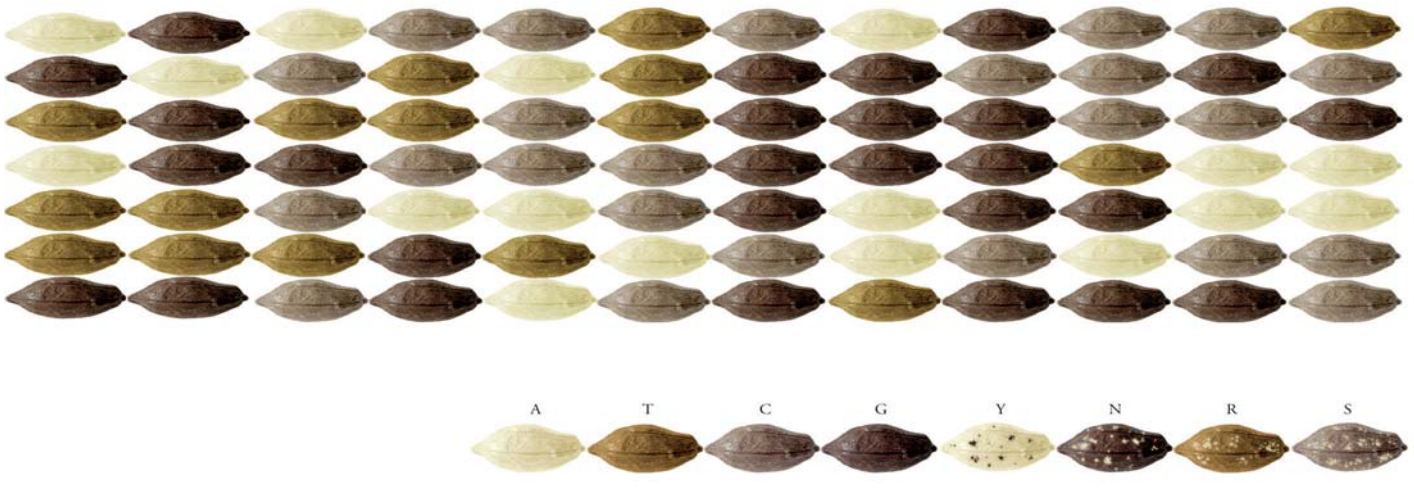
NELA OCHOA



GENETIC PORTRAITS

APRIL 17 - SEPTEMBER 6, 2009

THE PATRICIA & PHILLIP FROST ART MUSEUM
FLORIDA INTERNATIONAL UNIVERSITY

The human body is the main focus of my work, expressed in different ways that go from performance to visual arts. I integrate medical images into videos, paintings and installations.

Since 1994, I have been working with chromosomes and genetic sequences, as well as my own DNA, trying to add cultural meaning to nature.

Nela Ochoa

NELA OCHOA

GENETIC PORTRAITS

Director's Foreword

The first time I saw the work of Nela Ochoa, in 2005, I thought it was a beautiful and obsessively created wall installation made of paper flowers. When I realized that the colors and arrangements of the hundreds of flowers had meaning related to DNA sequences, I was immediately intrigued, and have remained fascinated by her work ever since. I have come to understand, from an art historian's perspective, not that of a scientist, the beauty intrinsic in nature and the complexity that makes up the human body and plant life, both of which share DNA's codes and profound structures as the very basis of their existence.

As Nela Ochoa transforms the arrangement of the genetic code into an artistic symbol, art and science (the title of Curator Julia P. Herzberg's essay) truly meet in provocative works that explore the mysteries of life. I am indebted to Nela Ochoa and Julia Herzberg for creating this exhibition for the Frost Art Museum and for the collaboration and technical expertise of FIU Medical School faculty Dr. Joe Leigh Simpson and Dr. Rene Herrera. I see this as an opportunity for a university art museum to bring art, science, medicine and research together in a multi-disciplinary forum for intellectual discourse.

Carol Damian, Ph.D.

Director and Chief Curator

Profile of Nela Ochoa

Elisa Turner

As a gifted young dancer in Paris in the early 1980s, Venezuela-born artist Nela Ochoa was already ahead of the curve. "Since I was a little girl I managed to study dance, ballet, tap, and painting at the same time. It was a natural thing for me to have an interest in these two disciplines," she says.

Ochoa explains this during an interview in Miami in March 2008, conducted while she was in town for the Latin American art fair *arteaméricas*. It is clear this adventurous woman still looks ahead. Prolific and internationally known, she has made her mark as a dancer, choreographer, video artist, performance artist, and sculptor, intrigued by the way new creative pathways reveal themselves when artists interweave disciplines. Numerous institutions collect her work, including museums in Venezuela and the Miami Art Museum

She ignored the advice of a young curator in Venezuela in the late 1980s. He said she was risking her career by mixing disciplines. Much later, he admitted his mistake. She recalled he exclaimed that "thank God you didn't listen to me!"

Some of the best artists and choreographers of their era have melded art and dance. Artist Robert Rauschenberg worked with choreographers Merce Cunningham and Trisha Brown, Alex Katz with choreographer Paul Taylor, and collaborations between Martha Graham and sculptor Isamu Noguchi are legend.

Why mix art with dance? As a dancer, Ochoa recalls, "my main focus was the gesture." In Paris she read work by noted 19th-century French philosopher François Delsarte, who believes people's gestures contain psychological cues. "He has a whole philosophy of how the soul is connected to the gesture, and the gesture is before the word," she says. "Sometimes people are telling you something but their gesture is saying another thing. There is that subtle thing that lies inside."

Searching to give shape to that "subtle thing that lies inside" led Ochoa to create distinctive art from X-rays and

MRI's. Now artistic curiosity has led her, she adds, "further inside."

Currently Ochoa is fascinated by genetic codes, vital visual designs of life marking the double helix structure of DNA. It is another ground-breaking chapter in the career of this persistent artist. In the 1990s she began exploring patterns in the biological building blocks of life, using research on the Internet to learn about DNA in species of plants and animals.

Through this process, she has created artworks echoing life-defining patterns in ways surely no scientist ever imagined. She has fashioned DNA-inspired art from such diverse materials as spooky plastic fingers manufactured for Halloween costumes and tiny silk roses mounted on perforated aluminum panels. Recently she worked with plastic baseball bats encased in brilliant shades of blue and fuchsia Lycra, which briefly recalled dancers' legs wearing colorful tights.

A veritable chorus line of baseball bats danced through grassy lawns of the Miami Beach Botanical Gardens in March 2008 for Ochoa's engaging outdoor exhibit "Gene Garden." Inspired by genes of endangered plants, this was her first exhibit in a botanical garden. It was a short walk from the art fair *arteaméricas* and the focus of a thoughtful panel at the fair, "Art and Science: How Genetics and Art Intersect. Nela Ochoa's Gene Garden Case."

Displaying an intricately-executed design and exuberant sense of color, "Gene Garden" was enriched by Ochoa's flair for performance art. Elements of her striking installation swayed in Miami's breezy springtime. She produces artwork that intends to makes a point, as she explains, "about science, art, and genetics that's completely new."

Her work, she reflects, may stem from art by Jesús Soto and others she saw growing up in Venezuela. Then and now, the sense of color and repeating forms are constants. "Maybe this is a natural evolution of Venezuelan contemporary art. They didn't work with science directly, but they worked with math." After a pause, she laughs. "Certainly genes are somehow mathematical."

Elisa Turner, M.A.

Art Critic

Art and Science at the Crossroads

Julia P. Herzberg

"As scientists try to solve the mysteries of DNA, artists contemplate them."[1]

Nela Ochoa's work focuses on the human body, both its visible as well as invisible aspects. The artist's interdisciplinary practice has evolved from the early 1980s in dance, video, performance, painting, sculpture, and installation. Since early 2000 the artist has worked with genes and chromosomes, creating a very significant body of two- and three-dimensional work informed by the DNA in human and, more recently, plant life.[2] Ochoa has focused on human genes associated with various diseases and those related to fear, violence, and gambling, and has investigated the genetic makeup of flowers and plants. The life-affirming power of art and science meets at the crossroads of Ochoa's art.

In considering the multiple explorations Ochoa (b. 1953, Venezuela) has pursued leading to her inventive imagery representing genetic sequences, we begin in Paris in 1981. That year the young artist left Caracas to study contemporary dance at the academy Rencontres Internationales de Danse Contemporaine.[3] There in the adopted city of many international artists, Ochoa, together with a fellow dancer, choreographed and danced in *Del porte de niños* in 1985 at the Premontres Festival of Contemporary Dance near Nancy.[4] That same year she co-directed her first video with Gustavo Morales. In addition to working with the body as a vehicle of movement in dance and video, Ochoa continued painting as a gestural intervention on X-rays of the human anatomy.

After returning to Caracas in 1985 Ochoa continued working in diverse

mediums, some of which included installations. By the end of the 1980s and the beginning of the 1990s, she was exhibiting in international group shows and receiving important awards for choreography and video in Venezuela. Subsequently Ochoa's work in dance shifted to performance and actions; her interdisciplinary work drew its subject matter from everyday life. While developing her practice in the 1990s, she became interested in the subject of DNA, an interest that led to a slow, but committed study of genes and chromosomes.[5] She has evolved a brilliantly novel aesthetic to refer to our invisible genetic makeup.

Ochoa's innovative sculptural objects represent genetic codes and mutations by selecting four colors to stand for the four nucleotides—A, C, G, and T—adenine, cytosine, guanine, and thymine in the DNA molecule. Through a precise arrangement of materials and forms, the artist combines certain colors with others to represent the way nucleotides bond or pair with each other on opposite strands of the DNA double helix: A with T and C with G. Genes, which determine all the heredity information, are made up of specific sequences of nucleotides. (See Dr. Joe Leigh Simpson's essay for a more detailed scientific discussion of DNA.)

BRCA 2 (Plate 5) of 2001 was her first artwork based on a genetic sequence of the breast cancer gene, BRCA2. The artist's specific interest in cancer genes was triggered as she read newspaper articles describing recent discoveries of BRCA1 and BRCA2. These two cancer genes were of particular importance because Ochoa's maternal aunts had been afflicted by breast cancer; in reading about them, the artist hoped to learn something about her risk for developing the disease. Scientists have begun to isolate genes responsible for hereditary breast cancer only fairly recently. In 1994 the gene named BRCA1 was identified. An altered BRCA1 has been linked to increased risk for the development of breast and ovarian cancer. Similarly, the following year BRCA2 was found, and it appears to account for as many cases of breast cancer as does BRCA1. With a better understanding of these two gene mutations, but still uncertain as to whether they will affect her chances for developing cancer, she configured a wall sculpture out of 4,290 plastic brassiere hooks, snapped in half and arranged in thirty-seven horizontal rows across the surface. Each half hook represents one of the four nucleotides—A, T, C, and G—the specific sequence of the BRCA2 gene in a double helix. At the end of the last row, the artist wrote the letters in four colors, so if the viewer were so inclined, he/she could imaginatively reconstruct the gene sequence through the alternating color patterns—and perhaps contemplate the rapid multiplication of cells that characterize the disease. Thus A is light

1.
Tóxica / Toxic (det.), 2004
Plastic fingers with glow lights, nail polish, tape, and nylon
51 1/4 x 10 1/4 in. (130 x 26 cm)
Installation view, Galeriá Sextante, Bogotá
Photographer Fernando Cruz

yellow, T, tan, C, light pink, and G, flesh.

The choice of material—half of a brassiere hook—cleverly refers to the specific undergarment worn by women to support their breasts. Rather than specifically rendering a realistic image of a breast or even a brassiere, Ochoa chose a hook as a metonym for breast cancer, which affects more than 192,000 American women each year.[6] Although BRCA2 can also cause breast and prostrate cancer in men (among other cancers in both sexes), the artist was evidently not addressing those other malignancies in her wall sculpture. The light yellow, tan, light pink, and flesh-colored brassiere hooks, purchased from a store in Caracas, gender the disease "woman."

This visually engaging gene portrait reveals the artist's deftness in creating an abstract work comprised of circles and rectangles to suggest the microscopic sequencing of the DNA of the BRCA2 gene. A fragment of BRCA2 is acagctgccc caaagtgtaa. In further considering the hook motif, we might wonder which hooks in a brassiere would help support a breast with a BRCA gene? Which would help support a breast that would develop breast cancer? What would be the outcome of the diagnosis and treatment for that breast?

Tóxica (*Toxic*), another provocative work, refers to a mutated gene of keratin 14 that has affected Chinese factory workers who have been exposed to mustard gas.[7] (Figure 1) The resulting deformity grossly affects the appearance of one's fingernails. To intimate this kind of epidermal disease, Ochoa configured a sculpture made of sixty-six plastic fingernails painted four colors—light green for A, dark green for T, pink for C, and red for G, thereby representing the nucleotides. The spiraling structure of *Toxic* resembles the image of the double helix. When exposed to a substance such as mustard gas, these nucleotides and their bonds are broken and damaged, causing, in the case of Chinese factory workers, finger blisters and deformations. Similar to *BRCA 2*, the artist used everyday objects, in this case day-glow plastic fingernails. She painted them with different color nail polish and then assembled them according to a color formation that represents the sequence of the A and T, and the C and G in this fragment of keratin 14.

Such an intriguing sculpture raises many questions. Are there other genes that have not yet been identified that are altered by mustard gas, and if so in what manner would they manifest themselves? Would the person develop cancer or have other physical abnormalities?

The botanical name for the cacao tree used for making chocolate is *Theobroma cacao*, which, when translated, means "food of the gods."[8] Why would Ochoa have been interested in cacao trees or beans or chocolate as points of departure for two captivating works? A plausible answer is that

Venezuela has long been known for growing some of the highest-quality cacao beans in the world. (Figure 2) For example, in Chuao, a tropical area near Caracas that the artist knows, the cacao growers use a special label, as in wine, "appellation contrôlée" to signify that the cacao from there is the best in the world.[9] Cacao (cocoa in English) is part of Venezuelan botanical and commercial history, and its citizens have long enjoyed the complex, rich flavor of chocolate as well as many other products for which cacao is used. They no doubt appreciate the fact that Venezuela was the first country to provide the beans to the European cacao market. Given the artist's fascination with the genetic makeup of human and botanical life, it follows that she would be curious about the gene sequence of a cacao bean. After her usual investigations, she bought some chocolate candy in the shape of *criollo* (creole) cacao pods from a candy store (*bonbonería*). She photographed a piece of the chocolate and repeated that image in Photoshop sixty times in twenty-nine rows as seen in the Giclée print *Theobroma cacao*. (Plate 1) She selected different colors to achieve the eight different tonalities of chocolate, each of which denotes the A, T, C, and G as well as the letters Y, N, R, and S, letters that represent combinations of A, T, C, and G. Ochoa used Y which stands for C or T; R for A or G; S, for C or G; N, for anyone of A, C, T, or G nucleotides.[10] The sequence that Ochoa used is from a gene called Theobroma Cacao 18S ribosomal RNA, which botanists use to determine the evolutionary history of plant species. The imagery in *Theobroma cacao* becomes a portrait of the nucleotides—the first sixty are: tcatatgctt gtctcaaaga ttaagccatg catgtgtaag tatgaactaa ttcagactgt.

In a subsequent exploration of the same gene sequence, Ochoa did an interactive wall installation titled *Pidiendo cacao / Give Me a Break* of 2004 (not in this exhibition). Briefly described, the artist employed 1,728 pieces of chocolate coins with one of the eight letters of the nucleotides stamped on each candy wrapper. (Figure 3) In this interactive piece, the viewer is invited to remove a chocolate coin, and, if so desired, eat it. After removing the coin, the viewer is asked to stamp the letter from the candy wrapper onto the wall where the coin was removed. During the exhibition, the stamped letters on the wall serve as a reminder that it is the genetic sequence that determines the size, color, flavor, and texture of a cacao bean.

Ochoa conceived this work during a period of intense political turmoil in Caracas—a time when she, together with thousands of other citizens, took to the streets to protest the Chávez government. As a clever personal response to the unsettling political situation, she exploited a double entendre in the title: the literal meaning, "asking for chocolate," and the idiomatic one, "we're fed up, so give me a break."

2.
Cacao pods
Photographer Antolin Sánchez

3.
Pidiendo cacao / Give Me a Break (det.), 2004
Chocolate coins, rubber stamps, and ink
Interactive wall installation: dimensions variable
Installation view, Galeriá Sextante, Bogotá
Photographer Lucia Pizzani

The artist has created a significant body of work since 1994 dealing with the subject of violence. (*A plomo* of 1994, for example, features a series of X-rays of people with bullets in their bodies.) Ochoa turned again to that subject when she was invited to participate in the Biennale Standard in Tijuana, Mexico in 2004. Each artist was asked to create an artwork in the shape of a banner that would travel to the biennial in a tube. In response to specific terms, Ochoa created *Materia gris incompleta* / *Gray Matter Incomplete*, a beautiful and intricate work that belies the unsettling content motivating its configuration. (Plate 4)

The tapestry-like work, viewed from both sides, is composed of 16 X-shaped bases, each hand-sewn in 45 rows, creating about 720 Xs, from a gene sequence of 2,946 bases. A fragment is aatgtcccga attcccagcc. Ochoa selected red (for A), gray (for C), green (for T), and beige (for G)—artistic prerogative! With the exception of red, the other three colors are military camouflage colors that are used to make military and urban police uniforms in different parts of the world. In her research Ochoa found that the MAPT gene is associated with several different neurodegenerative disorders, some of which can lead to violent behavior or to an antisocial personality disorder.[11] In using the four colors (read, four nucleotides) for the partial sequence of MAPT, the artist used artistic license to indicate a loss of the brain's gray matter associated with generalized violence. In this context, her choice of the letter X is probably intended to denote several meanings. It may refer to the need to X-out the kind of violent behavior inherent to war (note the symbolic use of camouflage for the coloring of the letters). The Xs may also refer to the X chromosomes that females inherit from both parents; and the unknown or as yet unproven associations between the MAPT gene and specific kinds of violence.

For many artists, Nela Ochoa included, the self-portrait continues to serve as a source of insight into oneself. The genre of self-portraiture has been traditionally expressed in drawing, painting, sculpture, and printmaking, but is now explored in all mediums—photography, film, video, and performance art. We may recall Andy Warhol's obsessive exploration of self-portraiture, Vito Acconci's unconventional portrayals of himself in body art, or Eleanor Antin's or Cindy Sherman's self- transformations through varied character appropriations and transgressions.

Ochoa's *Desentierro* / *Unbury* of 2001 / 2009 (Plate 6 and Figure 4) is a self-portrait of her invisible self.[12] The work consists of a series of black ink markers (or bands of DNA) on latex sheets installed in a grid pattern on the wall. Each sheet displays the markers from part of the artist's DNA alongside generic markers from a lab, used for comparison.[13] The resulting

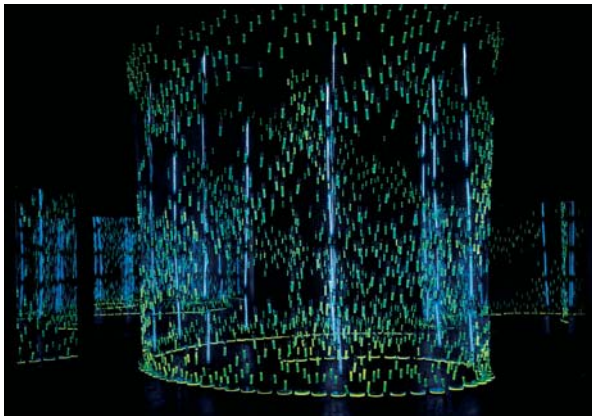
4.
Desentierro / Unbury, 2001 / 2009
Artist's DNA with the generic markers from a lab
Ink, latex, and hooks
17.3 x 11.8 in. approximately (44 x 30 cm)

configurations on each of the thirty or so latex sheets are intended to specify her genetic identity. The asphalt rocks along the floor under *Desentierro / Unbury* are by-products of petroleum, and as such remind us that microscopic plants and animals were slowly converted to oil over millions of years.[14] Considering the juxtaposition of the artist's DNA markers, that are biological as well as metaphorical symbols of the present, with the asphalt, which is a geological symbol of the past, we can only wonder what role DNA might have in scientific investigations or in molecular genetics as each advances.

How did a DNA test wind up as the subject of artwork? The artist went to a DNA testing laboratory where her blood was drawn so that five markers could be identified, then the lab recorded or printed Ochoa's markers on a glass plate, about the size of a legal sheet of paper, together with the generic ones. At this point, the scientific procedure evolved into an artistic one. How did this beguiling but labor-intensive piece wed process and form? Ochoa scanned and amplified the DNA bands from the glass to the computer, printed them on paper, then poured liquid latex on the paper so that the ink was absorbed into the latex. After the latex hardened, the artist removed the paper by softening it with water. In the wall installation, the latex sheets, with their different patterns created by the bands, are visually engaging: scientifically, the markers uniquely identify her—they are her genetic fingerprints.

Many captivating images addressing the subject of DNA in contemporary work come to mind. I mention just two briefly to touch on the inevitably diverse, exploratory contexts. Helga Griffiths's (Germany, b. 1959) multisensory installation, *Identity Analysis* of 2003, is constructed in the form of a spiral, suggestive of the double helix, which consists of four thousand suspended test tubes filled with a fluorescein solution.[15] (Figure 5) The artist's genetic code is contained in the petri dishes placed in a circle on the floor at the base of the installation. Walking through this spiral-shaped coded space, spectators could touch the surface of the test tubes, thus producing vibrating sounds as in a musical composition. Similar to Ochoa, Griffiths also imaged her identity through the markers in the Petri dishes. Michael Najjar's (Germany, b. 1966) *aging box 95 +* is a photograph of an open freezer compartment with boxes with gene samples taken from people who are older than ninety-five. (Figure 6) The freezer, belonging to an institute of molecular biology, conserves the gene samples "for future history when genetic optimization could enable multiple extensions of our life span."[16]

As final thoughts, I would like to underscore the ongoing importance of flowers in Ochoa's work. She created her first small flower works in 2002, elaborating the forms and patterns corresponding to gene sequences.



5.
Helga Griffiths
Identity Analysis, 2003
Iron spiral, net, glass test tubes, natrium fluorescein solution, ultraviolet light, and wire
18 x 13.5 x 16.5 ft. (6 x 4.5 x 5.5 m)
Installation view, Henie Onstad Kunstsenter, Høvikodden, Norway
Courtesy of the artist

6.
Michael Najjar
aging box 95 +, 2007 *(bionic angel* series)
Light-jet print
55 x 78 3/4 in. (140 x 200 cm)
Courtesy of the artist and bitforms gallery, New York

Whether working with roses, poppies, or daisies, the artist connected them to events or sensorial observations in her daily life. More recently, she began working with the genetic sequences of plants, for example, in *De todas maneras rosas / Anyway Rosas* of 2003 (Plate 7), *Bermudana Helix* (Plate 9), *Bucaneer Helix* (Plate 10), and *Fish Tail Palm* (Plate 2), all from 2008. These works exemplify, in varying degrees, the social, political, ecological, and autobiographical contexts that, layered in her work, reveal the breadth of her vision and the length of her inventiveness.

Curiously enough, the work on flowers began during a year of intense political turmoil (as noted earlier in this essay) and deeply felt frustration over the directions in which Hugo Chávez was taking his nation. Ochoa remembers 2002 as much for a prolonged general strike as for the huge political demonstration that took place on April 11 on the Autopista del Este, a major east-west highway in Caracas. (Figure 7) The artist, who had already participated in many smaller demonstrations, marched in this all-day protest among the roughly one million people who demonstrated in an orderly manner and became witnesses to tear gas and bullets.[17] From the time the march ended, Ochoa reflected over and over again on the heightened emotions that she and fellow marchers felt (and continue to feel) during their attempts to resist the increasingly dictatorial initiatives of the government. She also felt an almost uncanny sense of momentary relief at the sight of the infinite abundance of spring flowers throughout the city. She perceived them as a kind of counterpoint, a "consolation" for, the political difficulties of the time.

With flowers in mind, Ochoa began work on small pieces. The following year, however, during a period of ongoing political instability that involved yet another enormous march, she created her first and perhaps most important large-scale floral composition, *De todas maneras rosas / Anyway Roses*.[18]The formal pattern, as well as conceptual model, was based on the genetic sequence of *Rosa gigantea*—a fragment of which is atggaagaat ttcaaggata. For that work, the artist amassed 1,512 silk roses, the number of nucleotide base pairs in the gene sequence, using oranges (for A), yellows (for T), deep pinks (for C), and light pinks (for G). She appropriated the refrain "Rosas, de todas maneras, rosas" from a popular song for the title of her work. Ochoa's optimistic interpretation of that refrain parallels her hope for political change: "It means no matter what happens, there will always be roses."[19]

Ochoa proposed an exhibition of sculpture and installations to the Miami Beach Botanical Garden in which she would express the molecular structure of the DNA of endangered species in Florida. For that work, the

7.
Political demonstration in the form of a protest march on Autopista del Este, Caracas, April 11, 2002
Photographer unknown

artist researched the genes of the Buccaneer Palm and the Bermudana Fan Palm, among others. Through aesthetic configurations, Ochoa's sculptural objects were intended to raise the viewer's awareness of dangers posed by the ecological extinction of botanical species in our environment. The Buccaneer Palm spawned the idea for *Buccaneer Helix,* similarly the Bermudana Fan Palm, the *Bermudana Helix.* Despite the similarity of the names of the species to those of the artworks, the actual installations, as might be expected by now, do not remotely resemble their botanical inspirations.

Ever so audaciously, Ochoa created *Buccaneer Helix* out of 868 plastic baseball bats to form a double helix stretching some fifty-three feet along the ground. Each of the 434 units is constructed by removing the handles so that one bat can fit into the other. The bats are covered with Lycra sleeves in turquoise, black, fuchsia, and cobalt blue—each color symbolizing one of the nucleotides in the sequence. In simulating genetic pairing, the A (royal blue) and T (black) appear 267 times, and the C (turquoise) and G (fuchsia) 167 times. The *Bermudana Helix*, an eight-foot-high sculpture, is also configured as a double helix. Constructed from fifty custom-made, wooden tubular units resembling bats, each side is painted the color that corresponds to the letter it represents. In this work, the A is aqua, the T, lime green, the C, royal blue, and the G, white. A fragment of the gene sequence is aaaatccgtc gactttagaa. During the preparatory process for the work at the Miami Beach Botanical Garden, Ochoa looked in her own backyard for a botanical concept for what became *Fish Tail Palm*. She removed a palm leaf from one of her favorite plants, the Burmese Fishtail Palm, and made a monotype. The three different images were made by using three different parts of the same leaf—the bottom, the middle, and the top. After applying paint on each part, she pressed each one against the canvas, and then stamped a part of the genetic sequence of one gene—gtcttgaaag catcaaagct.[20]

Ochoa's works of art convey their meaning through their materials, colors, and patterns in bold, inventive ways. Half of a brassiere hook referred to the breast cancer gene BRCA2; day-glow plastic fingernails, to an epidermal disease caused by mustard gas; Xs made of military camouflage fabric, to the MAPT gene; and finally, 868 turquoise, black, fuchsia, and cobalt blue baseball bats, to the bonding of base pairs in an endangered Buccaneer Palm. The complex science of molecular genetics has been a rich source from which Ochoa's imagery and ideas spring. Her artistic fortune lies somewhere on the crossroads between art and science.

Julia P. Herzberg, Ph.D.
Curator

[1] Susanne Anker and Dorothy Nelkin, *The Molecular Gaze: Art in the Genetic Age* (Cold Spring Harbor Laboratory Press: Cold Spring Harbor, N.Y., 2004), xv. This book provides an insightful exploration of the growing influence of DNA science on art and artists during the last few decades.

[2] I am indebted to the following people who have discussed DNA with me, and, who in reviewing different parts of my essay, have made valuable contributions: Sawsan Khuri, Ph.D., Assistant Research Professor of Human Genetics, University of Miami; Philip B. Kivitz, M.D., Breast Health Care Specialist, Clinical Professor of Radiology at Stanford University, Stanford; Sharhnaz Kemal, Graduate Student in Cellular, Molecular, and Biophysical Studies, Columbia University, New York.

[3] Ochoa studied graphic arts and design at Instituto de Diseño Neumann and painting and drawing at the Escuela de Artes Cristóbal Roja, both in Caracas, from 1972 to 1977.

[4] Ochoa's co-director and fellow dancer, Valeri Pelegrin, also presented the same dance at the Danae Festival in Poully, France. For Ochoa's work as a choreographer throughout the 1980s and early 1990s, see the biography in *Nela Ochoa: El cuerpo es un altar / The Body Is an Altar Retrospective 1981-2006* (Bogotá: Galería Sextante; Caracas: Galería 39, and Miami, Hardcore Art Contemporary Space), pp. 79-81.

[5] At first the artist began reading about genes and chromosomes in biology books for high school students; she then progressed to more advanced publications in the field of genetics. Eventually, Ochoa became acquainted with the Human Genome Project website, which took her to the comprehensive database of all known genetic information maintained by The National Center for Biotechnology Information (NCBI'S). The NCBI is a national resource for molecular biology information that develops software tools for analyzing genome data and disseminates biomedical information. Ochoa began searching this database through *Entrez*, the geneticists' equivalent of Google, and her creative mind took flight.

[6] According to estimates of lifetime risk, about 13.2 percent (132 out of 1,000 individuals) of women in the general population will develop breast cancer, compared with estimates of 36 to 85 percent (360-850 out of 1,000) of women with an altered BRCA1 or BRCA2. At http://www.cancer.gov/cancertopics/factsheet/risk/brac.

[7] The KRT14 that Ochoa used is the NCBI sequence accession number, BF149105. See Schlager, JJ., Benjamin, H.R., Ali, K., et.al at http://www.ncbi.nlm.nih.gov/.

[8] This name was given by Carl Linnaeus, the father of modern-day taxonomic plant classification, in the mid-1700s. At http:www.amanochocolate.com/articles/theobromacacao.html In Pre-Colonial times, cacao was a commercially traded product.

[9] Email from the artist, January 13, 2009.

[10] These letters are used by geneticists to represent the

possibility that at that position in the sequence of the naturally occurring gene, there may exist one or the other of the four bases. The letters are part of an internationally agreed IUPAC DNA code. I thank Professor Khuri for her explanation.

[11] The MAPT gene stands for homo sapiens microtubule associated protein tau. Ochoa looked at http://www.ncbi.nlm.nih.gov/entrez/viewer.fcgi?db=nuccore&id=27754179 as well as http://www.ncbi.nlm.nih.gov/pubmed/10665614?ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_DiscoveryPanel.Pubmed_RVAbstractPlus.

[12] *Desentierro / Unbury* was originally created for the "IV Biennial Barro de América, Memorial de América Latina" in São Paulo, Brazil in 2001. It was also selected for "Cutting Edge" at ARCO in Madrid in 2002, among other exhibitions.

[13] The DNA lab used generic markers for comparison because when she went for testing Ochoa did not bring samples of her mother's or father's blood, which would have shown a heritable relationship.

[14] I thank the artist for bringing to my attention two opposing theories regarding the origin of oil. One is the "fossil fuel" theory, which the artist learned and to which she refers in *Desentierro / Unbury*. The other, more recent, is the abiotic theory, for which see Jerome Corsi, "How exactly do 'fossils' make 'fuel?'," WorldNetDaily, January, 26, 2009, at http://www.worldnetdaily.com/news/article.asp?ARTICLE_ID=47448.

[15] Fluorescein, used in both scientific and medical research, has a greenish glow when irradiated with ultraviolet light.

[16] Martin Schulz, "The Future of the Past: Body Technology and Myth in the Work of Michael Najjar," *Michael Najjar: bionic angel 2006 – 2008* (New York: bitforms gallery; and Santander, Spain: Galería Juan Silió, 2008), p. 13. My introduction to the work of these artists was in the 8th and 9th Havana Biennials in 2003 and 2006, respectively. I wrote about their work in two different articles.

[17] The artist communicated the details of this march and subsequent ones in an extensive exchange of emails with the author during January 2008.

[18] I first saw *De todas maneras rosas / Anyway Roses* at the exhibition *Urban Flora*, organized by Henrique Faria, at Red Dot Gallery in New York in summer 2004. That particular wall installation inspired my subsequent engagement with the artist's work.

[19] Ochoa to the author, email December 18, 2008.

[20] For the sixty base pairs, Ochoa consulted http://www.ncbi.nlm.nih.gov/entrez/viewer.fcgi?val=19849089&from=1&to=60&view+gb with parts.

A Short Primer on DNA

Joe Leigh Simpson

Deoxyribose nucleic acid (DNA) is a biological molecule that carries hereditary information. DNA contains the genes whose messages have directed us to develop from a one-cell embryo to a live-born baby and that instruct our body to maintain its function over a lifetime. DNA governs the hereditary information (genome) of humans and all other animals.

Most of us remember the dogma: DNA is transcribed within a cell nucleus into RNA (ribonucleic acid), which passes through ribosomes as its message is translated into protein. It is proteins that actually direct the necessary cellular functions. The region of DNA that codes for a protein is called a gene. Genes can be good, as we hope, and may sometimes be better than just good. It surely helps to have been raised by supportive parents who provide opportunities, but extraordinary musical or athletic ability is doubtless not solely the product of nurture. DNA can undergo changes and, actually, the ability of DNA to change (mutate) is the reason we humans have evolved. Still, perturbations are often less than salutary. Seemingly minute changes may have profound effects, causing serious medical conditions: congenital defects, childhood-onset disorders like cystic fibrosis or muscular dystrophy, adult-onset disorders like cancers or some forms of Alzheimer's disease. Once an esoteric term, DNA has now inculcated itself into literature, art, and cocktail conversation. In the process, interest has evolved from not just what DNA does, but how it looks and how it can be analyzed.

Understanding the chemical structure of DNA is necessary to appreciate Nela Ochoa's work. Briefly, DNA consists of a sugar, a phosphate and an organic base.

1.
Empalago / Excessively Sweet (det.), 2005
Metal spoons, electrostatic paint
165 x 40 cm diameter
Photographer Nela Ochoa

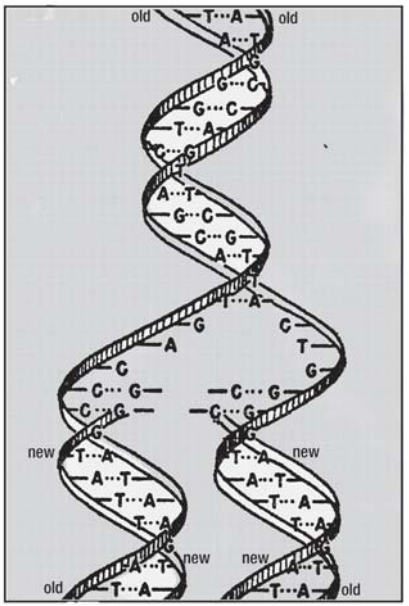
The deoxyribose in the name refers to a 5-carbon sugar deoxyribose. In DNA, a repetitive chain of deoxyribose sugars is linked by phosphates to form a backbone. To one edge of each sugar is attached one of four organic bases, each containing nitrogen, hydrogen and usually oxygen. The four nitrogenous bases are adenine (A), guanine (G), cytosine (C), and thymine (T). The aggregate of a phosphate, deoxyribose sugar, and base is a nucleotide.

Let us imagine that in Ochoa's *Empalago* of 2005 (Figure 1), the handles of each spoon represent the sugar, whereas the concave spoon itself represents the nitrogenous base. There are four differently colored spoons, corresponding to the four nucleotides. The hereditary information to be transmitted is determined by the sequence of nucleotides, which in turn specify the sequence of amino acids that constitute a protein. Thus, sequence AGCTAG differs from GGGTAC, and so forth. In more detail, one of the 20 amino acids is placed in its proper sequence in a protein in response to the message conferred by a set of three nucleotides (a codon). The triplet codon CAT dictates amino acid histidine; triplet AAA dictates lysine. Given four nucleotides, there are 64 permutations of three (4^3). Each of the 20

amino acids is coded by at least one unique triplet, and most amino acids have more than one. Three codons direct the message to stop (stop codon), ceasing amino acid incorporation. This is logically necessarily because eventually all the amino acids for a given protein have been assembled in the proper order.

Even a single errant nucleotide can be deleterious. Replacing one amino acid with another, as the result of a change in just one nucleotide, causes sickle cell anemia, common in Africans and African-Americans. Sometimes a change can alter the entire subsequent amino acid sequence. An example is the cancer-predisposing gene BRCA1 (BReast CAncer gene 1): at codon 185, the nucleotides adenine and guanine are deleted. Losing these two bases alters the entire remainder of the message (frame shift). Recall the catastrophic consequences of being off by one place on a standardized test answer sheet, every answer thereafter is wrong!

What about the famous DNA helix? What does a twisted helix (spiral staircase) have to do with the linear sequences we have been discussing? Actually, the helical structure provided the insight to deduce principles underlying genetic processes. There is not just one linear sequence of nitrogeneous bases, but two. The two strands are complementary: each adenine (A) is paired with thymine (T) on the opposing strand; each guanine (G) is paired with cytosine (C). The double-stranded nature of DNA allows it to unwind and replicate. (Figure 2) One strand serves as a template, its message read to replicate faithfully a genetically identical copy. That is, one strand stays "home" to conserve the code.



2.
DNA Double Helix
Illustration by Catalina Jaramillo

How is DNA analyzed? Conceptually the simplest way is to cut DNA into manageable pieces and compare their sizes, using enzymes called restriction endonucleases. These enzymes slice DNA at a specific (unique) nucleotide sequence, and only at that sequence. The size of the DNA fragments produced depends on the distance between the restriction sites. If sites are far apart, the

DNA fragments will be large, whereas if sites are closer together they will be small. Fragments can be separated by size, following application of an electrical current as the DNA is charged; small fragments naturally migrate more rapidly, racing to the bottom of a gel. This technique is memorialized in Ochoa's *Desentierro* of 2001/2009 (Plate 6), in which a portion of the artist's own DNA is fragmented.

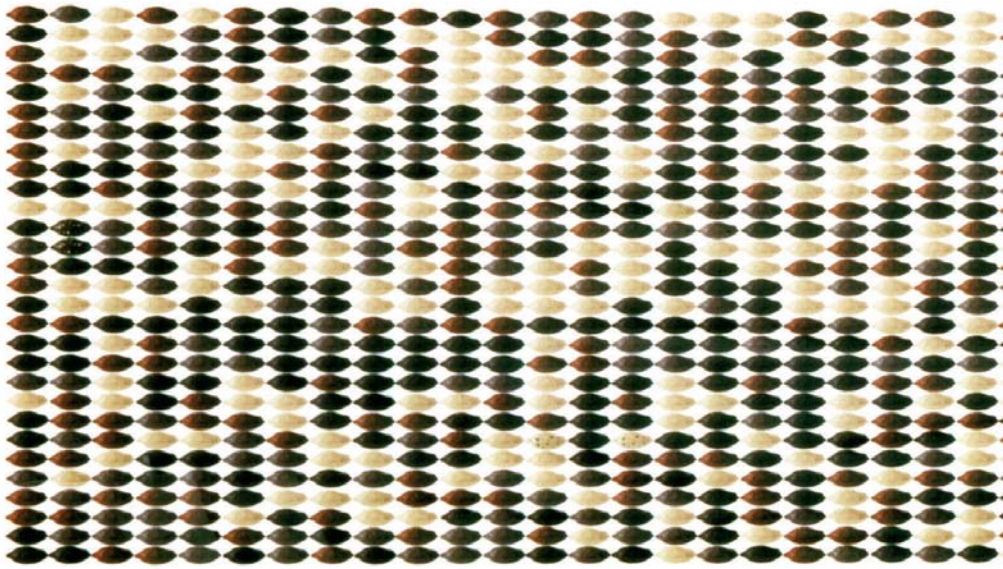
How do scientists communicate information about the DNA of a specific gene (or species) to one another? How is the genetic makeup (genome) succinctly displayed? Usually by showing the sequence of nucleotides or amino acids. These are often shown in rows, each entry representing either one of the four bases (adenine, guanine, thymine, cytosine) or one of the 20 amino acids (designated by letters). One reads left to right on one row, then starts again left to right on the next row, analogous to reading a book. Ochoa leverages this idea in her *Seeds of the Slaughterhouse* of 2002 (Plate 11) or *Gray Matter Incomplete* of 2004 (Plate 4). Sometimes one might wish to convey experimental results derived from different individuals, some normal and some not. Then, salient sequences of a single individual may be displayed in a single row, aligned for ready comparison to another row showing the sequence of another individual. Differences between rows (individuals) are easily spotted.

The four nucleotides in DNA can be represented by four different colors by scientists, but when depicted by an artist with four different colored chocolates or different colored roses, the final product contains beautifully variegated squares in rows and columns. Scientific communication has become the material for artistic communication.

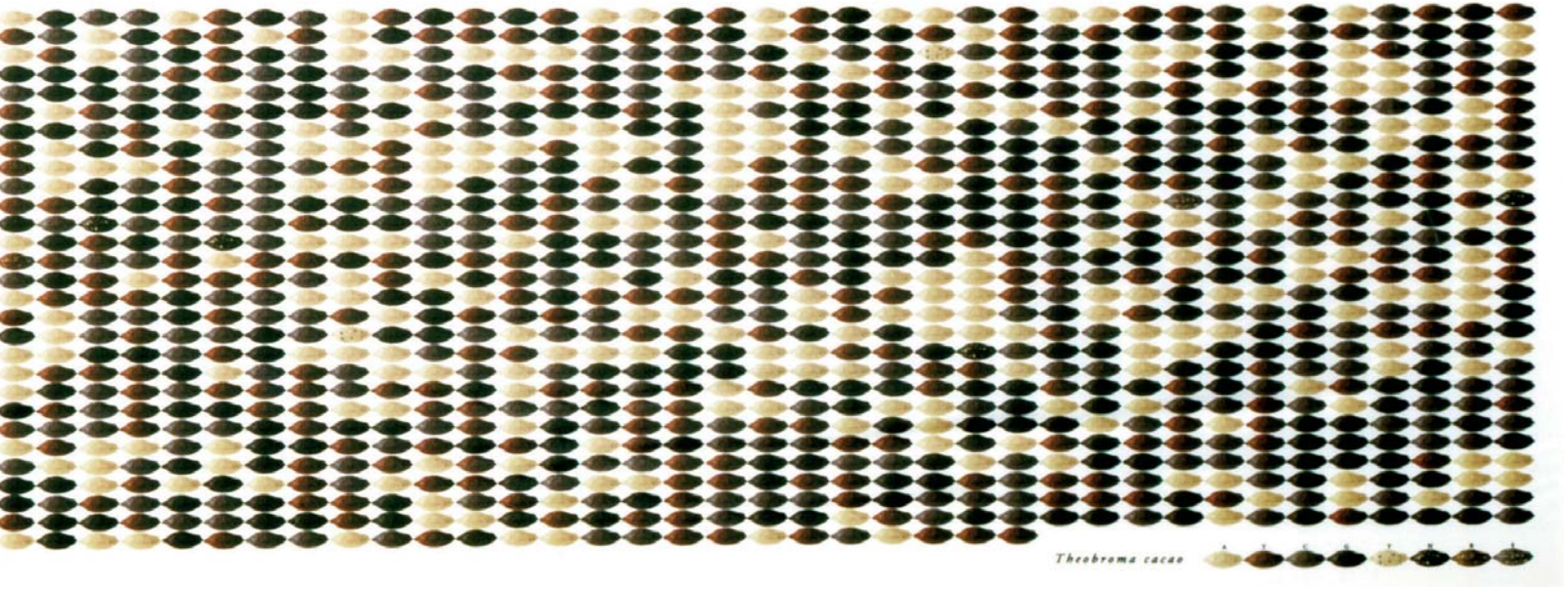
Joe Leigh Simpson, M.D.
FIU College of Medicine
Executive Associate Dean for Academic Affairs
Professor of Human & Molecular Genetics
Professor of Obstetrics & Gynecology

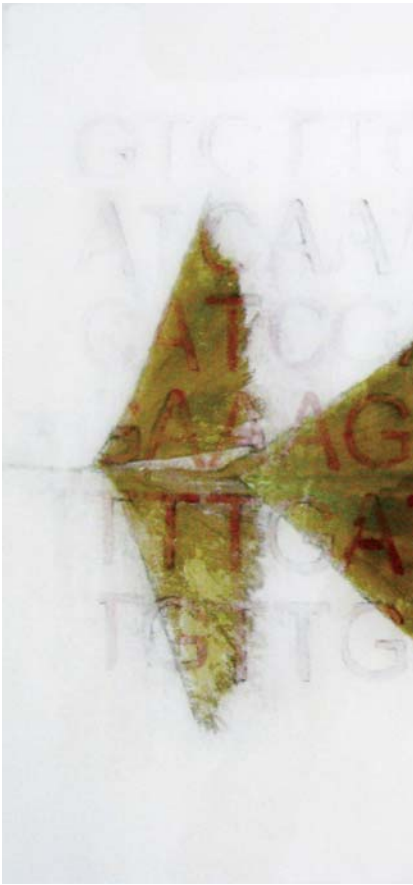
PLATES

Dimensions are in inches followed by centimeters; height precedes width precedes depth. In certain instances, measurements are given in feet followed by meters.

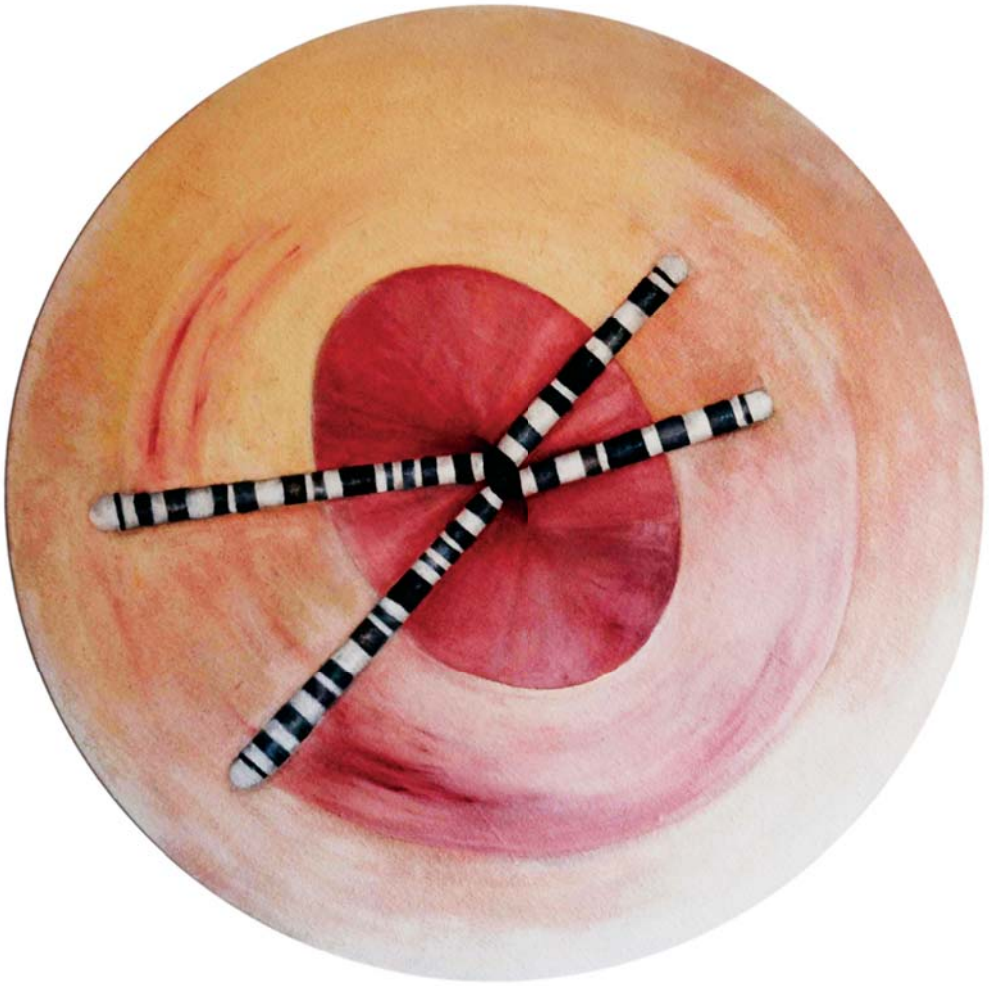


1)
Theobroma cacao, 2002
Giclée print on paper. Edition 3/3
23.6 x 82.6 in. (60 x 210 cm)
Courtesy of the artist and Hardcore Art Contemporary Space, Miami
Photographer Lucia Pizzani

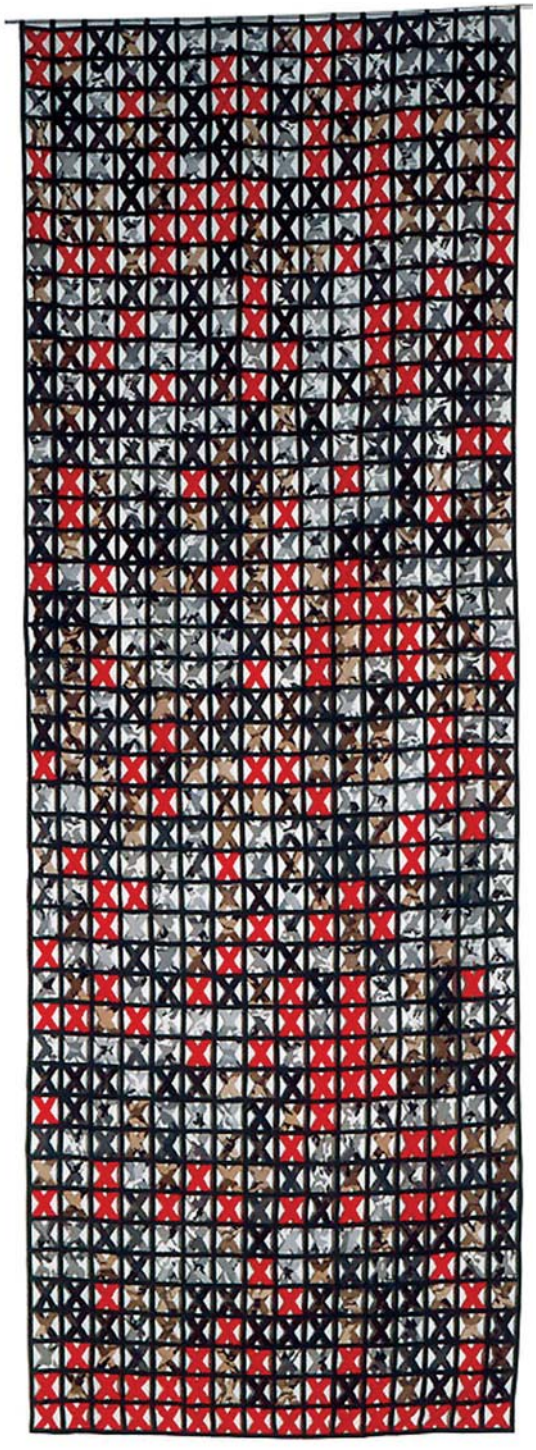

Theobroma cacao



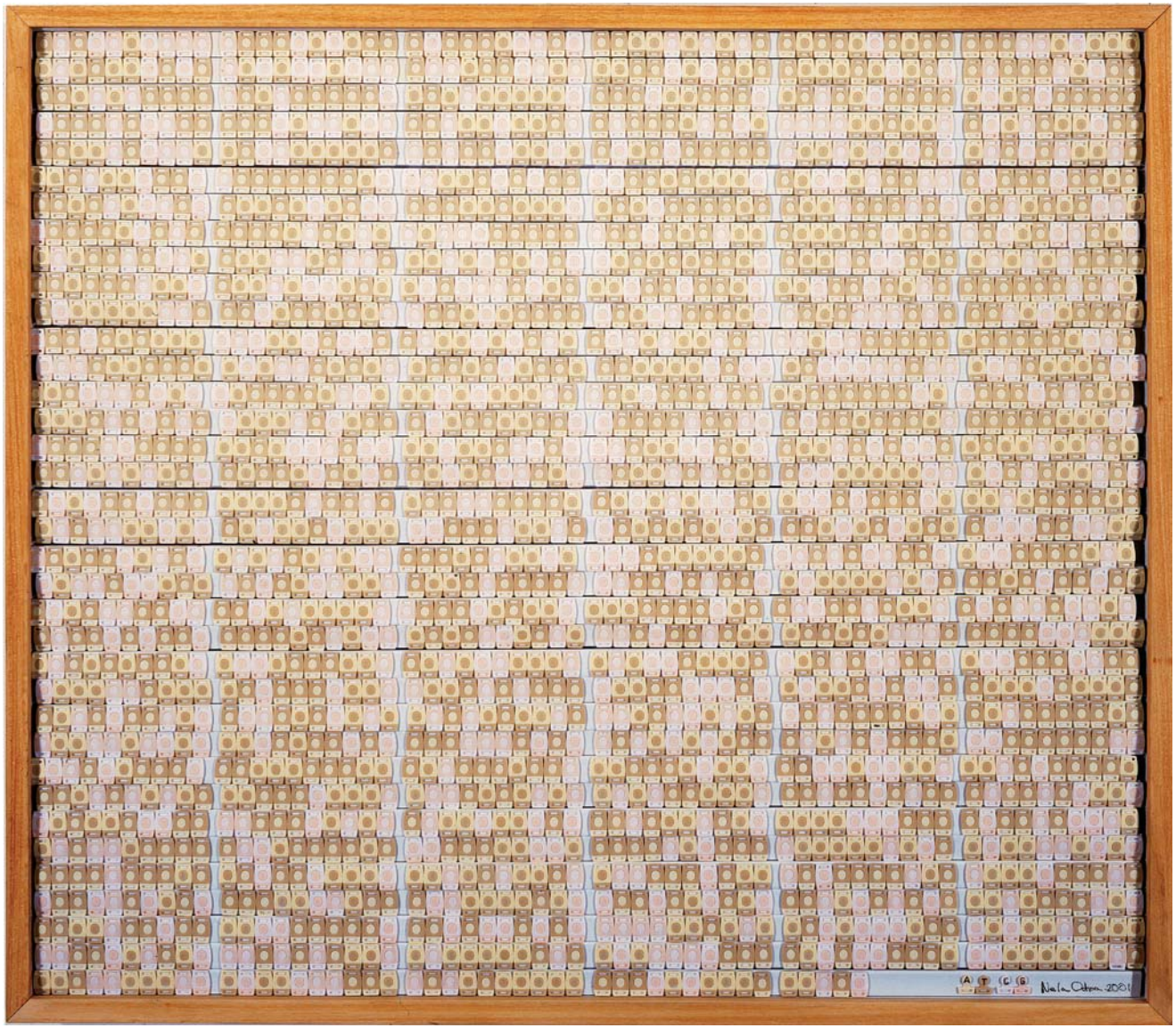
2)
Fish Tail Palm, 2008
Acrylic paint, pencil, resin, canvas, and wood
Triptych: 14 x 14 in. each (35.6 x 35.6 cm)
Courtesy of the artist and Hardcore Art Contemporary Space, Miami
Photographer Nela Ochoa



3)
Fontanela - Cromosoma 2 / Anterior fontanelle - Chromosome 2, 2008
Two units. Oil on canvas, resin, and wood; Gicleé print on 100% rag paper, varnish, and wood
25.9 in. diameter; 10.6 in. diameter (65 cm diameter; 26.9 cm diameter)
Courtesy of the artist and Hardcore Art Contemporary Space, Miami
Photographer Lucia Pizzani

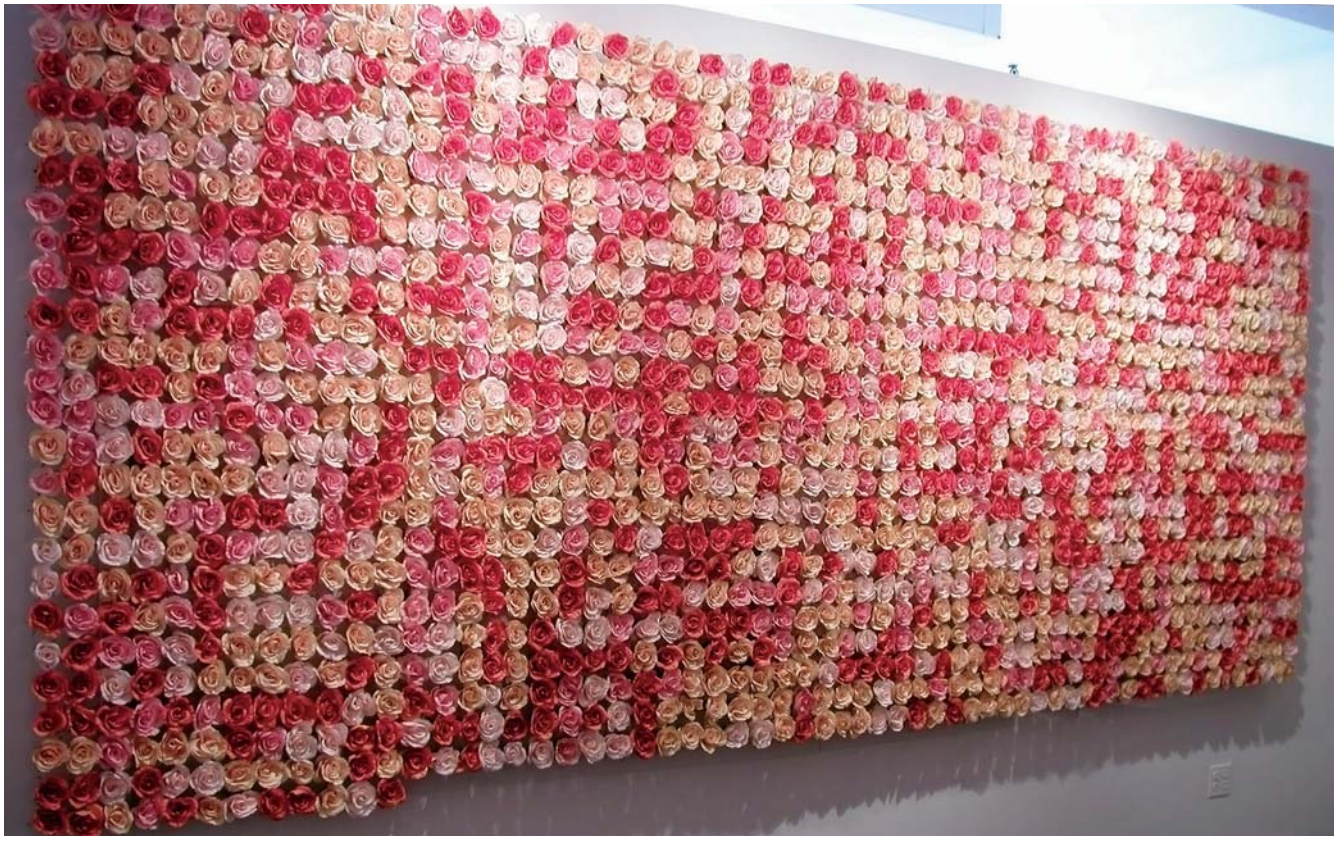


4)
Materia gris incompleta / Gray Matter Incomplete, 2004
Fabric and ribbon
16.4 x 5.9 ft. (5 x 1.80 m)
Courtesy of the artist, Henrique Faría Fine Art, and Hardcore Art Contemporary Space, Miami
Photographer Miguel Angel Clemente

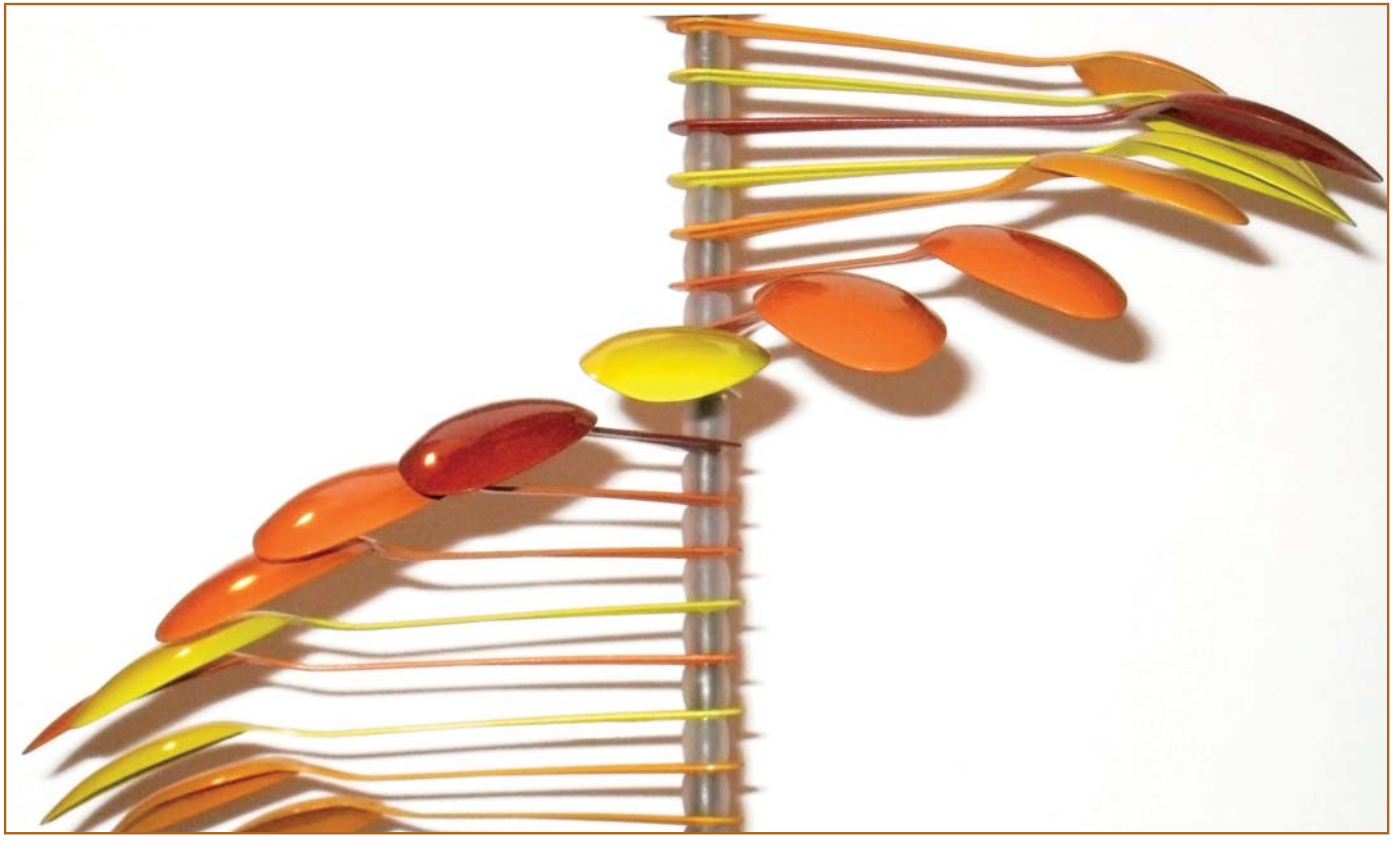


5)
BRCA 2, 2001
Plastic brassiere hooks on plastic panel
39.3 x 43.3 in. (100 x 110 cm)
Collection of Fundación Banco Mercantil, Caracas
Photographer Reinaldo Armas

6)
Desentierro / *Unearth*, 2001 / 2009
Latex, ink, hooks, and asphalt
Wall installation: dimensions variable
Installation view, Bienal Barro de América, Galeria Marta Traba, Memorial de América Latina, São Paulo
Courtesy of the artist and Hardcore Art Contemporary Space, Miami
Photographer Nela Ochoa



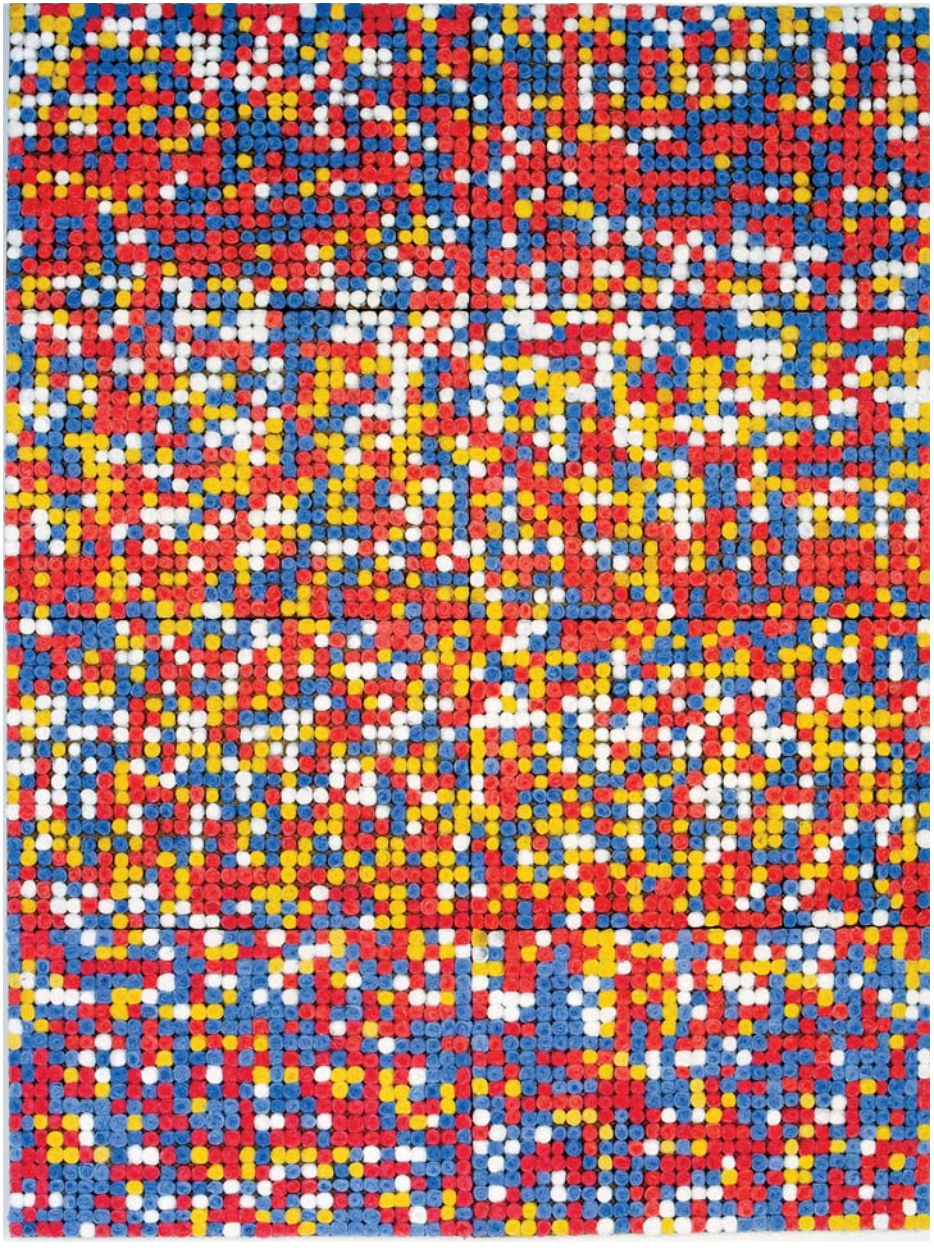
7)
De todas maneras rosas / *Anyway Roses*, 2003
Silk rose flowers on acrylic panel
6.5 x 13.1 ft. x 4 1/2 in. (2 x 4 m x 11.4 cm)
Installation view, Red Dot Gallery, New York
Collection of María Antonieta Faría and Alberto Briceño, Miami
Photographer Lucia Pizzani



8)
Anorexia Helix (det.), 2009
Metal spoons and electrostatic paint on iron base
64.9 in. high; spoons 15.7 in. diameter, approximately; base 12 in. diameter, approximately (165 x 40 x 30.5 cm)
Courtesy of the artist and Hardcore Art Contemporary Space, Miami
Photographer Nela Ochoa

9)
Bermudana Helix, 2008
Wood, iron, and enamel paint
6 ft. high x 25 in. diameter (2.4 m x 63.5 cm diameter)
Installation view, Miami Beach Botanical Garden, Miami
Courtesy of the artist and Hardcore Art Contemporary Space, Miami
Photographer Nela Ochoa

10)
Bucaneer Helix, 2008
Plastic baseball bats, lycra, nylon, and chain
53 ft. long x 25 in. diameter (16.1 m x 63.5 cm diameter)
Installation view, Miami Beach Botanical Garden, Miami
Courtesy of the artist and Hardcore Art Contemporary Space, Miami
Photographer Mariano Costa Peuser



11)
Semillas del matadero / Seeds of the Slaughterhouse, 2002
Cotton balls and jute
114.1 x 70.8 x 1.9 in. (290 x 180 x 5 cm)
Courtesy of the artist and Hardcore Art Contemporary Space, Miami
Photographer Nela Ochoa

I would like to thank Julia Herzberg, Carol Damian, and Andreína Fuentes for their belief and enthusiasm in my work; Tahía Rivero from Colección Mercantil for her support; geneticist and friend Sawsan Khuri for her enlightening words.

I would also like to thank the great team at the Patricia and Phillip Frost Art Museum, especially Ana Estrada, as well as Arts Connection Foundation and Hardcore Art Contemporary Space for their valuable help in making this exhibition a reality. I am grateful to Henrique Faría for his collaboration throughout the years; Evelyn Valdirio, Luciano Patriarca, and Albert Escalona for their professional assistance; all the photographers for their images.

Last but not least, I would like to thank my family, Antonio López Ortega, Lucía Pizzani, Jaime Gili, Bernardo López, and Juan Andrés Pizzani for their patience and encouragement through the dark hours in which we are living in Venezuela.

Nela Ochoa

Nela Ochoa

Born in Caracas, 1953; lives and works there

Education:

1981-85 Contemporary Dance. Rencontre Internationale de Dance Contemporaine (RIDC), Paris
1976-77 Drawing and Painting. Escuela de Artes Cristóbal Rojas, Caracas
1973-75 Graphic Arts and Design. Instituto de Diseño Neumann, Caracas
1972-73 Art Studies. Escuela de Artes Cristóbal Rojas, Caracas

Solo Exhibitions

2008 *Laboratorio*, Galeria 39, Caracas
Gene Garden, Miami Beach Botanical Garden, Miami Beach
2006 *From Outside to Insight*, Hardcore Art Contemporary Space, Miami
2004 *Gen-ética*, Galeria Sextante, Bogotá
Nela Ochoa: Recent Work, Galeria 39, Caracas
2003 *Gene Maps*, Project Room, Red Dot Gallery, New York
2001 *Videografías*, Galeria Sextante, Bogotá
Corpóreo, Galeria 39, Caracas
2000 *DNA 8A*, Ateneo de Valencia, Carabobo, Venezuela
and Centro de Arte Lía Bermúdez, Maracaibo, Venezuela
1999 *DNA 8A*, Sala RG, CELARG, Caracas
Lejana, Museo Alejandro Otero, Caracas
1994 *Alter-Altare*, Centro de las Artes, Bolívar, Venezuela
1993 *Alter-Altare*, Sala RG, CELARG, Caracas

Select Group Exhibitions

2008 PINTA, New York
FIA, Caracas
2007 *Utopias,* Galeria 39, Caracas
FIA, Caracas
arteaméricas, Miami
2006 *I Could Be You Could Be Me*, Video Box, bâlelatina, Basel, Switzerland
Ephemeral Trends, arteaméricas, Miami
2005 OmniArt, Miami
Hardcore Menu: Samples and Dishes, Hardcore Art Contemporary Space, Miami
Solar Gallery, Art Miami, Miami
2004 III Bienal Internacional de Estandartes, Tijuana, Mexico
Urban Flora, Generous Miracles Gallery, New York

2003 ARCO, Alternativa Galería, Madrid
2002 Galería 39, Art Miami, Miami
ARCO Fair-Cutting Edge, Galería 39, ARCO, Madrid
2001 Bienal Barro de América, Memorial de América Latina, Galería Marta Traba, São Paulo
1995 *Video Performance a 4 Manos*, Tacheles, Berlin
A Plomo, List Art Gallery Hall, Providence, Rhode Island
1993 *The Final Fontier*, New Museum of Contemporary Art, New York
1985 DANAE Festival, Pouilly, France

Awards

1998 *Una obra de gran envergadura*, Prize Harry Liepienz, 56º Salón Arturo Michelena, Valencia, Venezuela
1997 *Ruinas circulares-hoyano*, III Prize, IV Art Biennial of Mérida, Venezuela
1990 *Topos*, Best Experimental Video, V Festival Nacional de Cine, Video y Televisión, Merida
1990 *Que en pez descanse*, Best Video, CELARG Foundation, Caracas
Que en pez descanse, Best Video, V Festival Nacional de Chiné video y Televisión, Merida
1988 *Topos*, Prize, XIII Festival Internacional de Cine Super Ocho y Video, Centro Rómulo Gallegos, Caracas
1987 *Invernadero,* Prize Arte No-Objetual, 45º Salón Arturo Michelena, Valencia

Collections

Museum of Contemporary Art Sofia Imber (MACSI), Caracas
Galería de Arte Nacional (GAN), Caracas
Museo Alejandro Otero (MAO), Caracas
Centro de Arte Moderno Lía Bermudez (CAMLB)
Video collection of Museo Reina Sofía, Madrid
Video Data Bank, University of Chicago
Private collections in USA, Spain, Kuwait, Dominican Republic, Colombia and Venezuela

Web Pages

http://homepage.mac.com/esperanzaleon/
Solar/PhotoAlbum16.html
http://semana2.terra.com.co/opencms/
opencms/Semana/articulo.html?id=8 1 1

Patricia & Phillip Frost Art Museum

Carol Damian, *Director and Chief Curator*
Julio Alvarez, *Security Manager*
Etain E. Connor, *Development Director*
Jessica Delgado, *Director of Communications and Marketing*
Nicole Espaillat, *Museum Assistant*
Ana Estrada, *Curatorial Assistant*
Annette B. Fromm, *Museum Studies Coordinator*
Ana Garcia, *Museum Assistant*
Lynn Garcia, *Visitor Services and Events Assistant*
Elisabeth Gonzalez, *Administrative Assistant*
Stephanie Guasp, *Museum Assistant*
Yelipza Gutierrez, *Museum Assistant*
Julia P. Herzberg, *Consulting Curator*
Catalina Jaramillo, *Curatorial Coordinator*
Debbye Kirschtel-Taylor, *Curator of Collections/Registrar*
Miriam Machado, *Museum Education Coordinator*
Mary Alice Manella, *Budget & Finance Manager*
Ailyn Mendoza, *Communications Coordinator*
Amy Pollack, *Special Projects*
D. Gabriella Portela, *Museum Intern*
Linda Powers, *Curator of Education*
Ana Quiroz, *Museum Assistant*
Alejandro Rodriguez Jr., *Museum Assistant*
Klaudio Rodriguez, *Museum Assistant*
Susana Rodriguez, *Museum Intern*
Art Shields, *Security Guard*
Chip Steeler , *Exhibition Designer*
Andy Vasquez, *Museum Preparator*
Paola Villanueva, *Museum Intern*
Sherry Zambrano, *Assistant Registrar*

Florida International University

Modesto A. Maidique
President

Ronald M. Berkman
Executive Vice President and Provost

Sandra Gonzalez-Levy
Vice President, University and Community Relations

Robert Conrad
Vice President, University Advancement

Rosa L. Jones
Vice President, Student Affairs and Undergraduate Education

Vivian A. Sanchez
Chief Financial Officer and Senior Vice President, Business & Finance and Human Resources

Stephen A. Sauls
Vice President, Governmental Relations

George E. Walker
Vice President, Research and Dean of University Graduate School

Douglas Wartzok
Vice President, Academic Affairs

Corrine M. Webb
Vice President, Enrollment Management

Min Yao
Vice President, Information Technology and Chief Information Officers

The Frost Art Museum receives ongoing support from the Miami-Dade County Department of Cultural Affairs, the Cultural Affairs Council; the Mayor and the Miami-Dade Board of County Commissioners; the State of Florida Department of State, the Florida Division of Cultural Affairs, the Florida Arts Council; the National Endowment for the Arts; The Steven & Dorothea Green Endowment; Funding Arts Network; Dade Community Foundation; CitiPrivate Bank; The Miami Herald; Target; and the Members & Friends of The Frost Art Museum.

FIU | Frost Art Museum
Florida International University

Accredited by the American Association of Museums

Smithsonian Institution Affiliations Program

Miami-Dade County

h/a/c/s

FARÍA+FÁBREGAS GALERÍA

ISBN-978-0-9819337-3-3

Catalogue design by Alberto Insúa