalist and socialist themes and holding up José Guadalupe Posada as their ideal (Acha, 1993, p. 219). Hence, years later, all the aforementioned movements and artists influenced the *Graphic Art of 1968,* since the messages made use of characters of the public and political life of the country in a style similar to that of their predecessors.

It is for this reason that the *Graphic Art of 1968* in Mexico, set the precedent of the important relationship between art and technology (Benitez, 2004), as already mentioned due to the use of existing reproduction technologies, in such a way that it is also an antecedent of Copy Art.[8] Graphics constituted a powerful tool for social subversion, its speed of multiplication, its low costs, and the ease of its massive and serial reproduction, made the image a communications phenomenon, no longer of contemplation. (Benitez, 2004, p. 150). As stated by the art theorist Dominique Liquois, which is conclusively worth mentioning in this paragraph: "As a consequence, the dialogue between art and technology, between art and scientific, sociological, linguistic, semantic, pedagogical, philosophical theories is expanded and the work 'opens up' (according to Umberto Eco's term) to the multiplicity of media" (Benítez, 2004, p. 150).

[8] "Practically the first photocopying machine was the mimeograph created by Thomas Alva Edison, which became available in 1887 […] Processes were refined by the Xerox Corporation and its competitors after World War II, and photocopiers were common in offices during the 1960s. The color photocopier appeared in 1968 […] Artists began using photocopies regularly in the early 1960s. This was called Copy Art, Electrographic Art or Xerographic Art; it did not require any common approach or style, only those imposed by the limitations of the medium itself. For artists who used photocopiers, one of these limitations was the size of the "bed" of the photocopier (where the image or text rested to be photocopied), as well as the color palette of the first color photocopiers, which was very bright and unreal. Among the advantages would be the practicality of the medium and the low costs" (Atkins, R., 1997, pp. 79-80).

On the other hand, Estridentismo (1921-1927)[9] is another Mexican artistic movement with links to art with the use of technology; a unique and unrepeatable movement influenced by European avant-garde movements such as futurism, cubism, ultraism and dadaism, but very different from them. The Estridentistas like Manuel Maples Arce created literary works that were communicated through sound montages, for example, his radio poem "Locomotoras, gritos, arsenales, telegrafos…" of 1922 and "TSH" (1923), among others, contained multiple references through verbal and sound signs to technology. Therefore, they also went from the technological vanguard to the vanguard of ideas.

Within the genealogy of Mexican electronic art is the plastic artist Manuel Felguerez (1928-2020), considered the father of digital art in Mexico, due to research he conducted in the early seventies on the possibilities of the computer as part of his artistic creation process, which began at the San Carlos Academy of the UNAM where he was allowed to use a computer.[10] However, he was only lent it for one hour a week, since the computers at the UNAM were destined for scientific developments.[11] Felguerez's advances were few due to the slow technology and the limited time he had access to it at the time. He applied for a scholarship from the Guggenheim Foundation, which was granted, and left for Harvard University, which had state-of-the-art technology in those years. There he worked with a systems engineer in the creation of a program that would allow, through the introduction of mathematical figures, to generate *plotter* drawings.

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[9] We recommend listening to the podcast: RADIO Y ESTRIDENTISMO I: "De los poemas radiográficos a todas radios felicitan al presidente" (1922-1928). Production of the thematic podcast: Fonoteca Nacional de México. Research and presentation of sound material: Miguel Molina Alarcón. June 1 to 7, 2015 https://lagalenadelsur.wordpress.com/2015/10/05/el-estridentismo-y-la-radio/ and text: Javier, García-Luengo Manchado, Cuadernos Hispanoamericanos, February 1, 2017, *El Estridentismo mexicano semblanza histórico-estética* https://cuadernoshispanoamericanos.com/el-estridentismo-mexicano-semblanza-historico-estetica/.

[10] "A BENDIX G-15 computer, manufactured by *Bendix Aviation Corporation,* Computer Division, in Los Angeles California, in the mid-1950s. The Bendix G-15 measured 5 x 3 x 3 feet and weighed 950 pounds [430.9 kg]. The base system without peripherals cost $49,500… The G-15 could use a high-speed paper tape punch for output, punch cards, or a plotter. It used magnetic tape for storage. It used paper tape or punch card for input." Computer Museum. http://www.computermuseum.li/Testpage/Bendix-G15-1950s.htm. Accessed on April 4, 2014.

[11] It is worth mentioning that on June 8, 1958, the history of computing in Mexico officially began, when this institution put into operation the IBM-6501 at the Centro de Cálculo Electrónico, CCE. Then, at the end of the sixties, UNAM bought a more sophisticated computer: the Bendix G-15 (Arroyo, Rodríguez, C., 2010).

From the numerous drawings he obtained, he made a selection that he transferred to canvas, where he completed them in oils.: The result was an exhibition at the *Carpenter Center at Harvard* and, in Mexico, he published two books on the subject, one of which recounts the experience, which he calls *The Aesthetic Machine* and was published by the UNAM. (Ciberhabitat, 2010).

In addition to the above, there are the contributions to art with the use of technology by artists such as Felipe Ehrenberg in the seventies and eighties, the first to use the cyclostil as a form of artistic production and a pioneer of Mail art (Tibol, 1987, p. 302).

With respect to the technique with the use of the mimeograph, Tibol places it within the neographic technique and in this regard, he states the following:

> In Mexico, the term neographic includes artistic prints that exclusively or indistinctly use mimeography, stamps and any other unorthodox resource. Ehrenberg —precursor, teacher, experimenter and disseminator of neographs— defines them as that technique of image reproduction that resorts to instruments, technology and methods not used by conventional graphics and that, in doing so, seeks to structure a new visual language. [Tibol, 1987, p. 302]

At that time, Ehrenberg's artistic practices permeated art schools, especially design schools. Institutions such as the School of Design of the National Institute of Fine Arts used photocopier prints as a resource for experimentation in various courses.

On the other hand, the so-called Generation of the Groups burst onto the national art scene between 1977 and 1982, and with them the process towards digital art proposals began. According to the artist Mónica Mayer, although the processes used by the groups were not digital, their aesthetic and political approaches largely nurtured the current digital art (Mayer, *ca.* 1990). Groups such as Suma, Proceso Pentagono and the No-Grupo,[12]

[12] Other groups that emerged at the time: Tepito Arte Acá, Mira, Germinal, the Taller de Arte e ideología (TAI), El Colectivo, Tetraedro, Marco, Peyote y la Compañía, the Taller de Investigación Plástica (TIP), Fotógrafos Independientes, among others.

had in common political convictions, as well as the experimentation offered by technology with the use of photocopies, heliographs, mimeographs, stencils and other low-cost means of mass reproduction. The groups attempted to renew the artistic system that prevailed at the time.

Although these expressions are not digital art, they represent the incursion of artists in the use of the technologies of the time for the discovery of new possibilities of expression, that is to say, the genealogy of art with the use of technology, the direct antecedent of electronic art, a field that can use the analog or digital electronics which digital art utilizes.

In addition to the above, Javier Covarrubias (Mexico City, 1941), who in the 80s and 90s persevered in the experimentation of computer graphics, even made drawings with equipment for recording eye movements[13] I personally met Dr. Javier Covarrubias in 1998, the year in which I finished my Master's Degree in Creativity for Design in Mexico City. At that time I was looking to study a doctorate, so I went to the Department of Research and Knowledge for Design, of the Division of Sciences and Arts for Design (CyAD), Azcapotzalco Unit of the Metropolitan Autonomous University (UAM). There, I was attended by Dr. Covarrubias, a white-haired man with a lot of energy in his body language and speech, who explained to me that I had to do a two-year specialty and a two or three-year master's degree at UAM in order to aspire to a doctorate, mainly because they were working on design experimentation with the use of technology and that it was not possible for me to join this "new" aspect of design without having completed the preceding studies. At that time I felt excluded, certainly when I entered that work space there was a strong air of cybernetic ghetto, people with little time deeply concentrating on what they were doing with latest generation computers. Today, twenty-two years later, my decisions in my professional life have brought me to the happy path of art research with the use of technology, but that is another story. Dr. Covarrubias would corroborate that at that time they were working against the current in what many considered an aberration against design; that is, working with computer-produced images with low resolution and I quote,

[13] See Covarrubias, J. (2010). *Justine y sus amigas, ensayos sobre diseño y computación.* Mexico City: UAM-Azcapotzalco, p. 68.

> Undoubtedly, there was also order and anarchy, there was no shortage of irritated people and fanatics, and there was no shortage of angry complaints (as when we were stopped in the middle of the courtyard of the H building with the purpose of converting us for our imprudence in using computers to manipulate images of poor quality [read low resolution], deliberately breaking with the canons of good design… the important thing was to confirm that with our budget and our knowledge… we could appropriate a tool that, as (almost) everyone knew at the time, was completely alien to culture and design, an object for the exclusive use of exclusive scholars and extravagant specialists: the computer. [Covarrubias, 2008, p. 10]

Certainly, these were the times of the technological revolution in Mexico City, the universities where the degrees in graphic design or graphic communication design were taught (more direct antecedents linked to electronic art), began in the second half of the eighties to equip small laboratories with the first mass-market computers on a commercial level, which were no longer those monster-sized computers that occupied large workspaces. In 1984 the first *Macintosh* computer appeared with a very aesthetic and user-friendly graphical interface, in 1985 the *Commodore Amiga,* the first mass-marketed personal computer appeared. Very popular for *gamers, according to* Sergio Agudo (2018), its operating system had an exceptional particularity for computing at the time, consisting of the first multitasking and multimedia computer for the general public. In the School of Design of the National Institute of Fine Arts, of which I am a graduate, the first Macintoshes began to arrive in 1991, a year before finishing the Bachelor's Degree in Graphic Design, I remember they began to give us classes in a room where there were construction materials —surely to finish the computer lab. At the entrance they placed four computers on a thin table and four chairs, during the class a teacher operated a computer and a student also showed its use to the others; the other computers we were not allowed to use. Needless to say that in that course I never touched a computer, let alone used one.

At that time computers were seen as one more pencil or one more tool. This formed the subject of congresses and conferences at design universities, I remember in a design event at UAM Xochimilco in the early nineties at

which in the middle of the presentation the power went out in the auditorium and one of the panelists shouted "I am a designer, the power goes out and I am nothing". Regarding the beginning of the use of computers in this field, Javier Covarrubias comments,

> Seen from today's perspective, it can be said that, within its range of action, our movement inaugurated in the university field of design a current for the use and abuse of the computer, a current that could be understood, on its scale, as the remote echo of the irruption of the printing press, photography, the telegraph, the telephone, radio, cinema, television… in cultures that until then had not needed them. During the historical process, we went from the conviction of living fully without needing the aggressive novelties at all, to the banality of realizing shortly afterwards that we could not live without them. After rejecting them outright, artists and painters had to recycle themselves and accept, respectively, the printing press and photography. [Covarrubias, 2008, p. 10]

For Covarrubias, the comments against the use of digital technologies in design, are the continuation of that old phase of the human condition that resists change, that resists to face new realities and that, if such positions had prevailed, our species would continue at the level of hunter-gatherers, similar to the *Homo habilis* of the Olduvayense Culture, who for over a million years barely managed to improve the only kind of lithic tool they had (Covarrubias, 2008, p. 10). Incredible as it may seem, even today, more than thirty years after the publication of the magazine *Gutemberg DOS*[14] (sic), within the academy of university professors, there are those who still consider the participation of computers in design as a simple tool,[15] privileging the style of forty years ago in the teaching of design, where the whole process was manual and there was an emphasis on the representation and

[14] (1988-1991), *Revista Universitaria,* CyAD, Universidad Autónoma Metropolitana-Azcapotzalco, directed by Jorge Morales, with the collaboration of Javier Covarrubias.

[15] In a meeting of 22 professors via ZOOM of the Bachelor's Degree in Graphic Design at the University of Guanajuato for certification by CIIES on September 28, 2021, the professor of Design Workshop I (Bidimensional) commented that the computer was for the designer "… just one more tool", a belief rooted in the nineties in design schools.

its technical quality, without a need for communication to solve this, only aesthetic and technical aspects to cover. The truth is that the computer has come to modify even the structures of the human brain immersed in daily experiences where it would be practically impossible to do without a computer.

However, what is the perception of the alumni about the approach to experimentation with technological resources in the Department of Sciences and Arts for Design in the years of the "Pleasure Center" (as it was called), with Dr. Javier Covarrubias Covarrubias and Master Luis Bossano Rivadeneira at the helm? For former student and now research professor Marco Vinicio Ferruzca Navarro (2015), the unusual way in which the so-called "new technologies" were used, together with the constant conceptual provocations of Dr. Covarrubias, represented a break with what they as students understood as design, and at the same time awakened their interest in research. Ferruzca emphasizes the fact that the "Centro del Placer" and the administrative instances within the UAM that supported them, were pioneers at both a national and international level in proposing a line of postgraduate studies in design oriented towards the study of hypermedia and the technology called CAD-CAM. Marco Vinicio Ferruzca comments that his first experiences as a researcher were obtained by collaborating directly with Dr. Covarrubias on three projects: Interactive System "The avant-garde of design"; "Borges", (study of eye movements in relation to the interaction of visual messages); and "Mexico City billboard advertisements" (Ferruzca, 2015, pp. 47-48).

> The Avant-Garde of Design", a project conceived before my incorporation into the "Pleasure Center", was the spark that detonated my interest in cognitive interfaces, I changed physical objects for digital objects. It was also my ticket to a laboratory with computers and cutting-edge software to make multimedia. The restlessness and the desire to explore new things, as well as the passion for what we were doing, were the key elements for us to change our comfortable beds at home for a row of chairs in the office, to lie down while we finished *rendering* in Infini-D© or Elastic Reality©. It should be noted that during this period there was also a significant collaboration with the Multimedia Center of the National Center for the Arts (Cenart), as they

> had a very good path already walked regarding the creation of multimedia applications and it was inspiring to be able to exchange ideas with that space. [Ferruzca, 2015, pp. 47-48]

Marco Vinicio Ferruzca (2015) himself reflects in the aforementioned text on the purpose of the projects of the Centro del Placer and derived from it, concluding that they were exploratory investigations where the question was: What can we learn from the use of "new technologies" in the field of design? Some answers were: to visualize design objects in new ways; to confront with new reflections to great thinkers in the history of design such as Mies van der Rohe, Walter Gropius; to rethink the design of interfaces giving greater importance to cognitive aspects, among others (Ferruzca, 2015):

> The "Borges" project also represented an alternative way of understanding how we perceive things. To do so, we sought to have harder elements (eye fixations) that would allow us to analyze the cognitive impact of visual stimuli. Again, it was necessary to look to other fields of knowledge to understand and explain eye movements. And although the theoretical knowledge was under control, the reality is that the technological part was beyond our limits as designers, because software engineering knowledge was required to collect, organize, interpret and present data. Some tests of what Dr. Covarrubias described as "drawing with the naked eye" were achieved; however, from my perspective, that long-awaited project in which the acquired technology and knowledge could be applied never came. [pp. 47-48]

Contrary to the "Borges" project, the "Mexico City Billboards" project was very relevant, especially for the members of the "Centro del Placer", an experience that was described by Dr. Covarrubias in the book *Billboards: the Black Era of Outdoor Advertising* (2012). In this project, they applied the theoretical work that Dr. Javier Covarrubias dedicated for years to the complexity and visual pollution. In addition, they also carried out the project "The Avant-Garde of Design" which served to build a prototype that validated the proposed hypotheses. To the above was added the interest of

the Secretariat of Urban Development and Housing (Seduvi), since the project coincided with the government's initiative to regulate billboards or monumental billboards in Mexico City; finally the participants in the project were recognized by that organization because of its usefulness for the legislation of billboards (Ferruzca, 2015, pp. 47-48).

Dr. Javier Covarrubias (2010) would later reflect on the matter,

> As a consequence, in the short period of time that our movement lasted, we edited a magazine, published books and posters, held exhibitions, events, conferences, round tables, invited specialists, discussed heatedly and shook consciences. Among the major group exhibitions we highlight: the first at the Metropolitan Gallery (Computer Aided Design, August 1988), the second at the Gallery of the National School of Painting, Sculpture and Engraving, La Esmeralda (Electrosensitivity, March 1989), the third again at the Metropolitan Gallery (Compudiarte, July 1989), the fourth in the corridors of the Tunnel of Science in the La Raza station of the capital's subway (UNDO, December 1989). We also exhibited in a couple of cities of the Republic, as well as in the city of Toronto (The Colors of Will, 1994). To our surprise, in all of them, as well as in the different events, we had an unexpected social impact, and an unusual reception in the media. [p. 11]

In addition to the above, Monica Mayer and Victor Lerma led projects such as *Mimesis* (1991), which had the support of the photocopier industry to work with their machines (Mayer, 1991), or the project by Mayer, Lerma and Humberto Jardon called *Monumental Electrography (*1995). Later would come his incursions into satellite art, more specifically with performance.

Before dealing with the above, it is important to mention precursors of satellite art such as Nam June Paik (1932-2006), who during the celebration of the New Year, in January 1984, aired *Good Morning Mr. Orwell,* a live transmission between New York and Paris, with the participation of contemporary artists of the first order, such as John Cage, Salvador Dalí, Laurie Anderson, Joseph Beuys, among others. In 1986 he made *Bye Bye Mr. Kipling,* another live broadcast between Seoul, Tokyo and New York, as well as *East is East, and West is West, and never the twain shall meet,* in 1988

Wrap Around the World (Kac, 1988), which covered the entire planet, in this regard the artist Eduardo Kac also mentions:

> In his quest for an art that would express contemporary life in the media age, he blurred the distinctions between telecommunications and visual arts; ancient and electronic forms; folk art and high art; East and West; design and fine art; objective and subjective time. The form of his next project is a network on an international and global scale, to be aired on September 10, 1988, at 10:30 am (Eastern Time), one week before the Olympic Games take place in Seoul, Korea. Its structure can be summarized as follows: several satellites around the planet will transmit images and sounds from different countries and Paik will be editing them in real time in New York and rebroadcasting them to the participating countries, where viewers will be able to watch on a local TV channel. [Kac, 1988]

On the other hand, Monica Mayer and Maris Bustamante made televised performances, which, although they did not involve image and sound in real time like Paik, questioned the role of women in the eighties through performance. Mayer and Bustamante created a feminist art group called Polvo de Gallina Negra (1983-1993), on Friday, August 28, 1987. Within the *Project on the Archetype of Motherhood Mothers II*, they carried out "Mothers for a Single Day" a performance on television in the news program *Nuestro Mundo,* which consisted of putting an apron with a pregnant woman's belly on the host during the broadcast and reached and audience of 200 million viewers in Mexico and the United States. In the performance, Maris Bustamante tells the host:

> Because for us today [emphasizing the word "Hoy", probably referring to the program that Guillermo Ochoa hosted with great popularity for 15 years called "Hoy mismo"], is like the Museum of Modern Art, where we have been or in some galleries; for us *Hoy* the program, *Nuestro Mundo* of Mr. [Guillermo] Ochoa is a place to make an artistic event…we came in full, because we are the only "members" (sic) of the group, we decided that there were some very interesting men out there with charisma, etcetera, and that they deserved the honor of knowing what it is like to be mothers for a single day. [Mayer and Lerma, 2016, min. 00:08:27]

At the moment they put the apron with the belly attached, the roar of laughter is heard in the recording studio, and Maris Bustamante says, "You are already feeling the evil eye, have you seen? You are starting to need your black chicken powder too (Mayer y Lerma, 2016). [the laughter stopped, at least for a few seconds]". For readers who do not live in Mexico it is necessary to give a little context: In the 70s the mother of this writer was in a state of pregnancy and recently arrived in the city of Morelia, a Mexican province, her husband worked outside the city and with certain frequency she needed to go downtown to buy things and she had to do it alone, on her way downtown, she had to endure the lewd words of those who thought she was a single mother or a single woman; terrible experience, but true.

In 1999, one of the pioneers of digital art, Humberto Jardon, commented on graphics produced with photocopying machines, that twenty years ago a *small ghetto* used the photocopier as a means to create graphics at the San Carlos Academy, "… and they called us crazy" —he commented— until David Hockney and Robert Rauschenberg legitimized the use of xerography before the world (Malvido, 1999, p. 160). According to Adriana Malvido, graphics produced with technological resources contain countercultural features. Jardon mentions, "The idea of original and copy disappears, and you can make infinite printings so that the work has greater access to the whole world, and this is not convenient either for galleries, nor for auctioneers who generally rely on exclusivity" (Malvido, 1999, p. 160).

According to artist and digital art researcher Mónica Mayer (Mayer, *ca.* 1990), artist Pedro Meyer is considered one of the great gurus of Mexican digital art, who in 1990 created one of the first works on CD-ROM, entitled *Fotografío para recordar (*Meyer, 1990). Months after the death of his parents, Meyer created an interactive on a *Macintosh Classic* computer using family albums to create a personal memory about the body, old age and illness. The work is a precursor of interactive computer art (Debroise, 2007, p. 309). Meyer is also editor and creator of the digital magazine *ZoneZero,*[16] one of the most significant virtual magazines on photography in Mexico.

[16] Zone Zero. http://zonezero.com/es/. Accessed on February 2012.

2. Contemporary Art, Electronic Art and Digital Art

Every artist, gallerist, curator and member of the public has his or her own particular opinion about what is art. Below, we will write about some of the comments we have heard over the years. For some people, art is that which manages to endure throughout the centuries, while for others this is not so, since there are many works, for example, in the Museum of Mexico City that were rescued from great floods and are there for that reason, not because they are works of art.[1] For still others, art is that which is capable of arousing an emotion in such a way that, what we are indifferent to is not art; art is that which is beautiful, therefore, what is not beautiful is not art. The problem of this criterion is to establish when there is beauty and when there is not. It is that action, process or object produced by an artist recognized as such; art is that which is found in an enclosure recognized as a space that houses art, such as a gallery or a museum; and so on.

Apart from the aforementioned, there have been art theorists who have seriously reflected on the subject, particularly the Polish philosopher Wladyslaw Tatarkiewicz who, in his book *History of Six Ideas* (2002), makes a historical review of what art has been in different periods. For example, the ancient Greeks only considered poets as artists, because they considered that they created from nothing, while sculptors and painters were not considered artists. One of the conclusions of the same author is that art is a

[1] Dr. Blanca Gutiérrez Galindo, Professor of Art Theory, Faculty of Art and Design, UNAM.

reflection of its time (Tatarkiewicz, 2002). This last reflection is interesting, because nowadays it would be difficult to imagine the world without digital technology or the internet and that therefore it is the natural channel for art and artists to resort to the latest technologies to create.

For Terry Smith, there was a worldwide cultural shift around the 1980s: a postcolonial turn, followed by the decolonization of areas considered the second, third and fourth world, along with the impact this had on the first world, produced many art forms, characterized by "…local, national, anti-colonial, independent and anti-globalization values (those of diversity, identity and critique)." (Smith, 2012, p. 22). In addition to the above, for Smith, around 1989 there was "…a shift from modern to contemporary art in all cultural media worldwide," (Smith, 2012, p. 23).It should be noted that, at that time, the irruption in the market of personal computers and the internet, which revolutionized life as it was known until then, the above being among other phenomena as described by Smith, and that, "We can also notice that, even when they occurred in conflict zones, these events inspired a critique of capitalism and spectacular globalization also by many artists working within developed economies." (Smith, 2012, p. 23). We can still observe this in this day and age in the artistic practices of many artists such as Rafael Lozano-Hemmer, Arcangel Constantini, Erick Meyenberg, among others. The same author comments that several artists "developed practices […] marked by research over time, general public engagement and extensive didactic presentations…" (Smith, 2012, p. 23). In electronic art this last aspect is a constant: artists engage in the study and research of topics that are of particular interest to them, reading books, research articles, internet pages, talking to experts on the subject, etc., decanting all the knowledge acquired in new developments of electronic art.

> … other artists were inspired to base their practice on the exploration of sustainable relationships with specific environments, both social and natural, within the framework of ecological values. Still others work with electronic media, evaluating their conceptual, social and material structures: in the context of struggles for free, restricted or commercial access to these media and their mass colonization by the entertainment industry, artists' responses range from *net.art* to immersive environments and the exploration of the

> possibilities of interaction with avatar-viusers (visual information users). [Smith, 2012, p. 23]

Finally, Smith mentions that over time, thanks to his travels and his participation in exhibitions, biennials and museums, both those of world-renowned spaces such as the MOMA, or the Havana Biennial, in Cuba, and more, he became aware of the previously described characteristics of contemporary art, concluding that current art production rejects gratuitous provocation and grand symbolic statements in favor of specific, modest and small-scale proposals (Smith, 2012, p. 23). "These artists seek to apprehend the immediate, to capture the changing nature of today's time, place, media and mood… They raise questions about the nature of temporality in this era, the possibilities of place composition in the face of dislocation." (Smith, 2012, p. 23)

In addition to the above, we would like to begin to address the issue of the definition of the field of electronic art from the reflection of Mauricio Beuchot on the study of hermeneutics, because we consider that it contributes to resolving specific points of electronic art, Beuchot comments,

> The first problem that arises in a cognitive discipline is that of itself. To define or delimit itself, to distinguish or identify itself. There are several fundamental questions [referring to hermeneutics] with which it is convenient to begin. What kind of knowledge is it, what is it about, what is its proper method, of how many kinds are its objects, what is its aim or purpose. These are constitutive problems… [Beuchot, 1997, p. 15]

Therefore, echoing Mauricio Beuchot and applying the above precepts to electronic art as a discipline of knowledge, we will proceed to answer the questions that Beuchot relates to hermeneutics.

a) What kind of knowledge is electronic art? It involves scientific, technological and humanities knowledge.
b) What is it about? Mexican electronic art is mainly about environmental, political and social concerns.
c) What is its own method? Art, not being a scientific knowledge, has several non-quantifiable methods, however, in this book what is intended is to glimpse a methodology focused on emotions; in

another book[2] I proposed a methodology, which succinctly can be described as: Mexican electronic artists have a number of varied interests that have developed throughout his career. These interests or main lines of research are decanted in appendices subject to these lines, which are translated into artistic works.

d) How many kinds of their objects are there? Electronic art developments could be classified very broadly… as broad as the scientific and technological resources that are used, but it can be said that, within the great field of art with science and technology, they are classified as follows,
   - Art with science and technology: robot art, a-life art.
   - Media art: video art.
   - New media art: computer art; software art; telepresence; telematics and tele robots; net art; computer graphics; music and sound; media facades, digital art in public space; mobile and locative media; interactive objects; art in public spaces; among others.

e) What is their objective or purpose? In the case of Mexican create electronic art, the artists interviewed[3] mentioned, in the case of Gilberto Esparza, creating knowledge in the communities about problems that concern them, usually environmental. Arcangel Constantini, on the other hand, mentioned his interest in diverse scientific knowledge (human beings are formed by thousands of bacteria, he started *Bakterias* from 1996 to date) and to be able to relate them to new artistic developments. Rafael Lozano-Hemmer —although not exclusively— takes up political issues (such as the massacre of students in Mexico City in 1968 or the 43 from Ayotzinapa in 2014). Leslie García focuses his attention in some of his pieces on living systems. Ivan Abreu, on automating, on his works awakening in him and in the public, emotions, affection, poetics; among others.

[2] Villagómez, C. (2017). *Analysis of digital artistic production processes in Mexico: Mexican digital artists and their work*. Valencia: La Librería Universidad Politécnica de Valencia.

[3] Villagómez, C. "Entrevistas a 13 artistas electrónicos mexicanos." https://vimeo.com/user29545447. Accessed on February 2021.

Up to this point we have made a tour of contemporary art, as well as characteristics of electronic art, but what is electronic art? Electronic Art is a branch of contemporary art and part of a global phenomenon called Art and Technology, where artists can use state-of-the-art and even obsolete technology. An essential characteristic of some electronic art works is that they need the active participation of the viewer for the work to take shape or be determined.

On the other hand, an important derivation of electronic art is digital art. Thus, digital art is a branch or genre[4] of art linked to science and technology, both fields are part of its creative process and conceive its physical configuration. An approach to the definition is made by Bruce Wands when he states the following:

> … digital art can be considered as a subset of contemporary art. Since the adjective digital is often ambiguous, and does not clearly define the form of the final work, it is here applied to artworks in which the artist has used the computer as a primary tool, medium and/or creative companion. [Wands, 2007, pp. 10-12]

Therefore, the use of the computer is a mandatory element for it to be categorized as digital art. The same author notes the following: "Traditional forms of digital art include print, photography, sculpture, installation, video, film, animation, music, and performance. New forms that are unique to the digital world include virtual reality, software art and net art" (Wands, 2007, p. 12).

In addition to the above, we have that, for Wolf Lieser, digital art is a discipline that groups artistic manifestations carried out with a computer, where by definition they are works made with digital media and can be described as an electronic series of ones and zeros (Lieser, 2009, p. 11). Hence, the digital artist is a creator who uses means offered by the computer in any of the steps prior to the materialization of the work or in its

[4] El Diccionario de la Real Academia Española [The Royal Spanish Academy Dictionary] defines *genre* in the arts as: "… especially in literature, each of the different categories or classes into which works can be arranged according to common features of form and content".

exhibition, i.e., creates with the computer or shows his work with the intervention of one.[5]

In light of the above, we can infer that digital art is a branch of art that uses the most contemporary media and tools, which necessarily define the era in which we live. Today, digital art encompasses the entire production of artists who work with computers during the process of the work or in the exhibition of the same; a very broad field that offers both interesting stimuli and new challenges in the classification and definition of the same.

[5] Interview for this research to Mr. Francisco Giner Martínez, Professor of the Doctorate in Visual and Intermedia Arts, Universidad Politécnica de Valencia, Spain, 2007.

3. Fundamentals of the Creation Processes

"Human intelligence is animal intelligence. transfigured by freedom. The construction of intelligence, freedom and subjectivity creative run in parallel."

Jose Antonio Marina (2006, p. 27)

Emotions and the processes of creation are intrinsically related, which is why in this book we have decided to begin to understand the generation of emotions through electronic art, with an approach to the processes of creation; a subject that has occupied us for the last twelve years of research work.

There are inseparable factors in the processes of human production, many of which have not escaped the attention of various researchers, such as Manuela Romo, Mihaly Csíkszentmihalyi and Jose Antonio Marina, among others. After reviewing these authors, we came to the reflection that the knowledge of certain factors that intervene in the processes of creation of the human being are useful in the development of the field of electronic art and its didactics.

On the one hand, the act of creation has been of vital importance for the evolution of human beings. These new creations, be they artifacts, devices, works of art, models, strategies, theories, etc., usually respond to a need that seeks to solve problems, and they do so through originality and a certain degree of novelty —in the understanding that what is totally new does not exist; every human creation builds on other inventions that preceded it or finds its inspiration in nature. However, what makes a new creation in any field transcendent is that it has a certain value; this value is given by a small social group such as a family, a community, or it can also be valuable for all mankind.

For the Spanish philosopher and essayist Jose Antonio Marina, human intelligence is fundamental to the creative process and he likes to explain it in different way: "We call this way of acting, which solves new problems and allows a flexible adjustment to reality, intelligence" (Marina, 2006, p. 19). A creative intelligence is an exercise of human freedom, in this respect Marina comments, computers have an intelligence similar to the human one. However, in men and women it is self-determined, in such a way that it exercises its freedom. Therefore, the creation of novelties continues to be an entirely human characteristic, a process during which a person decides where to direct his or her attention, what to be enthusiastic about and what to direct his or her creative energy towards. For Marina (2006), what produces projects is our temperament, our needs and our education, which are spontaneous producers of ends (p. 168). Thus, one is intelligent, free and creative, as a result of a complex process, as well as of a process of autopoiesis, says Marina and hence, when we create we are negotiating with our freedoms, motivations and limitations, all of which is the responsibility of human intelligence (Marina, 2006, p. 19).

For Mihaly Csíkszentmihalyi (1996), a person with creative intelligence must also have a genetic predisposition for a particular field (1996, p. 79); for example, a person with a facility for numbers will have an advantage when working in science, and someone with a good ear will be a good sound artist. For the same author, these people possess admiration for and interest in how things are and how things work, qualities without which an electronic artist would not prosper. As the electronic artist Arcangel Constantini said in relation to the previous research he performs for each of his projects, "Each development is like studying a new career" (Villagomez, 2017, p. 184), showing the intrinsic interest in the subject of each work.

Another fundamental aspect of creative intelligence is the importance of the training received in the first years of life, which is decisive. For the renowned psychologist Howard Gardner, when children are given the opportunity to discover their world widely and take advantage of it by exploring, they will accumulate a great "creativity capital". If on the contrary, they are prevented from discovery activities, they are directed in only one direction, which is equivalent to telling them that there is only one right answer, or worse, that the right answer or the reason is held by authority figures,

considerably reducing the chances of them seeking and exploring other answers (Gardner, 1995, p. 49).

For Mihaly Csíkszentmihalyi (1996), this support is provided by access to the field of study, i.e., it is equivalent to having the necessary knowledge to work in a certain field. Sociologist Pierre Bourdieu calls it "cultural capital", and those who have this capital during their initial formative years have access to interesting information provided in books, conversations, music and possibilities of educational promotion, role models, and useful contacts, among others (Bourdieu, 1998, p. 202). Access to the field also refers to having colleagues within the field in which you work, so that these colleagues recognize you as part of the field, so that the contributions generated by the creator in question can be recognized as valid and important.

In the same vein, not everything is a matter of talent and creative intelligence, for Csíkszentmihalyi (1996), to stand out in a field and for contributions to be recognized. They have to be validated by other individuals in the same field, therefore, it is necessary that the creator maintains good social relations with his colleagues; otherwise, even if he has brilliant ideas, if the creator is not able to communicate assertively with his peers, he will be ignored and avoided. It is necessary to say that access to the appropriate field, defined as a space with determined limits, is usually restricted and many doors have to be knocked on. It is for this reason that, for whoever wishes to stand out creatively, sociability with individuals from the same field is essential (Csíkszentmihalyi, 1996, p. 82). However, in cases where creators do not have access to the field, perseverance will be the key, this characteristic is called *resilience*.

For psychologist Manuela Romo, creation is a thought process that does not necessarily obey a special type of personality. In this respect she comments, "People can have creative mental processes without this meaning winning the Nobel Prize or exhibiting paintings in the MOMA. There are no qualitative differences, from the psychological point of view, that explain the production of masterpieces." (Romo, 1997, p. 55). For the author, the roots of human creation are to be found in the biological need to intervene in the environment one inhabits (Romo, 1997, p. 115), which transcends the idea that creative people are divine beings, the concept of the Greek demiurge that accompanies many artists to this day.

The same author, Manuela Romo (1997), mentions that the studies of the psychology of creativity are based on four main points: the person, the process, the product and the situation. It is due to the importance that for the author the products have "without product there is neither person nor process!" (p. 50), that it is necessary to mention the characteristics that a creative product has for the author:

a) *Transformation.* A product reformulates a situation, a field of knowledge, offering new combinations of elements that offer new perspectives.
b) *Condensation.* The product unifies a large amount of information, so that the facts are connected in a new order.
c) *Area of applicability.* When a product by itself generates additional creative activity; this point is considered the maximum possible level (Romo, 1997, p. 57).

With this last reflection on creative products, we conclude this section, to give way to the actual phases of the creative process.

4. Processes of Creation in Mexican Electronic Art

The processes of creation, as Manuela Romo warned, are carried out by experts and neophytes engaged in small or large enterprises, hence from different branches of study it has been concluded that they are the same phases of the process of creation that are carried out, whether in scientific discoveries, artistic creations or everyday tasks. The analysis of the creation process is the conjunction of the work done on this subject by Csíkszentmihalyi (1996, 2007), Manuela Romo (1997) and the Mexican psychologist Mauro Rodríguez Estrada (1985), who added the phase of communication; a process to which we have added the phase of participation, which we consider proper of the processes of creation in electronic art. Also, some names of the phases have been changed so as to better adapt them to the subject that concerns us.

Thus we have found that the phases of the creative process are not linear and that there are creators who can be working on several projects at the same time, or start a project in any of the phases. The present research showed that the electronic artists studied, such as Leslie García, Ivan Abreu and Arcangel Constantini, work in continuous lines of work from which appendices emerge that become works or developments that can last for months or even years.

In relation to each of the phases, it is necessary to elaborate on each one of them, as well as on the approach of each of the artists studied in each phase. The artists were selected for having been producing electronic art for

more than ten years,[1] for being in the country and for the feasibility of interviewing them personally. It is worth mentioning that at the beginning thirteen electronic artists were interviewed, some of which were discarded for having few electronic works, for having mainly teaching activities and little production, among other reasons. However, the initial part of the present research considered eight of the thirteen artists, namely, Ivan Abreu, Arcangel Constantini, Rafael Lozano-Hemmer (Mexican, although he does not produce in the country), Leslie García, Gilberto Esparza, Santiago Itzcoatl, Erick Meyenberg and Roberto Morales Manzanares. In the case at hand, as previously mentioned, we will recapitulate the work of three of them, as we consider them significant for the present topic (see Villagomez, 2017).

Currently, the Mexican electronic art scene is diverse, there are artists with more than twenty years of work in the field of electronic art, some of whom have made electronic art. On the other hand, there is a greater number of younger artists, some of whom have recorded their work in the lists of beneficiaries of the *Young Creators* grant from the National Fund for Culture and the Arts, Fonca.[2] The research into electronic works and artists was carried out according to a pre-established order for their analysis, according to the phases of the creation process. In addition to this, works with political, social, —and environmental— postures were located. These to a certain extent echo those of preceding artists whose works gave rise to electronic art in Mexico.

Trend

This phase is also known as preparation. As a result of this research, we have called it tendency —or trend— because there is a tendency or affinity towards certain topics or problems that generate curiosity. Such topics are discussed with colleagues, information is sought and research is conducted.

[1] Manuela Romo considers that, *"Ten years or more of intense initial work*. Time is a basic element to reach the highest levels of creation. A minimum period of ten years is necessary to consolidate the three previous psychological elements" (Romo, 1997, p. 170).

[2] More about this research in Villagómez, C. (2017), Análisis de procesos de producción artística digital en México: artistas digitales mexicanos y su obra (1a ed.). Valencia: Universidad Politécnica de Valencia. Available at: https://www.lalibreria.upv.es/portalEd/UpvGEStore/control/product

This phase is characterized by the search for answers and solutions to certain problems; that is, by questioning and where the process of posing a problem and how to solve it begins. This phase is one of observation, intellectualization and deep reflections, which can include data collection through readings, experiments, trips, etc. According to Manuela Romo, there seems to be a direct relationship between the extensive time dedicated to the preparation of the topic and the value of the work; that is, the more time dedicated to the project, the greater its value (Romo, 1997, p. 121).

In the case of Mexican electronic art, through interviews it was observed that the artists studied[3] see in global and local problems an opportunity to make deep reflections through their work, sometimes because they seek to make these problems visible and want the public to reflect on them, or because they seek to reinforce cultural identity.

To cite an example of this phase, the electronic artist Leslie García (Tijuana, Baja California, 1981) has a wide range of interests in the preparatory phases of a project. In an interview (2013) for this research, she referred to tending towards the study of anthropology, biology, philosophy, physics, mathematics, literature, and particularly the psychoanalysis of Carl Jung, meditation and Shintoism —in short, everything that has to do with the soul of things, especially the knowledge acquired in the human mind and its ability to transform reality. For Leslie Garcia, a work with a greater capacity to transmit her positions as an artist needs maturity and experience on the part of the producer.

Another case is that of electronic artist Ivan Abreu (Havana, Cuba, 1967), currently a Mexican citizen. In the present phase, different tendencies can be observed in his work, ranging from, on the one hand, the concern for the somber aspects of Mexican politics, but he also has a special interest in the sound effects resulting from digital or mechanical actions, as well as in the correlation between the sound and the visual; as well as the effects of the passage of time in objects and spaces and the need to seek how to automate everything.[4]

[3] Ivan Abreu (Cuba-Mexico), Arcangel Constantini (Mexico), Rafael Lozano-Hemmer (Mexico-Canada-Spain), Gilberto Esparza (Mexico), Leslie García (Mexico), Erick Meyenberg (Mexico), Santiago Itzcoatl (Mexico). Interviews for this research available on Vimeo: https://vimeo.com/user29545447

[4] The latter was expressed by Iván Abreu in the talk he gave on the occasion of his exhibition "Evidencias" at the Museo de la Universidad de Guanajuato on October 16, 2021 in the city of Guanajuato, Mexico.

Gestation and discovery

These are two phases of the creation process that take place simultaneously. In gestation, the ideas occur in the mind subconsciously and discovery takes place when all the pieces of the problem to be solved finally fit together and a solution is found.

In this phase, there are some discrepancies. On the one hand, Csíkszentmihalyi (1996) considers that ideas are being forged in the unconscious of the brain in the incubation (or gestation) phase and emerge suddenly, in a *moment of intuition*, when one is in a moment of relaxation or relaxation. On the other hand, Manuela Romo (1997) considers that the creator is capable of generating ideas through associations —which are part of creative thinking— during moments of great agitation, and cites the case of the mathematician Henri Poincare,[5] and I quote,

> For him, creation consists in making new combinations of useful associative elements; in mathematics, he says, the best contributions consist in finding unsuspected relations between facts that are well known but considered as clearly strange to each other, coming from very distant domains. […] [Poincare's experience is as follows] One night when I had drunk, contrary to my habit, coffee, I could not fall asleep: ideas came rushing in; I noticed how they jostled, collided with each other, until two of them intertwined, to put it in a manner of speaking, forming a stable combination. In the morning I had already established the existence of a type of Fuchsian functions, the derivatives of the hypergeometric series; I had only to write up the results, in which I spent only a few hours. [Romo, 1997, p. 136]

Apparently, while ideas emerge suddenly, they are the product of years of continuous work by the artist. The electronic artist Ivan Abreu, in an interview for this research, mentioned that sometimes ideas come because he has been working on them, and other times he uses the ideas he already

[5] Who bequeathed important reflections to the study of the processes of creation, in a lecture he gave in 1908 at the *Institut Général Psychologique* in Paris, entitled *Mathematical Invention, in which he* reviewed his own thought processes that led him to his major mathematical discoveries.

had before and adapts them to the work in progress. In an interview (2012) for the present research, Abreu gave as an answer to the question How do you generate your ideas? The following typification of them:

a) *Invention:* the artist considers that it is the forced union of elements found in reality.
b) *The finding:* these are ideas that arise suddenly, where the result is articulated and coherent. He comments that it is as if something that was already there was discovered, the artist only locates it "outside".
c) *Previous ideas:* these are the ones that the artist has as pending to be carried out and emerge when he receives a commission or is invited to an exhibition venue, though changes and adapts them for the occasion.
d) *Ideas from the exhibition site:* these arise from observing the exhibition site, the specificity of the site, and according to the size of the space, the height of the ceiling, among other conditions, generates the artistic proposal.
e) *Ideas from workshop work:* the artist refers to working in his workshop for pleasure, for example, a program without a specific objective, and it is on those occasions when interesting ideas arise as well. (Villagomez, 2017, p. 173).

To conclude this section, we consider that both Romo and Mihaly are right; Manuela Romo because there are indeed geniuses like Poincare capable of such mental feats. However, relaxation —as Mihaly points out— is a way of creating in a more accessible way for most people, a situation that I corroborated in surveys administered to students of the Department of Design at the University of Guanajuato, who referred to having moments of intuition in moments of relaxation, when they were not overwhelmed thinking about how to solve the problem, in situations such as exercising, traveling in public transport, bathing or waking up in the morning. (Villagomez, 2010, pp. 123-131). In this phase of the process, some of the artists, such as Leslie García and Arcangel Constantini, mention making use of meditation and daydreaming as sources for generating ideas.

Valuation

One of the recurring problems in the creative processes of experienced artists is not generating ideas, but deciding among them. In other words, the real problem for the artists, according to the research, is to be able to choose the best idea, so that it is worth the investment of time in its development. This phase was difficult to investigate because the artists studied did not remember precisely how they had made the decision to develop their idea. However, most of the artists mentioned having developed a particular idea based on the knowledge produced and acquired during the process. Others mentioned having chosen a specific idea by intuition, while on other occasions they consulted colleagues, or researched more about the subject on the Internet and in books.

This phase is also known as the evaluation phase. One of the findings of this research is that for experienced artists the production of ideas is not a problem, rather, the problem is to discern which of all of them is a good idea, because it is then they weigh whether it is worth investing hours and hours of work. Therefore, it is an emotionally difficult part of the process, a period of self-criticism where you usually need the opinions of others.

In this respect Austin, J. H. (1978), mentions that knowing which ideas should be ignored is probably more important than the possibility of being able to generate many ideas, especially taking into account the skeptical and self-demanding attitude that most of the electronic artists studied have. For Austin this part of self-demanding in cognitive terms is recognized as keeping the problems open and undefined until the end.

Leslie García, in an interview for this research, mentions that the evaluation of her ideas is done through what she calls an "affective probe". She also recognizes that it is due to her education as a designer that she likes the idea of elaborating "objects of desire", just as design does. On the other hand, work teams are very important in her work processes, so that when a topic interests her, she starts sketching, looking for bibliography and reading about it, as well as starting to talk about it with her close circle. When she realizes that the idea is worth implementing is when she realizes that she has more and more need to talk about it.

For artists such as Arcangel Constantini (Cuautitlan Izcalli, 1970), in the evaluation of an idea the artist puts into practice a thorough analysis where he asks himself why, what for, how and reflects deeply on the problem, although he also mentions that his method is visceral; that is, he works through intuition, which although they are by definition intuitive, do not emerge magically and mysteriously, but rather are the result of the artist's years of experience, as well as his self-confidence (Interview to Constantini, 2011). On the other hand, Ivan Abreu, indicates that he considers that the idea is apt for its development when he feels fascinated by the knowledge it generates and that which he acquires during the development of the project.

Realization

In this phase is when the execution of the idea is carried out, meaning that the artist begins one of the most intense work stages of the whole creation process, since problems of different kinds must be solved, as well as working in teams with professionals from different areas, such as engineers, photographers, manufacturers, programmers, and others, depending on each project.

Similarly, in this phase the artist's capacity for work and discipline is put to the test, making patience indispensable. Many of the artists commented on working long hours without noticing the passage of time, as well as working on projects whose duration can take from several weeks to years, and where some of the projects can remain open, as is the case of *Bakterias* by Arcangel Constantini, which has been developing since 1996 to date.

In addition, some artists mentioned working without thinking of making a finished piece at all, but rather of making pieces that would initiate others. In certain circumstances a project may stop due to financial or technological limitations or even physical fatigue on the part of the creator.

It is interesting to mention that artists such as Leslie García or Erick Meyenberg, have diaries where they write and draw before and during the creation of their projects. In these notebooks or logs they record important data about the development of the project, such as errors, events and all the information that makes up the body of the artistic work. Added to this,

Leslie García mentions that the realization of some of her works is flexible, as she adapts them while visiting colleagues in other cities or countries, so she has adapted to work in different situations, which she considers opens the dialogue to different proposals, interests and ideas.

The elaboration or realization, tries to make the idea tangible, that is to say, the artist or creator lays hands on the work, and it is the phase that takes the most time and in which the hardest work is done. In this phase the polishing of the work can be carried out on the fly. For Csíkszentmihalyi (1996) many of the creators have self-imposed work schedules that are almost monastic, while Romo (1997) asserts that the amount of energy that great creators devote to work almost borders on fanaticism. In this regard he notes, "At least that is how it is perceived from the outside, with usually disastrous results for personal relationships; even the most direct, which are reduced and conditioned to the main reason for their lives, which is always work."(Romo, 1997, pp. 152-153) Gardner (1995) in his study of creative minds, considers a kind of "Faustian pact" of the creator, which allows him to go on regardless of the obstacles; it may seem an exaggeration, but creators know what we mean.

In the case of Arcangel Constantini, in an interview (2011) on collaborating with other professionals, he commented that it is not very frequent because he considers himself a complicated and very demanding artist, however, he belongs to a group of colleagues and friends with whom he regularly coexists and with whom he carries out projects such as "Meditatio Sonus" (2012-to date) artistic development that consists of collective meditations guided by sound compositions of electronic artists carried out *in situ,* among other projects.

For his part, Leslie Garcia says that her pieces usually respond to very personal questions and searches, but that he enjoys teamwork very much, so he regularly develops work within collectives, such as Dreamaddictive, Interspecifics and Astrobandalistas. Within her collective work she comments that she always looks for a specific function that has a social impact (such as "Arma Telematica" about the violent events in Mexico City in 1968); she also refers to working as a tutor in workshops organized by different organizations with groups of people and in these workshops she finds it interesting to talk with other tutors and students about personal and col-

lective ways of working because she considers that, through collective work, people can contribute to the solution of problems in their community, and that the more aware the artist is of these circumstances, the more complete and environmentally friendly the solutions that can be generated. (Interview to Leslie García, 2013).

Exchange and communication

The psychologist Mauro Rodriguez Estrada (1985), considers that artistic projects are only exercises, where the artist enjoys the process itself. In any case, the common thing is that the artist wants his work to be exposed to the public. In fact, it is one of the most important motivations for doing it, i.e., to communicate and have some kind of exchange with the public.

For Ivan Abreu, in an interview he comments (2012) that he frequently observes the first impressions of the public in front of his work so he can see the possible resonance that the work produces in the public's mind. In this way Abreu measures the possible relevance of his work: "There are projects that after being observed are quickly forgotten, but there are others that remain in the memory of the individual throughout his life…" (Villagomez, 2017, p. 172), the latter is what Ivan Abreu seeks with his works; that is, he looks for a positive reaction in the participants of his works and calculates the relevance of his art if the piece remains in people's memory. He is pleased that his pieces are remembered because that means that he reached the consciousness of the person who interacted with his work. Similarly, in the case of Arcangel Constantini, he looks for a physical or mental reaction in his audience and Rafael Lozano-Hemmer says that the audience completes or finishes his works, so he leaves them unfinished in such a way that hundreds or even thousands of people can finish his work by interacting virtually and physically. Meanwhile, Gilberto Esparza seeks a change in the audience, he seeks to provoke deep reflections through his work. Conversely, Leslie García comments that his pieces are archetypes, so sometimes they are not understood by the public, although there is interest in interacting with them, that many of his works were made in an austere way, which connects with Latin American audiences that live in permanent austerity.

For Erick Meyenberg, the thoughts and ideas exposed in his work are fundamental to communication, while Santiago Itzcoatl refers to enjoying the public's reactions to his work but that his main intention is not to communicate anything specific, so that although he may do, it is not his main purpose.

One of the main *leitmotifs* of the creative processes —as mentioned above and which we would now like to delve into— is the communication and exchange carried out during the process. Thus, once a work or some phase of it has been completed and presented to a group of people or to the public in general, the electronic artists studied report that they like to observe the public's reactions, listen to their comments or simply see how what took months or years to produce comes to light. That is to say, the result of the creation asks to be seen in order to be validated, let us remember the words at the beginning of this article: "what makes a new creation in any field transcendent is that it has a certain value; this value is given by a social group…"; therefore, we consider this phase essential in the creation process.

Participation

We have added this phase to the creation process, because it is the stage that we consider to be the most directly relevant to electronic art. Thus, most of the time, electronic artworks invite the public to interact with them, so there are reactions, interactions and emotions that arise among the former spectators, who are now participants of the works. Electronic art demands participation so that things "happen", and we must remember that when an individual is invited to "do", there is necessarily a certain involvement in the activity that is performed (which is why participation is one of the guiding principles of education), because reactions and emotions emerge through interaction.

In an interview (Interview to A. Constantini, 2011), the artist Arcangel Constantini said that his artistic developments are aimed at seeking a reaction from the public, as well as an interaction with the development (such as his work in Net.art unosunosyunosceros, among others). In an interview (Interview to Leslie García, 2013), Leslie García says that she has observed

that the reactions of the public to her work are very varied, some people do not seem to understand what is happening, while others analyze and reflect on what they observe. The artist seeks reflection from the public, to establish a relationship with her work, she comments that she has even seen children playing with her works, as if it were a video game, and reflects: "…if you can capture the child's attention and manage to generate a question, a questioning, a need and a response, it means that these have a fairly clear communication process: back and forth" (Interview to Leslie García, 2013).

It is precisely the participation phase that will allow us to reflect on the induction of emotions through certain techniques and resources, ultimately considering the creation of a methodological model of emotion focused on electronic art. Prior to this, we consider it necessary to review the emotions themselves and their relationship with learning.

5. Fundamental Notions of Emotions

"Sometimes it feels more like
we belong to our emotions, than they to us".
Tiffany Watt Smith

Emotions are sometimes difficult to detect for the individual who experiences them, so sometimes it is people in the immediate environment who point out to colleagues, friends or family about the emotion they expressed through gestures, words, body language, etc., because perhaps the person who experienced them did not detect them. So, it is common to hear the control of emotions spoken of as an aspiration. For example, the vast literature on the subject or the meditation apps and videos, which must be practiced until achieving a serenity similar to that of an experienced Tibetan monk free of emotional shocks, would be the ideal. However, meditating at advanced levels is a skill that requires lifelong practice that a few enlightened beings can achieve; the rest of us will experience a very wide range of emotions. What is essential is the understanding that emotions originate in our brain, but are also cultural, and that there are ways to manage them.

For Dr. Tiffany Watt Smith, philosopher at the University of Cambridge (2015), emotions are numerous, sometimes imperceptible and sometimes so intense that they override all others, such as the terror that can be felt when losing control of a car. Here, Watt agrees with Eduardo Andere (2020), education specialist at Boston College, in the sense that, one thing are the images that powerful tomography can take of brain activity and quite another is the human mind, the latter modeled by our environment, context and development throughout life. Thus, Watt Smith explains emotions as follows,

> Deep in our temporal lobe is a teardrop-shaped structure called the amygdala. Neuroscientists call it the "command center" of our emotions. It evaluates stimuli from the outside world, deciding which ones to avoid or approach. It triggers numerous responses: it speeds up the heartbeat, instructs the glands to secrete hormones, the limbs or eyelids to contract. When [the person] lies in a brain scanner and remembers a sad story or sees a picture of a newborn child, the amygdala area will "turn on" in the resulting computer image that is generated. [Watt, 2015, p. 7-8]

However, the author believes that approaching emotions primarily by biological facts does not represent what an emotion is; i.e., the subjective experience of what an emotion is. Dr. Watt quotes writer Siri Hustvedt, "It is like saying that Vermeer's *The Girl Pouring Milk* is a canvas with paint on it or that Alice herself [from Alice in Wonderland] is words on a page. These are facts, but they do not explain my subjective experience in either case or what these two characters mean to me" (Watt, 2015, p. 7-8).

However, emotions classified as we know them today, according to the historian Tiffany Watt (2015) did not exist before 1830, people in the West felt other things and in the records —we assume literary—, it was recorded that they felt: "passions", "accidents of the soul", "moral feelings" and all this was explained differently from how we understand emotions today (p. 5). It is interesting here to delve deeper into the emotions of the ancient Mexicans in their ancestral cultures, where there are records of emotions other than those referred to by Watt, here is a sample,

> Xon Ahuiyacan (Nezahualcóyotl)
> "Ica xon ahuiyacan ihuinti xochitli, tomac mani, aya. Ma on te ya aquiloto xochicozquitl. In toquiappancaxochiuh, tla celia xochitli, cueponia xochitli. Oncan nemi tototl, chachalaca, tlatohua, hahaya hual on quimatli teotl ichan, ohuaya, ohuaya Zaniyo in toxochiuhica ica tonahuiyacan. Zaniyo in cuicatl, aya icaon pupulihui in amotlaocol. In tepilhuan ica yehua, amelel on quiza, ohuaya, ohuaya Quiyocoya in Ipalnemohua, aya qui ya hualtemohuiya moyocoyatzin, in ayahuailo xochitli, ica yehua amel on quiza." Translation: "Rejoice with the flowers that intoxicate, those that are in our hands. Let the necklaces of flowers be put on already. Our flowers of the rainy season,

> fragrant flowers, already open their corollas. There goes the bird, chattering and singing, it comes to know the house of the god. With our flowers alone we rejoice. With our songs alone, your sadness perishes. Oh gentlemen, with this, your displeasure is dispelled. They are invented by the giver of life, they have been brought down by the inventor of himself, pleasant flowers, with them your displeasure dissipates." [Castillero, 2021, para. 5]

This short poem is attributed to Nezahualcoyotl, king of Texcoco and according to Oscar Castillero, one of the most significant and ancient poets of pre-Columbian Nahuatl poetry. The poem already speaks of rejoicing in nature —which can be interpreted in this case as joy, sadness, and disillusion.

In addition to the above, author Tiffany Watt (2015) states that, some ancient Greeks compared anger to an evil wind, and that early Christians living in the desert believed that boredom was probably implanted in people by evil demons, among others). Physicians developed a complex approach to understanding the influence of the body on emotions; their ideas were based on the Ancient Greek physician Hippocrates, this approach came down through physicians of the medieval Islamic world to the European Renaissance (p. 5), in this regard the author comments,

> The theory held that each person had a balance of four elemental substances in his or her body: blood, yellow bile, black bile and phlegm. These humors were thought to shape personality and mood: those with more blood in their veins were short-tempered but also courageous, while the dominance of phlegm made a person peaceful but gloomy. Physicians believed that strong passions disturbed this delicate ecosystem by moving heat around the body and arousing the humors in turn. Rage sent blood rushing from the heart to the extremities, preparing a person to launch an attack. Once the black bile heated up, on the other hand, it sent poisonous vapors curling into the brain and filling it with terrifying visions. Traces of these ideas still remain: that is why we speak of phlegmatic or bad-tempered people, or say that their blood boils. [Watt, 2015, pp. 5-6]

In the origins of the concept of "emotion" this was so, but the modern concept of emotion arose in the mid-seventeenth century, when the London

anatomist Thomas Willis dissected criminals who had been hanged, discovering that the reason for good or bad moods was not foreign liquids, but the network of the nervous system whose center was the brain (Watt, 2015, p. 6). "About a hundred years later, physiologists studying reflex responses in animals went further and claimed that bodies recoiled in fear or writhed in pleasure due to purely mechanical processes; no immaterial substance of the soul was necessary." (Watt, 2015, pp. 6-7). It was not until the early nineteenth century in Edinburgh, that the philosopher Thomas Brown suggested the word "emotion" for the new way of understanding the body.

Subsequently for Doctor Lino Cabezas Gelabert of the University of Barcelona, the study of expressions receives a crucial contribution from Charles Darwin's *Expression of emotions in animals and man* published in 1860, a foundational work of comparative psychology and the scientific study of humans and animals which focuses on the physiological aspects of the expression of emotions. For this work, Darwin compiled more than 30 years of observations of animals and people from different cultures expressing their emotions (Cabezas, 2016, p. 71). The main conclusions of Darwin's book were,

> 1) That the expression of certain human emotions is innate and universal and 2) that our emotions are the product of evolution and are shared to some extent with other animals, so that some of them can be easily recognized in chimpanzees seen at the zoo or in dogs and cats when they fight or play. [Cabezas, 2016, p. 71]

From the middle of the twentieth century, this work became an obligatory point of reference in the psychology of emotion. It is also one of the first scientific texts to make use of the photographic image because Darwin considered that this was the only possible way of illustrating the expressions (Cabezas, 2016, p. 72). Finally, he contended that emotions contribute to the evolutionary and survival process not only of the human being, but of all species.

According to Dr. Smith Watt, Dr. Sigmund Freud added greater complexity to the vision of emotions with his assertion that emotions can be repressed, constructed and need to be vented. For example, childhood terrors or desires full of rage can emerge in adult life in the form of dreams,

compulsions, and even physical symptoms. Freud also posited the idea that sometimes we do not recognize our emotions (the reflection with which we began this section), that they may be subconscious, and that they "jump out" at the least expected moment, for example in the jokes we make or in our habits (Watt, 2015, pp. 7-8).

In addition to this, for the purposes of this research, perhaps one of the most important claims made by Tiffany Watt is that emotions are culturally determined. I remember that my younger sister used to have a Brazilian boyfriend and that he was surprised that she sighed, because Brazilians do not do it, whereas in Mexico the sigh can indicate many emotions, such as falling in love, relief, hope, and so on. Tiffany Watt mentions that emotions are not just about biology or our particular physiological histories, but are woven into the cultural expectations and ideas of where we are from. For example, anger or desire can come from our wildest side, but they can also arise from the things that make us most human, such as religious convictions, moral judgments, even the politics and economics of the moment in which we live. Thus, people cannot fall in love if they have not heard of falling in love and, just as talking, watching or reading can incite emotions in our bodies, it can also calm them (Watt, 2015, p. 9).

There are multiple examples of the cultural relationship with emotions, such as the altars on the Day of the Dead (or Day of the Faithful Departed) on November 2 in Mexico, which help with the process of mourning the bereaved. However, the tradition actually dates back to pre-Hispanic times (although at that time it had a different meaning). Today, what is considered to be the annual visit of the spirits of our departed loved ones is celebrated by setting up an altar is made as an offering, in these altars it is customary to put everything that the loved one liked, for example their favorite food and drinks, as well as the traditional *pan de muerto*, candles, cempasúchil [Mexican marigolds] (it is believed that the aroma of this flower guides the souls of the deceased), sugar skulls, incense, die cut paper, and photographs of the deceased.[1]

Another example of the individual rather than the collective was the adoption of cultural traditions. This is the case of a personal friend who

[1] More information at Government of Mexico. https://www.gob.mx/siap/articulos/el-origen-de-la-ofrenda-de-dia-de-muertos?idiom=es. Accessed on October 24, 2021.

traveled abroad with his partner because she had to empty a storage room where she kept the things from the house she shared with her ex-husband. Among the objects she was going to throw away —since she could not carry everything back to Mexico— was a beautiful alabaster vase. My friend told her that he wanted it and he put it in the suitcase he had documented to travel in the plane hold, but when he opened the suitcase upon his arrival in Mexico, he found the vase had been broken, smashed to pieces! Soon after they ended the love relationship, my friend was extremely hurt and very dismayed. He thought about the vase and how his love had broken, he learned about the Japanese technique of Kintsugi and decided to glue the vase together. By means of that long and patient activity, he got rid of part of the regret that the breakup of the relationship with that person had caused him.

Nowadays, as mentioned above, the topic of emotions is an important one and its coverage in the print and electronic media is remarkable. Newspaper articles on how to be happy, how to be calm, how not to lose your temper in the office, etc., apps for registration and emotional management, are just some examples. Its importance according to Watt is that, as long as there is an awareness of emotions there will be strong resilience in times of stress, improved performance at work, with better management and negotiation skills, and more stable relationships at home. In addition to the above, knowing about the emotions experienced by others allows us to feel less peculiar and isolated (Watt, 2015, pp. 13-14), in this regard he says,

> Some emotions can fade into a smile when you know what to call them, like *"umpty"* (the feeling that everything is "wrong") or *"matutolypea"* (a sadness that only hits in the morning). Some reveal themselves as a more important part of our experience once we learn their name, such as *"basorexia"* (a sudden desire to kiss someone) or *"gezelligheid"* (the cozy feeling that comes from being inside with friends on a cold night). [Watt, 2015, pp. 13-14]

Regardless of all this, the truth is that human beings usually navigate in a sea of varying emotions, and these determine —most of the time— their actions. Sometimes we are calm, sometimes euphoric, sometimes happy,

sometimes sad, empathetic or angry, serious or joyful, etcetera. In adolescents these emotional changes are more evident, but not in adults, since many have learned to put on a "poker face"; that is, they learn to hide their emotions under a neutral facial expression.

It is worth mentioning some of the diseases in which emotions play a part, as they give an idea of the importance of successful regulation of our emotions and what happens when there is a lack of a healthy system of emotional regulation. One example of this is the Borderline Personality Disorder or BPD; i.e., "… severe and chronic mental illness, characterized by instability in mood, behavior and interpersonal relationships" (Grup TLP Barcelona, 2021, para.1). The disease is complex to diagnose, because many people do not see it as a mental illness, but rather as characteristics that a person may have, so it is common to deal with individuals with BPD within family and work environments who have not been diagnosed. This disorder is characterized by major mood or emotional swings that can last for just a few hours or up to days at a time. People with this condition may suffer from inordinate anger, impulsivity, intense happiness, irritability, embarrassment, anxiety, or intense anger. They may have frequent drastic mood swings, be sarcastic or bitter, to the extent that they may become involved in physical fights or heated arguments. These frequent mood changes alienate others and even when sufferers want to have lasting emotional relationships, they find it very difficult and sometimes impossible due to these sudden emotional changes. The causes of this disease are various. On the one hand, genetics plays an important role, because personality disorders are often inherited (there is a higher risk if a close relative has the same or similar disorder) and brain abnormalities can be another cause. According to the Mayo Clinic, research shows changes in certain areas of the brain related to the regulation of emotions, such as impulsivity and aggression, and this may be coupled with the fact that some brain chemicals (such as serotonin) are not helping to adequately regulate these emotions. Another concomitant factor is episodes of stress in childhood. Many individuals with BPD report having suffered physical and mental abuse in childhood, emotionally or physically absent parents, parents or guardians who used substances or had mental health problems, or were exposed to conflict and unstable family bonds. BPD can have serious consequences for those who

suffer from it, such as addictions, legal problems leading to jailtime, suicide, and more (Mayo Clinic, 2021, para. 1-14).

However, though paradoxically, according to education specialist Eduardo Andere (2020), each average individual is a similar cocktail of emotions and thoughts, and, according to the same author, no rational argument seems to work where emotions and feelings are involved (p. 161). Andere quotes the following phrases from renowned learning scientists to reinforce this point:

> Most of the emotional programming is executed, no matter how much will power we apply to inhibit it (Pithers and Soden, 2000, p. 245)… The expression of emotions can doubtfully be controlled by the will [Damasio, 2012, p. 133]… One cannot overcome emotion with rational thinking… even if you feel rational [Barret].[2] [Andere, 2020, p. 161]

Notwithstanding the above, everything points to the fact that emotions are generated —as already mentioned— by the brain, whose primary mission is to keep us alive. This is why it strives to give sense or meaning to everything that surrounds us: its perceptions are shaped by the inner world (organism) and the outer world (what the brain perceives through the senses), together with the context, so that "the brain simulates the world in which we live and makes predictions about how to respond" (Andere, 2020, pp. 161-162). Barret, cited by Andere, argues that most if not all of the emotions are constructed or simulated by ourselves based on previous experiences that enable the creation of concepts. In addition, the individual himself constructs and reconstructs emotions from the beginning of his or her life and it is suspected that this may even be prior to birth (Andere, 2020, pp. 161-162).

In summary, both the organism and the environment that defines its outside world and context, where the brain develops, influence the construction of emotions, as well as the response that the individual gives, "From what we eat, where we sleep, the tone and attention of adults (mom and dad) in the first days of life, the level of stress of mom during pregnancy and dads

[2] Barret, L. (2018). *How Emotions are Made: The secret life of the brain,* Boston, Mariner Books.
Damasio, A. (2012). Self comes to mind: constructing the conscious brain, New York, Vintage.
Pithers, R.T. and Soden, R. (2000). Critical thinking in education: a review, Educational Research.

later, are the pieces of a puzzle that throughout life will define the way we react" (Andere, 2020, p. 163).

One topic that should not be left out of this book, because it is central to the approach to the subject here, is the management of emotions in adulthood. Each individual has resources they can use according to what we see others doing or what we do ourselves, namely, going out on the roof to watch the clouds, going out on the balcony to watch people walk by, talking to your dog or your cat, exercising regularly, reading a good book or watching a movie, doing daily meditation, and so on and so on. On the other hand, some of the habits that can be considered harmful that people adopt to regulate their emotions are excessive consumption of tobacco, alcohol, drugs, abuse of electronic resources, such as the internet (social networks), video games or cell phone, and more. For example, it is common to see people experience anxiety with regard to a new situation mediated by the cell phone.

In this regard, Eduardo Andere mentions that one of the most commercially profitable literary industries is that of so-called personal growth. However, he bases this observation on scientific studies rather than on the anecdotal and makes a list (see Andere, 2020, p. 164) of some conclusions about the management of emotions in adulthood, as follows:

a) When a person becomes angry or upset because of someone else's actions or inactions, it is good to know that the anger, sadness, pain or joy experienced has been created by the brain itself, based on past experiences and concepts, as well as information from the present context (Andere, 2020, p. 164). That is, "at least in part, one is responsible for or causes one's own emotions. It helps not to seek blame." (Swaab, 2014, cited by Andere, 2020, p. 164). Looking for someone responsible for one's own emotions is also a sign of immaturity, on the contrary, taking responsibility for one's actions and emotions is a characteristic of a mature person.
b) Reducing uncomfortableness with healthy food, exercising, sleeping well, nurturing healthy and positive thoughts or actions, the same things that provoke internal feelings, allows you to be calmer and achieve a feeling of wellbeing. (Barret, 2018; Hason, 2019; cited by Andere, 2020, p. 164).

c) Move, walk, dance, shake, exercise (Barret, 2018, p. 187; cited by Andere, 2020).
d) Activities that require more discipline and are equally effective: yoga, meditation and seeking friendships (Hanson, 2009, p. 69; quoted by Andere, 2020). Yoga gives a feeling of full relaxation or can activate one, depending on the routine performed. Meditation, on the other hand, provides tools of proven effectiveness, which I personally have been practicing for years, which helps to maintain prolonged states of calm. There are many methods, but I especially suggest the reader the *Silva Method of Mental Control,* as well as the free access meditations *Youtube* by Andrew Johnson, Mooji and Yoga Nidra. The latter in case there are problems sleeping. On the other hand, having friendships helps to release the tensions of daily life through conversations.
e) Avoid constant pondering through some hobby. "There is evidence that 50% of our waking time is spent cavorting or pretending (Barret, 2018, p. 71) rather than concentrating on something specific." (Andere, 2020, p. 165). Here it is worth stopping to reflect on whether the mind itself takes that 50% of procrastination, either to order thoughts and ideas or simply to rest. Leisure is also productive and we do not necessarily have to be concentrating 100% of the time, which would perhaps make us anxious, nervous and desperate. It would be worthwhile exploring this point in further research.
f) Change the environment in which we live every day, for example, by changing the furniture, installing plants, not accumulating objects or arranging clutter around us (Andere, 2020).
g) "Getting rid of pending (especially trivial ones) payments, calls, daily chores, as soon as possible." (Andere, 2020). I consider this aspect to be practically impossible, when there is a working life and an adult life with chores to do at home, there will always be this type of pending detail. Perhaps the best thing to do is, instead of "getting rid" of these activities, to organize ourselves to fulfill them in time and form, assigning a window of time during the day to carry them out; at least this is what has worked for me personally.

h) In the case of addictions, the author recommends changing the context, if there is addiction to drugs or alcohol, he suggests radically changing the environment. If the problem is interaction with some person, change the interaction or change the person; if an object reminds me of an unpleasant event, change the object; all of which avoids the triggers that activate the negative habit (Hanson, 2009; quoted by Andere, 2020, p. 165). A suggestion by the authors with which I do not agree. In the case of addictions, it is not enough just to change the environment, in general, broader support and intervention strategies are needed. One of the most successful treatments against addictions is Alcoholics Anonymous or AA and its 12-step program —as well as other programs based on it, such as *Adult Children of Alcoholics and dysfunctional families,* ACA; *Food Addicts,* FA, among others— entails the work and support of other people who are also going through addiction problems; that is, the introduction of the addict into a support group, which most of the time becomes his or her closest social circle, in addition to attending meetings with other addicts, serving other people in the same condition in some community such as prisons, hospitals and recovery centers. In this regard I quote,

Assuming we are spiritually fit, we can do all those things that an alcoholic is not supposed to do. People say that we should not go where alcohol is served; we cannot have it in the house; we should shun friends who drink; we should avoid seeing pictures with drinking scenes; we should not go to bars; our friends should hide their bottles if we go to their homes; we should not think or be reminded of anything about alcohol. Our experience shows that this is not necessarily the case. We meet these situations every day, an alcoholic who cannot know about these things, he still has an alcoholic mind, something is wrong with his spiritual state, his only chance to get sober would be in a place like the Greenland ice cap, and even there an Eskimo could show up with a bottle of Scotch and ruin everything! […] From our knowledge, any strategy to combat alcoholism that proposes to protect the sick man from temptation is bound to fail. [A. A., 2001, pp. 100-101]

Therefore, it is not enough to change an addict's place or space. Any dependence on or addiction to alcohol, drugs, or even work, dysfunctional relationships, etc., requires more drastic interventions that do not guarantee the recovery of all addicts. Some will relapse, others will die and the luckiest will recover. Thus, there are many situations and factors that determine addiction, situations that trigger uncontrolled consumption and that violate the physical and moral integrity of a human being, a very complex subject which would require several more books to gain a slight approximation to the subject. Therefore, it is not necessary to be reductionist, changing an addict's place will not make him or her recover their health, nor that of those around them.

i) "Seek quiet spaces. There seems to be evidence of the inverse effect between noise and learning" (Duhigg, 2014, cited by Andere, 2020, p. 165). This aspect was corroborated in surveys conducted by the undersigned and a team of assistants, were carried out from January to November 2004 to students and alumni of the Bachelor's Degree in Graphic Design of the Department of Design at the University of Guanajuato, as well as students of the same degree at the Universidad Iberoamericana, Leon campus. (Villagomez, 2010, pp. 123-131). One of the aspects highlighted was that when they were sketching and generating ideas, it was very difficult for them to carry out this activity if there were people around them talking or conversing, and for the people surveyed it was very difficult to concentrate on the solution of a problem if there was noise in their environment. Conversely, others mentioned that certain music was used during the actual realization phase of the mock-up, prototype, etc., with the conclusion that music is tolerated after the Gestation and Discovery phases.

j) "a lot of cognitive work is required to create new habits and new experiences that better prepare the internal neural conversations." *(Ibid).* A study by the University of London *(University College London)* concludes that a new habit is built between 18 to 254 days, and the average time in which people acquire it is 66 days, all depending on how complex the habit to be acquired is. (Lally, Van Jaarsveld, Potts y Wardle, 2009, para. 1).

k) Finally, Andere suggests trying all of the above, and if none of the above works, go for professional help, although this option, he says, will be the most expensive (Lally, Van Jaarsveld, Potts y Wardle, 2009, para. 1).

We conclude this preamble to emotions and the human mind in order to contribute to a better understanding of the following section on emotion and interaction.

6. Interaction in Electronic Art

To understand electronic art without understanding that most of the time electronic art requires some interaction from the public would be very difficult. In 2009, when this author first heard about digital art, it took her three years to fully understand what it was all about. The most complex thing was to try to define what digital art was without objects for its study. It was possible to read, but without objects of study, some names of artists mentioned here and there (many of them wrong, that is, they were not digital artists), in a very cryptic essay of barely five pages on digital art in the library of the National Image Center, but there were no works of digital art to study in my immediate environment in Guanajuato, until the day my Thesis Director, Dr. Francisco Giner Martínez from the Polytechnic University of Valencia, suggested several places to visit in Europe. That trip in 2011, in addition to all the books on digital art (e.g., "Digital Art" by Christiane Paul) and on electronic art, which I found in electronic bookstores like Amazon, among others, opened my eyes to the world of art with the use of technology. Places like Ars Electronica in Linz, Austria, Arts Santa Monica and Disseny Hub in Barcelona, Media Lab Prado in Madrid, ArtFutura in Bilbao were the key to understanding what electronic art was, where interaction was an essential feature between the work and the public. In addition to the above, I conducted thirteen interviews. The first was in 2011 with the electronic artist Arcangel Constantini, who kindly talked to me about his pioneering Net.art projects, e.g., Unosunosyunosceros (2002) and Bakterias (1996

to date), among others, which introduced me to an understanding of Mexican digital art.

It is for this reason that in the chapters of this book there have been extensive descriptions of electronic art and the elements involved in this branch of art. Because we know that, at least in the province of Mexico and even in Mexico City, despite the fact that some of the main centers for art that uses Mexican technology are located there, people are not familiar with electronic art. This despite the fact they do like certain forms of art, perhaps with the exception of video art, which is one of the oldest forms of electronic art, with pioneers such as Pola Weiss (Mexico City, 1947-1990) who in the 1970s when experimented with dance, video and new technologies.

This section begins by analyzing the relationship between interaction and electronic artworks. For Margarita Schultz (2011, min 00:11:12), as quoted by Miguel Angel Reyna Martinez (2021, p. 58), there are three criteria in digital artworks and I quote,

> Interactivity: where a committed user is required, who will transform the piece into different physiognomies, requiring a more complex degree of communication on the part of the creator, becoming a mediator between the user and the work.
>
> Instability: In these interactive works it is a virtue, the more unstable the work is the greater the success with the public, instability is a quality, the work is modified, creating uncertainty in the public.
>
> 3. Incompleteness: Incompleteness is a consequence, if the work is unstable as a result of interactivity, it can be deduced that the work is incomplete, it is an open work in time, until an event occurs.

It is important at this point to explain as simply as possible what interaction in electronic art is. It is necessary to start from the explanation that electronic art works are built, conceived and elaborated with state-of-the-art technology and sometimes in Mexico, and in other countries, also with obsolete or reused technology. Electronic artists more often than not "hide" the ways in which the work will be "activated" in the presence of the public, that is, a person approaches the work and the way in which the interaction will occur may be by the proximity of the person to the piece, in such a way

that some device is activated or some action is performed on it. Another form of interaction is that in the work there is some kind of instruction or simply that a person has observed how the person who preceded him or her interacted with the work. On other occasions, the form of interaction is more elaborate. For example, "Alzado Vectorial" (2000) by Rafael Lozano-Hemmer, is a work where he asked the public to design a pattern with a beam or beams of lights on an internet page designed specifically for the large-scale installation he made for the change of millennium in the capital's Zocalo central square, Each member of the participating public was informed via e-mail about the time when the light robots would project the design that the user had made days before onto the night sky. The light beams were several kilometers long, and the patterns were designed by more than eight hundred internet users.

Therefore, the idea of a person arriving at a museum or gallery to observe a painting, an engraving or a sculpture,[1] that is, the public as spectator, does not apply in electronic art, where most of the time the public is a participant in the work. Another example of interaction is the Net.art work entitled "3:00 am <" by the Mexican artist Arcangel Constantini, which involves opening the Internet site www.unosunosyunosceros.com, clicking a couple of times, clicking again on the word "anima" which then appears at the top of the list "3:00 am <". When clicking on this button, a grid of frames appears where one clicks randomly and video sequences of the Santa Martha Acatitla market in Mexico City appear accompanied by an audio created by sound artist Manrico Montero Calzadíaz. Men move reused objects from a pile of old iron. It is three in the morning and they begin to take objects for sale at the flea market or used goods market. In this Net.art development, each cybernaut can click where he/she wants, and each time a person enters the web site he/she will interact in a different way, that is to say, as he/she sees fit, in such a way that the piece will have several final appearances depending on the squares he/she chooses to click, the time intervals in which he/she clicks and how long the user remains interacting with the work; that is to say, if the user did not click, nothing would happen on the web page.

[1] It is important to mention that both forms of art, traditional art and art with the use of technology run at the same time in the contemporary art world; both are equally valid forms of art and one does not obliterate the other. On the contrary, at certain moments they interact and feedback on each other.

Now, for there to be interaction, an interface is necessary, the Dictionary of the Royal Spanish Academy defines interface as "From ingl. Interface 'contact surface'. 1. F. A common connection or boundary between two independent devices or systems. 2. F. Inform. Connection, physical or logical, between a computer and the user, a peripheral device or a communications link" (RAE, 2021).

> In interactive electronic art, information is kept in a constant flow, the same data can change in different *ways* according to the perception of our senses and the decoding we make of it. The interface is the essential element of the perceptible work, it is the form given to the information (Bureaud, 2020). Lev Manovich professor and researcher in digital humanities, social informatics, art and new media theory, expresses that in electronic art the interface must be totally determined by the content of the work. Content and interface merge into a single entity, and cannot be separated (Manovich, 2002, 116). Artists use the usual interfaces, in the same way, they develop specific, unusual, even incongruous interfaces as dialectics of the work. [Reyna, 2021, p. 62]

For professor and electronic artist Miguel Angel Reyna, a digital interactive artwork can be related to the objects and subjects of its environment in such a way that there is a reaction. What he calls the sensory organ of the work (the interface) behaves similarly to the sensory receptors in organisms, since they communicate through electrical impulses, comparable to a nervous system within the work, where in reality they are communicating to a microcontroller, the processor or other information processor (Reyna, 2021, p. 163). In this regard he mentions that:

> This communication is possible from electrical impulses in an electrical signal.
>
> This is where it differs from living organisms, but this difference does not interfere or distort communication, it refers to the type of electronic sensory device used for the design of the interface. The sensations in the case of a living being are defined by their intensity, spatial and temporal dimensions that lead to the quantification of that stimulus, in the work the reading of infor-

> mation is processed in a similar way, behaving with dynamics according to the same variables of a stimulus to be measured. [Reyna, 2021, p. 63]

Due to the above, "The fundamental element in the development of electronic interfaces within the digital art is the sensor or transducer, which is a device that from the energy of the medium where it measures, generates a non-homogeneous output signal that is a function of the measured variable" (Pallas, 2005, p. 3 cited by Reyna, 2021, p. 64). And with the above we enter the subject of what I personally call "the iron" of electronic art. In the area of human sciences and the study of electronic art, people generally avoid talking about "the iron" of the intricacies of electronic art; i.e., how it is done. However, here it is considered essential to tackle it in order to better understand its operation, especially if we are talking about interaction, as in this case. Another basic concept necessary to understand the interaction are the sensors. Below is a broad description of Antonio Serna, quoted by the electronics engineer Miguel Angel Reyna,

> Sensors mimic the perception of the sensory organs of living beings, expanding the capacity in the perceptual field, due to this characteristic of imitation of perception, we can find sensors related to the senses: Sight, hearing, touch, sound, contact. Sensors are therefore electronic devices that allow a digital logic system to interact with the external environment, providing information of variables found in the environment to the system, processing and generating orders to perform actions. There are different types and classifications of sensors, for this research we will mention the classification that corresponds to the nature of the stimulus being measured: position, photoelectric, magnetic, temperature, humidity, pressure, motion and chemical. [Serna, 2010, p. 4, cited by Reyna, 2021, p. 64]

On the other hand, according to the contemporary art historian of the University of Amsterdam, Dr. Katja Kwastek, interactive artworks often do not manifest or express themselves autonomously, by their material form, but through structures or systems. They may have been produced in different versions, and sometimes have a large number of components, or may run in different media. However, they were consciously conceived to be

hosted in multiple vessels in very different ways (Kwastek, 2013, p. 149). Examples of this are Rafael Lozano-Hemmer's public art works presented in different cities around the world and even his Relational Architecture series, works designed to adapt to different spaces with totally different requirements; i.e., not only their internal components are referred to, but also the adaptability of the works to different environments.

Because of its relevance to the field of electronic art, I make a parenthesis here linked to the above relating the conservation of the pieces over the years. It is well known in the field of electronic art that one of the challenges to overcome is how to preserve a piece if the technology becomes obsolete at some point; that is, the electronic components used will reach a point where they will no longer be manufactured and will not be found on the market. In this regard, there is at *Carnegie Mellon University* in Pittsburgh, Pennsylvania, the *Carnegie Mellon Computer Club*[2] a group formed by engineering students, among whose various tasks is restoring and maintaining in operation obsolete technological devices. They solved the issue of the 3 ½ discs found in boxes owned by Andy Warhol discovered in the basement of the artist's museum: "… the Andy Warhol Museum had the computer equipment given to the artist [an Amiga 1000 with color monitor], including the *floppy disks*. What the *floppies* contained no one knew. This was in 2011, a generation removed from what was considered cutting edge in art in 1985. The disks were obsolete technology; everything stored on them was inaccessible" (Flecker, 2014, para. 10). When the information was recovered, they found formidable works on the disks Warhol had made, such as a portrait of singer Debbie Harry, and more.

Returning to interaction, Dr. Katja Kwastek comments that Umberto Eco introduced the category of "work in movement" to denote another variable to the category of "open work". Both concepts are based on the idea of a classification scale that reflects the degree of activation of the receiver, which can be problematic when both are focused on electronic art projects (Kwastek, 2013, p. 150). Therefore, it is preferable to adopt an approach in which the electronic art pieces remain open and undetermined, both in the work presented to the public (who are the ones who finish it), as well as in

[2] See http://www.club.cc.cmu.edu/ and https://www.facebook.com/cmucclub. Accessed on October 28, 2021.

the artist's process itself, since the artists mention in interviews conducted for this research that they are often forced to finish pieces due to lack of budget or even by the fatigue caused by the realization phase. However, the works remain open, they are developments that decant into small "sub" pieces, but the work and research in this regard continues for several years.

In relation to the process qualities of an electronic art development and its behaviors, Katja Kwastek discusses a model that distinguishes between the following elements: behaviors, contents, installation, execution, interaction, reproduction, duplication, encoding and networked behaviors. Conversely, traditional works of visual arts, e.g. sculpture and painting, are mostly described by their content or their own materiality, so they are described on the basis of material characteristics, such as type of surface or support. Meanwhile, interactivity is characterized by the definition of the input options and the participants who can interact, which contributes to creating a classification and description of artistic activities, taking into account the close interrelation of not only material characteristics, but also of the process (Kwastek, 2013, p. 150-151). Hence, the study of electronic art is complex, not only because of the changing technology that can be used, but also because of the analysis of the processes contained in the piece and the interaction that it can provoke. In relation to the materials and returning to the subject of the conservation of the work, the electronic artist, Doctor Roberto Morales Manzanares commented in a talk after the professional examination of the electronic artist Miguel Reyna[3] that the museums and galleries of electronic art or that safeguard work of this nature are opting to ask the artists for extensive and detailed descriptions of how they made the work, what software and hardware they use, and a dossier of the work accompanied by photographs and videos of its operation in order to keep evidence of it, once it can no longer be put into operation due to technological obsolescence.

For Dr. Kwastek, inseparable elements of an interactive work are the actors, that is, the active entities involved (in Mexico, some scholars on the subject, such as Fernando Monreal, also call them *actantes*).[4] Human

[3] Doctorate Hall, Belén Unit, University of Guanajuato. Guanajuato, Gto. Mexico. October 22, 2021.

[4] "From fr. actant, from the root of action 'action'. 1.m. Gram. In some linguistic theories, argument (II participant selected by a predicate)." Diccionario de la Real Academia Española [Dictionary of the Royal Spanish Academy]. https://www.rae.es. Accessed on October 4, 2021.

actors are considered to be individual subjects; i.e., not simple operators of the interactive system, because these systems usually prioritize the interaction of perceptions and interpretations, which arise individually and subjectively and not in a generalized way. The creator is considered to be the first actor, because if we speak in chronological terms, he or she was the first one involved with the work, besides the artist (conceiving and facilitating the interaction process), and in this role can also be the makers of the systems of the piece. The reality is that many people can be involved in the process of conception and creation of an interactive work, especially because it requires various skills, e.g., sound design, interface design, programming, etc.; For his or her part, the artist, as author of the work, can create the interactive design proposal, programming or implementation of underlying systems, building, assembling digital resources and material components or configuring the devices; that is, digital media provide the means to structure the interactivity.

Programming deserves a separate mention, as it is also a form with potential for creative expression (Kwastek, 2013, pp. 150-151). An important aspect of the interaction is that, most of the time, the result of the interaction is indeterminate and surprising, even to the artist himself. In this regard,

> Artist Yvonne Dröge Wendel has stated that, "the beauty of interactive work is that, the moment you let go, the unthinkable happens and unknown situations arise beyond your preconceptions… I have to suppress my tendency to intervene or impose my intentions on how the work should be used or experienced." [Kwastek, 2013, p. 153]

The receiver is another element that participates in the interactive artwork. The interpretation made by the receiver will be decisive in the final result of the piece. With regard to this aspect, as a researcher of electronic art, the work of Rafael Lozano-Hemmer's team, who have a very complete and constantly updated website (https://www.lozano-hemmer.com) with all the information on each work produced by the artist and his team, as well as a large amount of articles and book chapters where they discuss it, is greatly appreciated. In the records on several of these works, the artist men-

tions that in the *Body Movies* performance, *he* did not expect such a response from the public. The same goes for *Re:positioning fear*: "The results obtained from each work depend on each project and how it is received. According to the artist the response to the work frequently varies from what he imagined, and he recalls his experience with the piece *Re:positioning fear,* when he started with his installations of giant pedestrian shadows in public spaces" (Villagomez, 2017, pp. 233-234).

> … when I transformed the facade of a military armory in the Austrian city of Graz, it so happened that in the armory there was a painting entitled *The Scourges of God*, depicting the three main fears of the people in Graz during the Middle Ages: a potential Turkish invasion, the bubonic plague and locust infestation. For this installation I invited dozens of artists and thinkers from around the world to participate in an online discussion of the transformation of the concept of fear; probably the Turkish threat was replaced by the invasion of Yugoslavian war refugees, or instead of the bubonic plague, the current HIV epidemic; the discussion was projected in real time onto the façade, but I thought I could use the shadows of pedestrians as a kind of "window" or "scanner" linking the audience to the text. I assumed that the shadows would give an expressionistic and gloomy touch to the piece,… I also wanted the shadows to function as metaphors for the fear of the Turkish invasion… I was totally wrong! As soon as people passed by and noticed the installation they started to play with their shadows acting out comical pantomimes, the large dimension of the shadows allowed —for example— school children to step on their teachers, or a man in a wheelchair could roll his 25 meter high shadow over others getting the great pleasure of crushing them with his giant wheels. This installation became an *ad hoc* carnival and no one gave a minute's thought to fears, pests or invasions. This was one of the most entertaining mistakes of my career. [Barrios, 2005, p. 11]

Kwastek points out that artists are absent from the interaction process, which is an important characteristic identified in interactive art. However, the artist may be present in the roles of receiver, observer, mediator, or partner in the interaction game (Kwastek, 2013, p. 154). Sometimes, elec-

tronic artists are at the side of their piece while it is exhibited, as some artists like to interact with the public for their pieces, explain what their work is about and in general make sure that it is functioning properly. I remember at the *2017 International Symposium of Electronic Art (ISEA)* held in the city of Manizales, Colombia, Canadian artist Lynne Heller[5] was notified that her piece *Pillflower* was malfunctioning and late at night she had to go to fix the problem and verify the next day that it worked. At Transitio_MX in 2011, the Brazilian artist Guto Nobrega[6] spent a good part of the time with his work *Breathing*. Almost incognito, he remained observant, leaning against one of the walls of the cubicle assigned to him in the exhibition area, until one of the attendees asked the others how it worked. At that moment he was ready to clear up any doubt. The same was the case with Clarissa Ribeiro,[7] who at ISEA 2017 received into her exhibition space practically all members of the public that approached in order to explain on her tablet what her piece consisted of.

It is necessary to mention that electronic works of art require excellent support from the museographic design, the design of technical cards, descriptions, brochures, and all signage and museographic material that contributes to the understanding of the pieces plays a crucial role. I remember attending the exhibition |/O//|. *Los sentidos de las maquinas (Laboratorio de interaccion)* at the Disseny Hub or Museu del Disseny de Barcelona, an exhibition that ran from June 22, 2011 to May 27, 2012, which proposed,

> … a didactic and experimental look at the relationship between humans and machines, at a time when new generation interfaces include natural interactive functions and social behaviors and behaviors. An exploration of the new territories in which interaction design develops and generates new needs, disciplines and experiences. An exploration of the new territories in which interaction design develops and generates new needs, disciplines and experiences. [Disenny Hub, 2011]

[5] Lynne Heller, https://www.lynneheller.com/. Accessed on October 12, 2021.
[6] Guto Nobrega. https://cargocollective.com/gutonobrega. Accessed on October 12, 2021.
[7] Clarissa Ribeiro. https://bit.ly/3EtXY2C. Accessed on October 12, 2021.

This exhibition presented finished pieces by various electronic artists, as well as devices commonly used in areas such as robotics, the Internet of Things, biotechnology and data visualization (Arte Informado, 2011, para. 4). The idea was to have the public participate in an electronics laboratory by providing descriptive cards on how to interact with the mechanisms and devices, as well as handing out a brochure with instructions at the beginning of the tour through the exhibition space. This was how, from my perspective, they successfully achieved their goal: to involve and invite the public to interact with the pieces and mechanisms, as well as to contribute to their understanding of these. The exhibition,

> … approaches interactivity from different levels, represented on a scale that goes from very simple devices —that evidence the transmission of energy and the conversion into gestures, signals and data— to more complex systems, where identical machines interact with each other and generate behaviors in community. All this with the intention of reflecting on the effects we produce with the use of technology, the different scenarios where interactivity is present, the development of intelligent interfaces and their role in the design of the future. In short, about technology, humans and their environment. [Arte Informado, 2011, para. 3]

On the other hand, with regard to the means and resources that the institutions can provide to facilitate the interaction of the public with the electronic art pieces, it is, we reiterate, necessary, because they are works made with new resources, most of the times complex, that a well-structured strategy of means and resources within reach is indispensable to achieving the task that the artist has proposed. That is to say, it requires close collaboration between galleries and institutions, the work and the artists. In this regard I quote a couple of e-mails, the first from myself to Laboratorio Arte Alameda, following my visit to the group exhibition "Machina|Medivm|Apparatvs":

From: c v < cynthia.villagomez@gmail.com>
Date: 26 October 2012 19:18
Subject: Comments
To: info.artealameda@gmail.com

To whom it may concern, about the work *Nave Solar* by Rafael Lozano-Hemmer in 'Machina | Medivm | Apparatvs', I am writing a doctoral thesis project on the subject of Digital Art in Mexico, I am writing the following and I think it is important to comment on it.

I find it very important to point out, that during the visit made to the said piece in December 2011, I questioned the employees guarding the room on how to interact with the piece, the answer was: *'Just walk to the back and smoke will come out of its shadow…..";* in my visit in August 2011 to Ars Electronica in Linz Austria, to Arts Santa Monica in Barcelona, to Artfutuperson who explained to the v ra in Bilbao, Disseny Hub in Barcelona, among others, there was always a isitor how to interact with the piece, in addition to explaining the general aspects around the piece, in case there was no one available, at the entrance of the room they gave an explanatory brochure of each of the exhibited pieces that included the possible ways of interaction, or failing that there were signs indicating where you could pull, press, talk, etcetera. I consider it very regrettable that the LAA in Mexico does not foresee these situations in the exhibition of digital works or with the use of technology, especially considering that it is supposed to be a center specialized in the exhibition of such material. This problem did not occur only with the piece by Lozano-Hemmer, the staff did not know how to explain the operation, nor the idea of the piece *Nomadic Plants* by Gilberto Esparza, they only handed out a brochure at the entrance with a small font, in white italics on a blue background with white illustrations, which made it practically illegible.
Kind regards, Cynthia V.

The response to this e-mail, also sent as a comment on the Laboratorio Arte Alameda's web page, received a reply from Dr. Karla Jasso,[8] a leading figure in the electronic art scene in Mexico, which describes some of the problems with spaces such as the Laboratorio Arte Alameda, among others administered by the National Institute of Fine Arts and Literature, the INBAL. The following is quoted with the constructive desire that the difficult conditions in which artists and curators work may improve at some point,

[8] D. in Art History from the Faculty of Philosophy and Letters of the UNAM and researcher in the field of *Archaeology and dialectics of the media.* She has been Professor of Contemporary Art and Critical Theory at the Universidad Iberoamericana (2004-2008) and Chief Curator of Laboratorio Arte Alameda (2007-2013). She is a member of the curatorial and programming committee of MUAC, Museo Universitario Arte Contemporáneo (Mexico City). She is currently developing a research project on Art and Bio-Linguistics.

karla jasso <…..@gmail.com
For me
28 Oct 2012 21:08

Dear Cynthia,
First of all, I am Dr. Karla Jasso, curator of the LAA and of the exhibition you visited.

I want to tell you that I greatly appreciate your comments, which were forwarded to me by the person responsible for information and attention to our public.

I have several points to mention. First, it is a great pleasure to know that you are doing your doctorate on the subject of digital art in Mexico. From my own experience, I know very well that the subject is not easy, the programs in Mexico often do not meet the needs of a serious and meticulous researcher, who tries, above all, to develop critical thinking. And in short, one must travel as you have done, try to do semesters outside the country and, without less importance, visit assiduously the Mexican spaces dedicated to the exhibition, production and reflection of the so called "electronic arts".

Also, I am very sorry that your visit to MMA [Machina | Medivm | Apparatvs] was frustrating. And I mention this because it was an exhibition where we worked hard and above all, we dedicated time and effort to communication strategies and dialogue with visitors. There was one rule, and that was to give what we call a "Room Sheet" (which I add here), to each person, totally free of charge. An apology because I see that you point out that it was illegible. Your reflection is true, one of the problems we have faced is precisely, the union staff working as custodians. Many times, although we explain in detail the concept of the pieces, they interpret them in their own way and transmit erroneous or incomplete information. This is not justification, I mention it only as part of the context. Your e-mail reaffirms to me the urgent need to take care of the "legibility of the room sheets" and to propose to INBA a real training program for custodians.

For more than fifteen years, her work has explored the history of technology, as well as the language of new media and art. Her curatorial projects include Tania Candiani's *Five variations of phonic circumstances and a pause* (2012) which won the *Distinction Award* at the *Prix Ars Electronica* (Linz, Austria, 2013); *Dynamic (in)Position,* organized by the Mexico City Festival at the Laboratorio Arte Alameda, the Centro Cultural de España and the MUAC in collaboration with *Ars Electronica* (2010); Contra Flujo: *Independence and Revolution, Rubin Center, University of Texas,* El Paso (2010) and *Distortions: Contemporary Media Art From Mexico, The College of New Jersey* (2009).

She is the author of books such as Arte y Tecnología: Arqueología, Dialéctica y Mediación (*WebPress,* 2014), co-author of *(ready) Media: Hacia una Arqueología de los Medios y la Invención en México* (INBA, 2012); *Machina-Medium-Apparatus* (in press, 2015). (Museo Amparo, 2021).

I am very familiar with all the organizations you mention in your e-mail. I have also been able to observe closely the way they work the *exhibition-content-dialogue* relationship with the *public*. They are valuable examples. I cannot tell you that from our position we would try to imitate them, but to be creative to develop our own way or strategy of communication and thus avoid that what happened with you happens again. Why not imitate them? Because it seems to me that each cultural-local context has specificities that must be taken into account when drawing communication strategies. The audiences in Linz do not have the same needs as the audiences in Mexico, for example. And this point seems to me to go beyond information to content.

Although it is late, here is the room sheet with information about each piece, as well as the colloquium that was organized as a counterpoint to the exhibition. By reading the room sheet you will realize its purpose and intention. I also leave you the press information in case it is useful for your research.

And finally, I thank you again for taking the time to point out these unfortunate flaws that we will certainly try to fix.

If I can help you in any other way, please do not hesitate to contact me.

Thank you,

karla jasso.

PS. We are opening a new show next Tuesday, I hope you can attend and I would love to meet you in person to learn more about your doctoral thesis.

Hence, many artists choose to act as mediators of their own work, inviting the receivers to interact, or describing to them how the system can behave more powerfully. The boundaries are fluid, says Katja Kwastek, mediation follows observation, and the artist can even take on the role of the ideal receiver to act out possible interactions, mostly to encourage the audience to follow. Kwastek mentions that many artists exhibit at Ars Electronica in Linz, where they are well aware of the needs of the artists and works, and thus allows the artists to be close to their works during the exhibition, making sure they function properly, allowing the artists to be available to engage in conversation with the public, giving suggestions, and even interacting with the work so that, by being the ones interacting with the piece themselves, they break the ice and the receiver begins to interact

as well. Media artist Teri Rueb jokingly calls this activity *babysitting a work*, (Kwastek, 2013, p. 155), referring to the work a nanny or babysitter does with a baby in her care.

This was personally verified in conjunction with Arq. Ulises Flores and Mtro. Juan Carlos Saldaña as authors of the interactive video installation *La Caja*[9] *(*2008), which was exhibited in the auditorium of the Department of Design of the University of Guanajuato, as a result of one of the workshops taught by Dr. Moises Mañas Carbonel within the PhD in Visual Arts and Intermedia of the UPV. It was the first interactive video installation presented in that space, and unfortunately the day of the presentation there were problems with the *Pure Data* software used (recently I learned from Dr. Roberto Lopez and Mtro. Miguel Angel Reyna that this software had problems, as it was under development) and only the projection of the videos was presented. That day all the guests arrived and sat in the auditorium seats waiting for something to happen. Before any action, my colleagues asked me to give a speech about the installation. It was really unusual to see how, despite the fact that the public was asked to move between the video camera, the projection, the drawer with buttons, nobody did this. Everyone respectfully occupied their seat until the speech was over and then they left. The following day the malfunction was fixed, and due to the equipment inside the auditorium it was necessary to be present during the hours the auditorium was open to the public. It was necessary to explain the operation of the installation to each receiver, even though the instructions about the interaction were on a Macintosh computer monitor at the entrance from the first day, although another option would have been to have prepared assistants. However, it was a situation that had not been foreseen. As Katja Kwastek observes, "…the receiver's activity depends largely on their experience with similar work, their resulting expectations, and their willingness to perform an action" (2013, p. 156). In the case of the interactive video installation *The Box,* the receivers had no prior experience with similar artworks.

In spite of the above, the results of the forms of interaction are more often than not unpredictable. Regarding the work of the receiver of the

[9] See Interactive video installation La Caja, https://www.youtube.com/watch?v=1NVaNS5xxKA. Accessed on October 2, 2021.

pieces, Kwastek mentions that the task of the receiver in interactive art —a branch of electronic art— is to literally realize the work of art,

> This means that the receiver actively responds to the proposal to interact (although not in the sense of "correctly" executing a prescribed concept, since the behavior of the recipients will not always necessarily correspond to the artist's expectations). The scope of action offered by different works varies considerably, starting with the question of how to communicate possible or expected actions. Written or verbal instructions may be provided, but most works are constructed and configured in such a way that the possibilities for action can be deduced by the installation itself. In many cases, one of the central components of interaction is the receiver's own exploration of the possibilities for interaction offered by the piece. [Kwastek, 2013, p. 156] *(au. transl.)*

According to the electronic artist Golan Levin, among the ways of relating to a work is the "vicarious interaction",[10] which is when a receiver limits his activity to observe the interaction of others with a piece, so they take some distance from the work to perform this work. Even so, the senses awaken sensations or there is cognitive understanding in these cases (Kwastek, 2013, p. 157); that is, there is an exchange, information going back and forth or interaction, although he does not have the same experience as the receiver or participant of the work. The fact is that "vicarious interaction" is so common that there are electronic artists who plan their projects considering spaces for these passers-by who swarm the exhibition sites. Such is the case of CalArts artist and teacher Grahame Weinbren,[11] who frequently presented his early interactive narratives on screen in cage-like constructions that contained a protected seating area for interacting recipients, while also having a spectator area outside the cage or behind a metal construction, equipped with a monitor that played the active user's screen recording for the viewers (Kwastek, 2013, p. 157).

[10] Vicar: 1. adj. Who has the times, power and faculties of another person or substitutes for him. Diccionario de la Real Academia Española. http://www.rae.es. Accessed on October 2, 2021.

[11] Grahame Weinbren Oral History. https://www.youtube.com/watch?v=FsbujGlmsaw. Accessed on October 11, 2021.

In conversation with electronic artist Dr. Roberto Morales Manzanares about what code was and how to learn it, he mentioned that, for him, code was like having an assistant or a servant to whom he writes text so that the code executes actions; the art is in who can perform the same action with the least amount of code possible, which is where a good programmer can be recognized. This brings us to another primordial element in interaction: the technical system. This, according to Kwastek, is the one that supports the interaction proposition and the material components of that system that must be considered as actors in their own right, and not only when the system is configured as a virtual person. "As a matter of principle," says Kwastek,

> … interactive systems not only enable actions, they also have their own processuality, which, although designed and programmed by the artist, acts differently from him: "Actor-network theory", for example, starts from the assumption that objects can be considered actors. Objects not only serve as a backdrop for human action; according to Bruno Latour [philosopher specializing in science, technology and society studies] they can also authorize, enable, cost, encourage, suggest, influence, block, enable, prohibit, and so on. The proponents of actor-network theory are not interested in process entities, but in static objects. Donald Norman uses the term "capacity" to describe the action potential of objects. "Affordability" refers to the actual and perceived characteristics of things, especially those that determine how things can be used. [Kwastek, 2013, p. 161]

7. Emotions, Interrelation and Interaction

As we have seen, in the interaction between the public and artistic developments, a field for research has been found due to the complete lack of information about Mexican electronic art works and their emotional content. Additionally, modern psychology considers emotions to be visible behaviors; they manifest themselves visually. A question emerges from this: Is it possible that artists and students of electronic art can establish a plan to arouse a range of specific emotions with determined purposes in the public? Hypothetically it can indeed be inferred, as a result of the advances of modern psychology in the study of the development and detection of emotions, that it is possible to create a model for eliciting emotions through works of electronic art. Because of this, in this section, we are going to analyze several Mexican electronic art developments linked to specific emotions. However, it should be noted that the model does not predict emotional response. As Jonathan Frome said, the emotional response to a given work depends on a "variety of contexts and ways of viewing the artwork, diverse individual histories and cultural contexts, is what makes it possible, as well as the enormous influence of historical and cultural factors on emotional response." (Frome, 2007, p. 831). The emotional model created for the present research analyzes the resources for interaction used by various Mexican electronic artists in their works with which they generate emotions in the perceiver and participant in the work.

Due to this, emotional response can be termed "emotion" per se. According to Frome (2007), the basic types of emotions investigated by Ekman are: joy, sadness, disgust, fear, anger, surprise, interest, and contempt. On the other hand, others, for example Ortory, Clore, and Collins, classify emotions as either positive or negative, while for Antonio Damasio, emotions are vast (Frome, 2007, p. 831). It should be emphasized that emotions, in general, even negative emotions, have evolved for human well-being. In addition, it does not matter if sometimes a negative emotion leads us to non-positive actions; in the first instance the emotion emerges for our well-being. Although the topic gives elements for further discussion, for the purposes of the present research it can be said that emotions respond to a stimulus with an associated phenomenological "feeling" designed to motivate organisms toward their well-being (Frome, 2007, p. 832). Finally, for cognitive psychology, thoughts produce emotions, and emotions create behaviors that are essential for awareness of various aspects of existence. In the case at hand, electronic artists seek to sensitize specific audiences regarding issues of social interest and the artist's own interests.

With the understanding that the aspiration of the artists studied is to cause the public to reflect on the themes addressed in their works, the objective of the present research at a future stage is to create a methodological model that will guide both novice and experienced artists on inducing emotions. This section therefore outlines the techniques and resources according to that perspective. The principle followed here is the postulation by cognitive psychology that thoughts produce emotions, and that these in turn generate essential behaviors at the moment of awareness in various ways.

Therefore, the central theme of this section is the role played by emotions in electronic art as a resource to reflect on the messages that artists wish to convey; that is, the various forms of interaction with the work by the participant as an essential resource for the induction of emotions. It is through these that the electronic artist can communicate and, on occasion, it is possible that the artist's messages remain in the public's memories and can contribute to a reflection on those aspects inherent in the work. For the purposes of analyzing these processes in artistic developments, a model has been created to elicit emotions through Mexican electronic art works, as well as works motivated by events that have occurred in the country, creat-

ed by artists resident in Mexico or Mexican nationals who produce their work from abroad. The emotional model created for this research analyzes the resources for interaction used by various artists, with which they generate emotions in the participant in the work. In addition to the above, the proposal here is that emotions respond to a stimulus with an associated phenomenological "feeling" designed to motivate organisms to well-being. Lastly, providing a model for producing an emotion in electronic art is considered to be of value to both novice and experienced artists who wish to experiment with eliciting specific ranges of emotions, whether positive or negative.

It is important at this point to emphasize that the use of technology in art has created new ways of relating to the works, in such a way that in many cases it is the public itself who participate creatively in the work, determining what happens with respect to it, and even giving it different endings. It is therefore important to mention some forms of interaction:

a) *Musical composition.* The participant in the work generates sounds with a certain musicality, through different actions that the artistic work may require, ("Meridian" by Ivan Abreu).
b) *Stimulus-response.* Actions carried out by the participants are fed back to them by the work ("Pulsu(m) Plantae" by Leslie Garcia).
c) *Virtual communication.* Communication through social networks is necessary to activate actions in the work ("Arma Sonora Telematica" by Leslie García and Astrovandalistas).
d) *Costumes.* The participant of the work may wear special garments with specific devices ("Usable Soundscape 2.0" by Amor Muñoz).
e) *Clicking.* It is necessary to click on a computer mouse or on a keyboard to execute certain actions ("Bakterias" and "unosunosyunosceros" of Net.art by Arcangel Constantini).
f) *Voice as an instrument.* As part of the work, the participant must whisper, chat, shout, etc. ("Matriz de Voz" and "Menos que Tres" by Rafael Lozano-Hemmer).
g) *Body and movement.* To interact with the work the participant must perform specific movements, such as gesticulating, jumping or moving from one place to another ("Body Movies" and "Level of Confidence" by Rafael Lozano-Hemmer).

h) *Artifacts and devices.* The use of certain devices and artifacts may be required by the work, such as Virtual Reality glasses, keyboards, joysticks, tablets, microphones, cell phones, among others ("Escrituras" by Gilberto Esparza, "Kauyumari, el venado azul" by Arnold Abadie, Lozano-Hemmer's works from the series "Arquitectura Relacional", among others).

For researchers such as Seyedeh Maryam Fakhrhosseini and Myounghoon Jeon (2017), the experience of psychological changes leads to feelings and emotions. Therefore, it can be inferred that the audience can perform body movements and thus evoke emotions (p. 245). Thus it is that interaction with electronic art can be considered to induce emotions.

8. Categories in Mexican Electronic Art

It is necessary to point out that most of the works of Mexican electronic art evoke emotions. In part, this is due to the topics addressed, which are mostly sensitive for Mexicans, such as those related to Mexican politics or environmental problems. From both of these topics, we have extracted two major categories of national electronic art, as detailed below.

Political expression

According to Dr. Luis Leon Ganatios, "… democracy confers two rights to citizens, the first right is that of equality which is expressed in the vote, the other form is the manifestation, where the citizen can express himself, from the proposal to the protest. The citizen has the right to have what the Greeks called an agora, a place of expression, and here democracy in art would enter, because democracy is a way of expression and the citizen can turn this expression into a political expression. What would this advantage? When political expression goes through art, it would enter in other senses of this manifestation, this is clearer in the antithesis of democracy, all authoritarian governments throughout history, the first thing they have tried to influence is art or have tried to silence the artistic expressions that do not suit them, for example, the persecution of Luis Buñuel in Franco's regime, or in the USSR to many of its writers. So democracy is a way for

the manifestation of the citizen to be given in different forms, and art would be a vehicle for the citizen to have a means of enriching his manifestation" (Leon-Ganatios, 2021). In this category, artistic developments address the recovery of historical memory, social manifestations of inequality, government interference that either creates or exacerbates social conflicts or violence, among others. According to the artists' observations, these artistic works invite reflection and awareness on the part of the public.

Works such as *Étude taxonomique-comparative entre les Castes de la Nouvelle Espagne et celles du Mexique Contemporain* (*Taxonomic and comparative studies between the* castes *of New Spain and Contemporary* Mexico)[1] (2010), also known as The Castes by Erick Meyenberg, where the artist makes an ironic analysis of anthropological attempts to define and classify races. It is based on the Mexican Manuel Gamio's 1916 book "Forjando patria" (in turn influenced by the 19th century studies of French anthropologist Ernest Theodore Hamy), in which Gamio arrives at the idea that society is sustained through a common cultural identity as part of a post-revolutionary colonial discourse. Meanwhile, the Mexican genome had been officially defined by the National Institute of Genomic Medicine INMEGEN, 2009 (Ceballos, 2009).

Erick Meyenberg uses LED colors: red, green and blue, representing indigenous, black african and white european, respectively, which, when lit at the same time and at the same intensity, produce a perfect chromatic mixture, which is again used as a metaphorical and ironic medium: white light being the ultimate symbol of purity in the racial combination.[2]

What the artist indicates he wishes to highlight in this piece is the following:

> … I was very interested in seeing how the country has always seen itself and constructed its own imaginary through the gaze of the other, so for me

[1] More information at: Archee. http://archee.qc.ca/ar.php?page=article&no=427. *Erick Meyenberg: Race Discourse in Present Continuous.*

[2] Based on text by Daniela Wolf, curator of the *Haus der Kulturen der Welt,* 2010. PDF provided by the artist. And interview with Erick Meyenberg by Cynthia Villagómez.

> it was very important to highlight this gaze of the other, which defines us by means of a French title. What I did [for the title of the work] was a kind of almost Dadaist collage of different titles of this anthropologist Hamy [Ernest Theodore Hamy], I began to mix words that for me were fundamental, such as the notion of taxonomy, the idea of comparison of the kingdom of the new Spain, etcetera, and I made this collage alluding to a key problem of our country: the racial mix, which is something that I feel has not been resolved to this day, that is disguised. Now it is no longer a problem of talking about blood but of talking about genetics, that is why what I do is to compare the blood percentages of the castes with the blood percentages of the study of the genome of Mexicans published in 2009… to question what it is that makes us contemporary mestizo Mexicans and suddenly see that these scientific results are practically the same as those of the colony, which seemed to me a remarkable problem. [Erick Meyenberg, 2014]

In 2005, the Mexican government invested more than 20 million dollars for Mexican scientists to start the project to create the genetic map of this country, the results of which were made public on May 12, 2009. The argument for such a project was to improve public health. However, very little legislation has been passed in this regard in Latin America, and genetic information can lead to stigmatizing some populations in connection to certain diseases. In addition, and due to the social inequality in the region —according to experts— only the wealthy have benefited from genomic medicine in Latin America and nothing indicates that this will change in the future. Hence, Erick Meyenberg's work constitutes a critique of governmental discourse, emphasizing the fact of possible discrimination similar to that experienced in the past due to belonging to a specific race, but in the present.

Another example of art with political themes is Rafael Lozano-Hemmer's Voz Alta (2008), a memorial for the 40th anniversary of the 1968 massacre of students in the Plaza de las Tres Culturas in Tlatelolco, Mexico City (Lozano-Hemmer, 2008). In this work, witnesses, neighbors of the site, writers and survivors of that night spoke uncensored, narrating with indignation and sadness what happened. This was done through a megaphone

set up for that purpose, at the same time that several long-range spotlights located at points such as the Basilica of Guadalupe, the Plaza de las Tres Culturas, among others, were automatically controlled. The laser beams were projected into the capital's sky, blinking like Morse code to the rhythm of the voices of the testimonies, which in turn were transmitted by the radio station of the National Autonomous University of Mexico (UNAM), to be heard by millions of people throughout the city. Finally, a formerly completely censored topic is remembered with absolute freedom by the affected citizens.

Rafael Lozano-Hemmer's *Sintonizador Fronterizo* (2019) is a large-scale installation from the series Arquitectura Relacional, in which the artist seeks to intervene public spaces in such a way that it is the citizens themselves who determine it, conclude it and most importantly, can recover public spaces that have been expropriated by governments and institutions, as is the case of the border line between two cities: El Paso, Texas, in the United States and Ciudad Juarez, Chihuahua, Mexico.

The work used powerful spotlights to construct "bridges of light", which in turn opened live sound channels so that different people could communicate on both sides of the border between the United States and Mexico. The piece creates a "ceiling" of lights over the *Rio Grande* or *Rio Bravo* that separates the two countries, and these lights can be modified by participants at six interactive stations, half located in Mexico and half on the other side of the borderline. At each of the stations there is a microphone and a speaker with a wheel or dial. When a participant turns the dial, three nearby spotlights create an "arm" of light that follows the movement of the dial, automatically scanning the horizon. When two of these "arms of light" meet in the sky and intersect, a two-way sound channel automatically opens between the people located at the two remote stations. As they talk and listen to each other, the brightness of the "light bridge" modulates in synchrony, and a flash similar to a Morse code scintillation is activated (Lozano-Hemmer, 2019).

It is very interesting to see the interaction between people on both sides, because many of them immediately seek to engage in conversations based on points in common, so the experiences on both sides are shared, dealing with topics such as what they know about each city, if they have been there,

what they like about the city, why they do not return, where they are from, do they speak Spanish or only English and vice versa. Rafael Lozano-Hemmer's intention here is to make visible the already existing relationships between the inhabitants of both cities, magnifying these in a discourse where he makes evident that you cannot divide two peoples that are twinned by their culture, their common history and personal and family relationships with a wall[3] or borderline. According to the artist, the project seeks to draw attention to the coexistence and interdependence of sister cities that make up one of the longest binational metropolitan areas in the Western Hemisphere (Lozano-Hemmer, 2019).

Another work that falls into the political category is Rafael Lozano-Hemmer's piece known as *Los 43 de Ayotzinapa*, although the precise title is Nivel de confianza (2015). This artwork recalls the mass kidnapping and murder of 43 students from the Ayotzinapa Normal School in the city of Iguala, Guerrero state, Mexico in 2014. The artist said in this regard, that the project consists of a facial recognition camera programmed to see the faces of the missing students, when the user is placed in front of the camera, the system uses algorithms to find which face of the 43 students most resembles the user and provides a level of confidence on how accurate the percentage is in the resemblance to the student. The work makes use of biometric surveillance algorithms (Eigen, Fisher and LBPH) used in police and military forces to recognize suspicious individuals. In this project, Lozano reverses the use of this technology to instead identify victims. The piece always fails to find the perfect match, because the artist includes the assumption that the 43 students were killed and burned in a massacre where the government, police and drug cartels were involved. Either way, the commemorative side of the project is to be found in the relentless search for the students and the superimposition of their photographs on the facial features of the audience (Lozano-Hemmer, 2015). I personally saw this work in a gallery in the central building at the University of Guanajuato during the Cervantino Festival in 2019. Without a doubt, the emotions that envelop the work are sadness, anger, and resentment. Currently, the most plausible

[3] Former U.S. President Donald Trump had begun to build a high border wall, which according to his idea would go from side to side of one of the largest borders in the world, the U.S.-Mexico border.

theory about what happened was that the students hijacked two buses (a years-old custom of the students to travel to demonstrations, in this case on September 26, they were heading to the October 2 demonstrations in Mexico City) when they were violently detained by the aforementioned groups, plus the military, who were in the pay of the drug cartel in the area, because those buses were transporting million-dollar loads of drugs headed for the United States.

El_autentico_chilango (2000) by Arcangel Constantini, is a Net.art development that forms part of a larger project titled *Unos unos unos y unos ceros,*[4] which consists of several web pages on which predominate elements that are constants in the work of Arcangel Constantini, such as machines and obsolete technology, numbers, ancient illustrations, items that represent the past and present of Mexico, such as the *Ambystoma mexicanum* or axolotl. All the pages of the project can be interacted with through clicking, dragging and the user's search for hyperlinks within the screen.

In the case of *El_autentico_chilango,* the central element is the axolotl, an amphibian endemic to central Mexico, with mythical status in the Aztec culture where it was a twin god of Quetzalcoatl or Feathered Serpent, and was believed to take advantage of its powers of transformation to escape death. The artist took photographic and video shots of people in the Mexico City subway system observing this rare amphibian inside a fish tank. The symbolic relationship between the two (the observer and the axolotl) leads to several reflections by analogy: the "Chilango",[5] is strange, little understood, with a great capacity to adapt to adverse conditions, characteristics also of the axolotl, which unlike the former is in danger of extinction.

Also worthy of consideration in this category of works with political interests are "Anima, 3:00 am" (2002) by Arcangel Constantini; "Emperadores Desplazados" (1997) by Rafael Lozano-Hemmer; "Escrituras" (2008) by Gilberto Esparza; "Arma Sonora Telemática" (2013) by Astrovandalistas and Leslie García.

[4] Archangel Constantini. http://www.unosunosyunosceros.com/. Accessed on January 5, 2021.

[5] The inhabitants of Mexico City are sometimes referred to in this derogatory way.

Environmental expression

Several Mexican electronic artists are deeply committed to improving the environment, an understandable situation due to multiple factors, including Mexico's extraordinary biodiversity and the lack of emphasis on environmental education in our country. Therefore, pieces that address issues such as pollution, bioremediation, garbage, repurposing of obsolete technology, or devices that interact with marine life or plants are recurrent. According to what artists have observed, these works can arouse astonishment, as well as concern and, in some people, awareness of the great environmental problems not only in Mexico, but also in Latin America and the world.

One of the examples in this category is Pulsu(m) Plantae (2014) by Leslie García, a work that analyzes the possible means of interaction between plants and their biological processes to communicate, which are invisible to humans. The artwork consists of sound prostheses based on biofeedback, a technique that records the physiological functions of plants and instruments in order to collect information about them (García, 2014). The prostheses translate this data into sounds as if the plant had a voice, so that if the audience touches the plant, speaks or places light nearby, they will get a sound in return. The emotions in the participants of the play when they see the reactions of the plants to the stimuli are surprise and awareness of the existence of other living beings.

In the case of Plantas Nomadas (2014) by Gilberto Esparza, it reflects his concern for the environmental impact generated by human beings. The excessive exploitation of natural resources, the resistance to the use of renewable energies, and the lack of awareness about finding more empathetic ways to coexist with nature are reflections which this artistic development invites. In the artist's words, technology has a vast potential to make significant transformations and achieve the goal of reversing the harmful effects on the environment. "Nomadic Plants" is a living organism with a robotic system, several species of living plants, a set of microbial and photovoltaic fuel cells. The work addresses the union of different forms of intelligence that constitute a more robust species, with the potential to restore damage

to the environment on a small scale. This robot takes polluted water and processes it into fuel through a colony of bacteria native to that water which feeds itself by transforming the nutrients into electricity, which it then stores in its harvesting system. This biodegradation process improves the quality of the water, which is then provided to the plants, which in turn produce electricity in their metabolism. The release of oxygen is a remnant of this energy process. Hence, not only does the species adapt to the modified environment inside the robot, but it also restores the energy available in the soil (Esparza, 2013). The artist started up the robot "Plantas Nomadas" in El Río Lerma in Salamanca, Mexico, where the inhabitants[6] approached to see it working with amazement and curiosity, because of this, the artist had the opportunity to talk to the community about the possibility that technology has of restoring a polluted environment. In an interview for this research, Gilberto Esparza commented that this is one of his purposes: to do community work to raise awareness.

Another work in the category of environmentalist pieces is Gilberto Esparza's Auto-photosynthetic Plants (2013), this artistic development uses microbial fuel cells to create energy and sound from contaminated water samples collected from urban spaces. The artist created a symphony using microscopic bacteria as an orchestra (UQAM, 2017). Through the work, Esparza seeks to raise awareness about the highly polluted water in cities generated by human activity and its terrible consequences for the environment. It is important to mention that the play has plants that transform polluted water into energy that allows them to survive.

Another work especially focused on arousing emotions —in this case autobiographical memories— is Leslie García's Memoria Esférica (2019), an art installation that releases scents through edible spheres of wet earth. The work synthesizes the smell of dry earth after a day of rain and a bio-printer makes edible spheres from this phenomenon from the oils (or petricor) that plants release from the soil. The artist says that these spheres melt in the mouth, thereby releasing the smell, which travels from the

[6] Originally it was wealthy families who lived along the riverbanks. Several decades ago, the river began to receive waste from the city's factories and homes, and, incredibly, on several occasions the water has caught fire due to the chemical waste it carries (it is worth mentioning that the city is home to a refinery belonging to Petróleos Mexicanos, PEMEX). Since the river became polluted, only poor people live along its banks.

tongue to the olfactory bulb, and from there to the brain connections strongly linked to memory and emotions. The project has a collection of thousands of testimonials from people sharing the memories that the art project awakened (García, 2014). Leslie García's work was planned to awaken memories, and, according to what has been investigated here, one of the most powerful resources for inducing emotions is through biographical memories.

9. Induction of Emotions in Electronic Art

By now, it is fair to say that enough information and documentation of electronic art developments have been analyzed to infer that Mexican electronic artists and their works induce different emotions through their work. Further, creating a model for the production of an emotion can be of value to both beginners and experienced artists who wish to experiment with obtaining specific ranges of emotions, whether positive or negative. Therefore, a model has been created to induce emotions in electronic art developments. There follows a review connecting the field of electronic art with different approaches to emotion assessment and which will contribute to the field of study. At the same time, we will develop some ideas about emotion induction methods based on research by various authors.

For Seyedeh Maryam Fakhrhosseini and Myounghoon Jeon (2017) of Michigan Technological University, imagination; movies, sound and music, images, reading and writing passages, personalization or embodiment, as experienced in Virtual Reality, feedback, self-referential statements, social interaction, psychological manipulation, motivation to perform specific tasks, combined techniques, ways of inducing emotions, sound, music, images, reading, writing, among others, are among the most powerful ways of inducing emotions, along with autobiographical memories (Fakhrhosseini and Myounghoon, 2017, pp. 236-250).

It is necessary to point out that there are several examples of the use of autobiographical memories in electronic art, such as the work "Voz Alta"

by Rafael Lozano-Hemmer, where neighbors of the Plaza de las Tres Culturas in Tlatelolco, Mexico City, remember the students of the 1968 massacre, as described above. It is also the case of the artist Monica Mayer and the "Clothesline" (1978-to date), a feminist artwork, which although it was not electronic at the beginning, has gone through several versions and we do not rule out that some have already been electronic[1]. In this work, women come and go, pegging to clotheslines testimonies about sexual abuse and harassment they have suffered throughout their lives. The work continues to feed and build each time it is presented from the same social problem, which is years old and seems eternal.

On the other hand, historically, art has been made primarily with images. For Fakhrhosseini and Myounghoon (2017), in everyday life people seek evocative imagery in magazines, on the internet, and in various forms of social networks. Although images are unimodal visual stimuli, they can express and evoke emotions (2017, p. 242). The authors mentioned there are researchers who use images to induce emotions, and one of the most commonly used tools is the *International Affective Picture System* with its more than one thousand systematized images. In electronic art, artists make use of images, often accompanied by movement, interaction, or projection in specific spaces. Rafael Lozano-Hemmer uses this resource in the work "Nivel de Confianza" (2015) using black and white photos of the 43 students of Ayotzinapa.[2] The photos used are those that are required in public schools and are common in Mexico (front face, 2.5 × 3 cm, white background, etc.).

Another technique to induce emotions for Fakhrhosseini and Myounghoon (2017) is embodiment. The concept is related to the theory of William James, who suggested that the experience of physiological changes directs feelings and emotions (2017, p. 245). In many electronic art works participants are asked to be mobile, they can adopt different body postures, gesticulate or speak. An example of embodiment, is Rafael Lozano-Hemmer's "Body Movies", which consists of an interactive projection where hundreds of photographic portraits (taken of people in the streets where the project

[1] Mónica Mayer is a precursor in Mexico of art with the use of technology with works of Copy Art, project "Mímesis" (1991) (Mayer, 2021, p. 388).

[2] Ayotzinapa is a Mexican town with significant production of poppy, a plant that drug traffickers use as a precursor to make some drugs. As of July 2021 the crime remains unsolved.

is presented), are projected and automatically controlled by robots; The portraits appear projected inside the shadows of people passing in front of the wall of the art installation, in such a way that many passers-by seeing the projection of their shadow on the wall on a large scale, start to move more, raising their arms, shaking their body, dancing, stretching in front of the projectors, because this allows them to see the projection of their shadow in movement, and simultaneously to see the portraits of other people inside their own shadow.

Virtual Reality is another technique to induce or arouse emotions "… [I]t has been demonstrated that a computer can replicate the environment, real or imaginary, in such a way that allows the user to interact with it. With virtual realities, participants can artificially experience some situations, just as if they were interacting with real-world people, objects, scenes and events" (Fakhrhosseini and Myounghoon, 2017, p. 246). Virtual Reality opens the possibility for artists and scientists to create real or imaginary environments, something which is being successfully used in the treatment of phobias. In the case at hand, a Virtual Reality work that exemplifies this is "Kauyumari, the blue deer" (2016) by Mexican artist Arnold Abadie, which won the "Eco Film Festival" in 2013. Abadie then decided to make a VR version. The short film shows a Huichol god[3] who guides his people during a pilgrimage through the desert to recognize the mysteries of existence and the balance of the environment on the planet.

Added to this, there are researchers such as Roy Ascott,[4] who has studied the phenomenon of transiting through real and virtual worlds. According to Ascott, in post-biological terms, this situation is a reflection of the human being's ability to move easily through cyberspace while being at the same time within the structures of the material world. He he came to these conclusions after having experimented in laboratories with advanced virtual reality systems and powerful simulation systems, as well as participating in spiritual reality with an indigenous tribe in Mato Grosso, Brazil, with states induced by a plant known as ayahuasca[5] (Ascott, 1997-2002).

[3] Majority ethnic group in the state of Nayarit, Mexico.

[4] British artist and theorist working with cybernetics and telematics; his work focuses on the impact of digital and telecommunication networks on consciousness. He is honorary editor of *Leonardo* magazine.

[5] Ayahuasca is the potion par excellence of the Amazonian world and a link between various cultures that have in common the individual or group consumption of ayahuasca for various purposes, ranging from heal-

On the other hand, films are another resource that is very familiar to us. They integrate image, sound and movement, a hence represent a very complete to emotion generating experience. They create the possibility for viewers to identify themselves and create their own experiences along with the characters. For Fakhrhosseini and Myounghoon, through film, the audience "lives" emotional situations as if they were experiencing them in real life, so much so that they consider film to be one of the most important techniques for inducing emotions (2007, pp. 236-239). Researchers J. J. Gross and R.W. Levenson (1995), in their text *Emotion Elicitation Using Films,* summarize five years of research developing a valid archive of films that reliably induce each of the following emotions: fun, anger, joy, disgust, fear, neutral, sadness and surprise. They list 250 films tested on a sample of 494 participants, including a Japanese group, with success. Some of the emotions mentioned and the movies that triggered them are: fun —"When Harry Met Sally", "The Curse of Mr. Bean"; anger —"Cry Freedom", "My Bodyguard", "Schindler's List"; disgust —"Pink Flamingos", "Saving Private Ryan", "Joan of Arc"; fear —"The Shining", "Silence of The Lambs", "The Blair Witch Project", "Monster", "Kill Bill II"; happiness —"Sister Act", "Dances with Wolves", "Big Fish"; neutral —"Weather News", "Abstract Shapes"; sadness —"The Champ", "The Bear", "Bambi", "Philadelphia"; surprise —"Sea of Love", "Capricorn One" (Fakhrhosseini and Myounghoon, 2007, pp. 237-239).

In addition to the above, there is another way to classify the emotions that are provoked in a given work. For Jonathan Frome, cinema and literature, that is, all narrative art, can generate *narrative emotions*, which are the emotions that are most commonly induced when a viewer establishes a connection with a work of art (2007, p. 832). It is important to highlight that electronic art goes beyond narrative; that is, many electronic artistic developments do not have a linear narrative with a beginning, a develop-

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ing to what has a spiritual character or personal and therapeutic revelation, it is the most powerful relaxant on the planet patented in the USA as an antidepressant. […] Ayahuasca is known as ayahuasca to various entheogenic beverages resulting from the decoctions of multiple plants. The basic component is a decoction of the liana *Banisteriopsis caapi,* whose property is its content of monoamine oxidase inhibitors, known as (IMAOs). It is mixed with the leaves of shrubs of the *Psychotria* genus, for its content of dimethyltryptamine (DMT) which is a neurotransmitter produced by our brain naturally. Dimethyltryptamine has psychotropic effects. Ayahuasca. www.ayahuasca.com.pe. Accessed on June 20, 2014.

ment and an end —like the narratives inherited from Ancient Greece, but can instead be appreciated in a non-linear way.

For Frome (2007), another category of emotions is the *artifact emotion,* which is that generated by the human being's own response to the work in an artifact or art object. More often than not, an artwork elicits an emotional response, whether positive or negative. The artifact emotion is about the work of art being a work of art, it is about how an artwork represents its content, in other words, artifact emotions are an emotion of aesthetic evaluation. Frome believes that while there is a tendency to think of artifact emotions as artistic judgments or preferences that do not have the same intensity as other types of emotions, they are emotions nonetheless. Aesthetic evaluations can cause frustration, astonishment, surprise, among others, in the same way that narrative can arouse emotions (Frome, 2007, p. 833). Examples of the above are color, textures, shapes and images in electronic art developments that can arouse awe.

The final type of emotions for Frome are ecological emotions, which are generated when a participant responds to a stimulus. The author focuses on video games, where the emotions coincide with those in the field of electronic art, specifically in interactive installation developments. Frome considers that, "whereas an artifactual emotion responds to a video game at the representational level, an ecological emotion responds to what a video game represents, and responds to it as if it were real." (2007, p. 833). In electronic art, this is experienced in immersive and interactive works that use technological resources such as Virtual Reality, Augmented Reality, among others.

The following table details some forms of access to emotions related to electronic art works or developments.

10. Model for the Induction of Emotions

Theme of the work	*Emotion induction method*	*Type of interaction*	*Electronic art development*
a) Policy b) Environmentalism	a) Personalization (incarnation) / Ecological emotion b) Virtual Reality / Ecological emotion	Use of special devices, such as Virtual Reality glasses, tablets, joysticks, keyboards, microphones, apps, cell phones, among others.	a) "Escrituras" (2008), by Gilberto Esparza. b) "Kauyumari, The Blue Deer" (2013), by Arnold Abadie.
a) Environmentalism b) Policy c) Policy	a) Personalization (embodiment) / Ecological emotion b) Personalization (incarnation) / Ecological emotion c) Images / Ecological emotion	Performing body movements, facial gesticulation or particular actions.	a) "Tornado de Vortices Múltiples" (2013), by Ivan Abreu. b) "Body movies" (2001), by Rafael Lozano-Hemmer. c) "Level of Confidence" (2015), by Rafael Lozano-Hemmer.

a) Soundscape b) Soundscape c) Policy	a) Personalization (embodiment) / Ecological emotion b) Personalization (incarnation) / Ecological emotion c) Autobiographical recollection / Narrative / Ecological emotion	Speaking privately or through special devices.	a) "Matriz de Voz" (2011), by Rafael Lozano-Hemmer. b) "Less than three" (2008), by Rafael Lozano-Hemmer. c) "Voz Alta" (2008), by Rafael Lozano-Hemmer.
a) Environmentalism b) Policy	a, b, c) Emotion artifact / Ecological emotion	Clicking on a keyboard.	a) Net Art: "Bakterias" (1996-to date), by Arcangel Constantini. c) "Unos unos unos y unos ceros" (2002), by Arcangel Constantini.
Soundscape	Customization (incarnation)	Wearing special clothing.	- "Usable Soundscape 2.0" (2014), by Amor Muñoz.
Policy	Ecological emotion	Interacting in social networks.	- Arma Sonora Telematics" of Leslie Garcia.
Environmentalism	Customization (incarnation)	Touching another living being.	- "Pulsu(m) Plantae" (2009-2012). by Leslie Garcia.
Soundscape	Ecological emotion	Making music.	- "Meridian" (2012), by Ivan Abreu.
Environmentalism	Ecological emotion	Eating	- "Spherical Memory" (2019), by Leslie Garcia and Interespecifics.

Personal memories	Cinema / Narrative emotion / Images / Autobiographical recollection	Clicking on a CD ROM	- "I photograph to remember" (1990), by Pedro Meyer.
Policy	Emotion artifact	Reading	- "Étude taxonomique-comparative entre les castes de la Nouvelle Espagne et celles du Mexique Contemporain" (*2012), by* Erick Meyenberg.

Conclusions

The processes of creation are often hidden within a halo of mystery. The investigation of these processes contributes to increasing the knowledge of the field, so that in this way it is feasible to create a methodology of Mexican electronic art.

Thus we conclude that there are no studies with the characteristics shown here, where part of the findings have been that Mexican electronic artists do not work only in electronic art, and that some of them even describe themselves as contemporary artists with electronic works.

In relation to the context, Mexican electronic artists grow up in certain circumstances that link them to science and technology, either through their families or close friends who introduce them to the field of electronic and digital art. While artists living in Mexico begin their artistic production in austere conditions and with very limited resources, over the years they receive government support and scholarships.

It can be inferred that there is a relationship between the background of electronic art and its current manifestations, due in part to the fact that Mexicans are citizens with diverse political stances, so the intention of improving the economic, political, social and environmental environment is present in electronic works.

It is possible to conclude that in the processes of creation, in the search phase artistic interests are related to deep reflections and even concerns, in such a way that the gestation and discovery emerge surrounded by multiple

interests. This makes the evaluation phase more complex because the problem is not to generate ideas, but to choose the best, the most original and novel, but also those that are possible to implement, so that it is feasible to carry out the exchange phase successfully. On the other hand, the participation phase is the key phase for connecting the creation process with the emotions of the public. It refers to the participation of the public —before only expectant now participants in the work. It is the people who attend to perceive, sometimes with all their senses, the development of a work, who give it different appearances and endings. Multiple electronic art projects have been created so that each interaction with the public derives into a different response from the work.

The development of knowledge about emotional content and its valuation is a new topic of study in Mexican electronic art. The influence of national electronic artists can be expanded if the theory and concepts of behavioral sciences are implemented or applied.

It is possible for artists and art students to plan an artistic development taking into account the range of emotions they wish to induce. This does not mean that they are not currently doing this, it means that the result could be consciously planned and perhaps more precise. We consider that, in national electronic art, it is necessary to develop methods for the induction of emotions because our environmental, economic, social and political situation requires it. Mexican society as a whole needs more artists with some influence that can contribute to effecting changes in aspects such as those mentioned above and Mexican electronic artists have proven to have an enormous interest in having a more evolved and proactive social stance; this has been confirmed by the interviews and analyses of works presented here.

We have seen that emotions are vastly varied and depend on a social and cultural context, and that scientists have done a significant amount of research linked to emotions and human behavior. In this article, our efforts have focused on that research through which links can be made to Mexican electronic art, where the connection between this field and the behavioral sciences are the new topic of study.

Added to this, electronic art developments involve different forms of interaction. Many of the artists considered believe that the public finishes

their work, and that each person gives a different ending to each work. Interaction makes this possible because the public is asked to use a particular device, make certain body movements, speak softly or shout, click on a keyboard, wear special clothing, write or post on social networks, and so on. That is why electronic art is an extraordinary medium for reflecting and inviting new ways of thinking and acting.

The model for inducing emotions that we have created in the Table "Induction and Emotion" begins by analyzing methods for inducing emotions in electronic art developments that use a particular form to communicate their artistic statements or stances. In the same way, we have seen different research that examines the topic through autobiographical memories, images, personalization or embodiment, Virtual Reality, cinema and narrative, artifacts and ecological emotions.

Finally, more research needs to be done in both fields of study to develop, for example, a database in which it would be possible to detect specific emotions generated by a particular electronic artwork. The effort is well worth it, because there are sources of information of great importance in behavioral science research waiting to be explored which are useful to develop the field of Mexican electronic art and its society.

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The Aesthetics of Sensations in Mexican Electronic Art addresses the study of the origins of electronic art in Mexico, the differences between contemporary art, electronic art, and digital art. It takes a turn to dwell on the analysis of the fundamentals in the processes of creation with a focus on the processes of Mexican electronic artists. It also studies the role of the interaction of the public in the artistic works of electronic art and how, due to the interaction, it is possible to induce a certain range of emotions in the user. In such a way that it becomes necessary to establish thematic categories in Mexican electronic art and its works, due to the existence of an interrelation between emotions and interaction. Therefore, we have created a model for the induction of emotions to contribute to the understanding of this branch of contemporary art and its didactics, both inside and outside educational institutions. *The Aesthetics of Sensations in Mexican Electronic Art* is a book for art lovers, as well as for novice and experienced artists who wish to implement conscious strategies in their artistic production processes.

The Aesthetics of Sensations in Mexican Electronic Art is the author's ninth book on creation processes focused on electronic art, digital art and design.

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