LIGHT / SPACE / CODE





Opposite: Morris Louis, Number 2-07, 1961 (detail)

Light / Space / Code How Real and Virtual Systems Intersect

The Light and Space movement (originated in the 1960s) coincided with the development of digital technology and modern computer programming, and in recent years artists have adapted hi-tech processes in greater pursuit of altering a viewer's perception using subtle or profound shifts in color, scale, luminosity and spatial illusion.

Light / Space / Code reveals the evolution of Light and Space art in the context of emerging technologies over the past half century. The exhibit begins by identifying pre-digital methods of systems-style thinking in the work of geometric and Op painters, when radiant pigments and hypnotic compositions inferred the power of light. Then, light sculpture introduces the medium of light as an expression of electronic tools. Finally, software-generated visualizations highlight advanced work in spatial imaging and cyberspace animation. Several kinetic and interactive works extend the reach of art into the real space of viewer participation.

A key sub-plot of Light / Space / Code concerns the natural world and its ecology. Since the Light and Space movement is an outgrowth of a larger environmental art movement (i.e., Earthworks), and its materials are directly drawn from natural phenomena, Light and Space artists address the contemporary conditions of organisms and their habitation systems on this planet. This conceptual step from systems art to ecosystems is important. Toward this end, artists have harnessed nature as a tool and theme, including gravity (Morris Louis), fire (Spencer Finch), flora (Jennifer Steinkamp), wind (Robert Rauschenberg), soil (John Gerrard), the cosmos (Leo Villareal and Alfred Jensen) and humankind (Jim Campbell). Visual art and the natural sciences have long produced fruitful collaborations. Even Isaac Newton's invention of the color wheel (of visible light spectra) has aided visual artists immensely. Artists and scientists share a likeminded inquiry: how we see. Today's art answers that question in tandem with the expanded scientific fields of computer engineering, cybernetics, digital imaging, information processing and photonics.

- Jason Foumberg, Thoma Foundation curator



© Yorgo Alexopoulos

Yorgo Alexopoulos (American, born 1971)

Everything In-Between, 2014 Digital animation on six synchronized LCD displays, customized electronics. 10-minute continuous loop. 110 x 69 inches

Yorgo Alexopoulos combines digital painting, original photography and live-action film into an animation across six synchronized screens for the newly commissioned Everything In-Between. Alexopoulos travels on photo safaris to capture landscape imagery for his digital video. Here, he journeyed across New Mexico and incorporated the state's flora and topography with geometric symbols of nature, such as triangle mountain shapes and brightly colored circles. "Landscape is the star of the film," he says about *Everything In-Between*.

Everything In-Between employs 4K resolution technology, the highest currently available, and Alexopoulos collaborated with the monitor manufacturer to devise the optimal display design for his imagery. He fractured and then synchronized the imagery over six panels in order to emphasize his geometric pursuit. For Alexopoulos and the Cubists before him, geometry is a filter or structure for picturing a many-dimensioned experience of our world.

Alexopoulos does not use algorithms or randomized data. Rather, everything is directed in his works, including key attention to edits, animations, color and pacing. As a visual statement, the artwork connects to the artist's research interests in natural history and physical science. The unfolding, ambient experience of *Everything In-Between* echoes the artist's creative exploration—over landscapes and through the eye.

Alexopoulos often relates his digital practice to painting. His former work as a graffiti and mural painter translates into the wall-sized scale of his media-driven works. The large size suggests a deep, immersive space of experience.

Everything In-Between continues endlessly. "There is no beginning or end," says the artist, "which is representative of the cycles of life."



© Richard Anuszkiewicz, Photo: Joseph Rynkiewicz

Richard Anuszkiewicz (American, born 1930) *Untitled (#302),* 1970 Acrylic on canvas 48 x 48 inches

Richard Anuszkiewicz is the father of the Op art movement of the 1960s and 70s in the United States. The term Op, short for Optical, was coined by *Time* magazine in response to William C. Seitz's exhibition *The Responsive Eye* at the Museum of Modern Art, an exhibition that first contextualized the hard-edge painting movement.

Anuszkiewicz trained at the Cleveland Institute of Art where he befriended Julian Stanczak, a fellow Polish immigrant and native Midwesterner. The two went on to Yale University and came under the tutelage of the great Bauhaus master and colorist Josef Albers. Albers' influence on Anuszkiewicz cannot be understated. It was profound and immediate.

Anuszkiewicz's process is extremely systematic and mathematical in his method of taping off and applying thick layers of viscous acrylic paint. The final effect produces a light sculptural relief. His works pulsate and flicker, sometimes giving the impression that they are backlit, or that they are protruding and receding into three-dimensional space. The slippery-focus effect is often dynamic and at times psychedelic.

Despite his prominent place in the Op art movement, Anuszkiewicz strongly protested the label, instead preferring to view his style more simply as one preoccupied with line, space and most importantly, color. "I'm interested in making something romantic out of a very, very mechanistic geometry," he said. "Geometry and color represent to me an idealized, classical place that's very clear and very pure."



© Jim Campbell, Photo: Joseph Rynkiewicz

Jim Campbell (American, born 1956) *Grand Central Station No. 3*, 2009 1,728 LEDs, Plexiglas diffusion screen and custom electronics 33 x 44 x 1.75 inches

Whereas a typical HDTV contains two million pixels, a Jim Campbell artwork might contain less than two thousand. *Grand Central Station No. 3*, from 2009, is from Campbell's Low Resolution Works series. Despite its intentionally low-resolution, Campbell's artwork is not low technology. "What that does is it eliminates all of the details in the image and it kind of forces you to focus on the movement and the shape and the form," said Campbell in a 2014 interview.

Campbell earned degrees in Electrical Engineering and Mathematics from MIT, designs his own circuit boards, and has said that the engineering process is an important element to his artwork. "I call myself an electronic artist," he said. "I work with electronics. Mostly, more recently, I work with light."

For *Grand Central Station No. 3,* Campbell filmed commuters walking across Manhattan's busy train station. The seemingly endless flow of anonymous humans through the space is one of his most abstract works to date. Viewers must fill in the visual and narrative gaps in the scene in order to make sense of the lowresolution, pixilated moving image. Campbell takes advantage of the human brain's ability to efficiently make these perceptual connections, much like commuters reaching their trains.



© Spencer Finch, Photo: Joseph Rynkiewicz

Spencer Finch (American, born 1962) *Fire (After Joseph Wright of Derby)*, 2009 Lightbox and filters 38 x 61.5 x 7.5 inches

Spencer Finch's Fire (After Joseph Wright of Derby) considers the long collaboration of the arts and sciences. Light was a key metaphor during the Enlightenment, and painters such as Joseph Wright of Derby (1734-1797) used this visual element to great effect. Finch's homage to Wright of Derby, and to Enlightenment pursuits, compares the modern digital revolution to the eighteenth-century scientific revolution. To do this, Finch plucked colored pixels from a Wright of Derby painting that depicted scientists experimenting with fire, and extended the pixels into color bands atop a lightbox. A dimmer on the lightbox's side allows for viewer interaction.



© Dan Flavin, Photo: Joseph Rynkiewicz

Dan Flavin (American, 1933-1996)

Untitled (in honor of Leo at the 30th anniversary of his gallery), 1987 Red, yellow, blue, green and pink fluorescent light 48 x 48 x 8 inches

Untitled (to Charlotte), 1987 Red, yellow, blue, green and pink fluorescent light 96 x 16 inches

While most artists in an exhibition favor to hang their work on clean, brightly lit walls, Dan Flavin saw an opportunity to illuminate the usually dark corners. Many of his fluorescent light artworks, from the 1960s onward, are installed in corners and activate that space. As such, Flavin is an early innovator of the Light and Space movement.

Flavin used all available colors and all standard lengths of commercially produced fluorescent light tubes. He liked to emphasize the accessibility of his readymade materials, and so his sculptures were often produced in small editions. Flavin considered his true material to be fluorescent light, rather than the tubes themselves. His colleague Donald Judd described them as "neither painting nor sculpture" —a truly innovative approach.

Most of Flavin's artworks are subtitled in homage to personal friends or revered artists. Here, Charlotte is the daughter of Flavin's Paris dealer, and Leo is the famed gallerist Leo Castelli, who represented Flavin in New York for many years.



© Dan Flavin



© John Gerrard, Photo: Joseph Rynkiewicz

John Gerrard (Irish, born 1974) *Dust Storm (Manter, Kansas*), 2007 Real-time 3D on plasma screen 40.75 x 34 x 9.25 inches

In *Dust Storm (Manter, Kansas),* John Gerrard depicts a virtual landscape from the catastrophic Dust Bowl of the 1930s using a composite of historic and contemporary photographs in an animation that progresses in real time. 3D gaming software advances the threatening dust cloud pixel-by-pixel. The time of day reflects the real time at the reference site in Manter, Kansas—a tiny Midwestern farming town. As the scene will never repeat itself, the storm is forever on its destructive path.

The Dust Bowl caused both environmental and economic devastation. The advent of fossil-fuel powered farm equipment initiated the industrial agriculture movement in the U.S., but this new technology was not used with care. The soil was aggressively over-farmed, which led to the conditions for the massive dust storms that wrecked farms and cities in the U.S. Plains regions. This, along with other factors, precipitated the Great Depression.

Gerrard considers this historic event in light of recent wars in the Middle East. A commentary is enacted by Gerrard's integration of contemporary U.S. soldiers' photographs of explosions in Iraq and Afghanistan to render this dust cloud that threatens the Kansas town. "The Dust Bowl," says Gerrard, is "the start of the Oil Age." Our economy's addiction to refined fossil fuels could cause additional disasters, the artwork seems to say. This is why the depicted dust storm forever looms in the sky.

Dust Storm (Manter, Kansas) was developed using computer-based imaging technologies. Gerrard collaborated with programmers to construct the 3D models, render realistic reflections and shadows, and to code the endless, real-time animation.



© Sabrina Gschwandtner, Photo: Tom Powel

Sabrina Gschwandtner (American, born 1977) *Expanding/Receding Squares*, 2014 16mm polyester film and polyester thread on lightbox 32 x 32 inches

Since 2009, Sabrina Gschwandtner, a founding editor of *KnitKnit* magazine, has been creating "film quilts" on lightboxes. She sews l6mm footage from found documentary films into quilt-like patterns. After investigating the histories of film editing and textile craft, Gschwandtner found crossovers in their technical concerns. The design of an early film camera by the Lumière brothers, for instance, was based on the sewing machine, and seamstresses were hired as editors for their familiarity with sewing.

For the commissioned film quilt *Expanding/Receding Squares*, Gschwandtner responded directly to the foundation's holdings of Op painting and Hard-Edge abstract paintings. Specifically, *Expanding/Receding Squares* recalls the optical motion of Richard Anuszkiewicz's *Splendor of Orange* from 1977, a square composition with receding, radiant diamond-shapes.

The filmstrips in *Expanding/Receding Squares* were sourced from several documentaries, from the 1950s through the 1980s, including *Arts and Crafts in America, Hearts and Hands: 19th Century Women and their Quilts, Hopi: Songs of the Fourth World* and others.

Shortly after earning a graduate degree from Bard College in 2008, Gschwandtner received a trove of 16mm films from a film archivist at the Fashion Institute of Technology. Having founded the artist's publication *KnitKnit* (2002-2007), Gschwandtner was no stranger to textile techniques, and combined them with film history. "My impulse here was to preserve the content and the imagery," she said of the films, in a 2013 interview with Bomb magazine. "That's really a quilting impulse: preserve and reuse."



Alfred Jensen (Guatemalan, 1903–1981) There Came Into Being, 1959 Oil on canvas 74 x 49 inches

Alfred Jensen studied under the geo-expressionist painter Hans Hofmann in the mid-1920s, yet he only arrived at his own mature style of lyrical geometric patterns in 1957 at the behest of his friend Mark Rothko, who encouraged Jensen to abandon his Abstract Expressionist style. From then on, until his death in 1981, Jensen became a prolific painter of colorful diagrams and impasto geometries. Many of his paintings relate to Mayan cosmological diagrams, which Jensen justified as a field of inquiry since he was born and raised in Guatemala.

Jensen called himself a "diagram painter," and often included paintings within paintings, such as in *There Came Into Being,* from 1959. An important reference for Jensen's paintings is Johann Wolfgang von Goethe's color diagrams. In his 1810 essay on color, Goethe examined how humans perceive color, as opposed to the scientific or physical properties of color (as examined by Isaac Newton, for example). Ultimately, Jensen sought to give order and rational design to metaphysical and cosmic concepts—even if they intentionally retain a cryptic or mysterious quality.

© Alfred Jensen, Photo: Joseph Rynkiewicz



Photo: Joseph Rynkiewicz



Morris Louis (American, 1912–1962) *Number 2-07*, 1961 Magna on canvas 94.25 x 69.5 inches

Number 2-07 is from Morris Louis' last major series, called the stripe paintings. For this series, Louis had perfected his pouring technique using Magna, an early form of acrylic paint, staining the raw canvas with luminous, overlapping streaks. While his exact process is not fully documented, Louis likely relied heavily on the force of gravity while guiding the paint by folding the unstretched canvas into channels. Louis' painting studio was a mere twelve-by-fourteen feet, and one can imagine the artist enveloped within his own canvases there during the creative process.

In 1936, Louis apprenticed in the temporary New York City workshop of Mexican muralist David Alfaro Siqueiros, where he gained an appreciation for massively scaled paintings. (Jackson Pollock apprenticed with Siqueiros the same year as Louis, although the two artists claim to have never met.)

Louis finalized the composition by cropping the bottom edge of the canvas, yet left the initial pour marks intact to heighten the sensation of gravity's vertical pull. *Number 2-07* was first exhibited in a posthumous retrospective in 1967 at the Cleveland Museum of Art.

© Morris Louis, Photo: Joseph Rynkiewicz



Helen Lundeberg (American, 1908-1999)

Blue Planet, 1965 Acrylic on canvas 60 x 60 inches

California Hard-Edge painter Helen Lundeberg transitioned her painting style several times over her six-decade-long career, from figuration to abstraction and back to representational work. Although she left a diverse oeuvre, which unfolded with method and grace, she revisited certain image motifs over and again. The planets were one such topic of fascination—as objects both mysterious and familiar.

With her husband, the painter Lorser Feitelson, she penned a "post-surrealist" manifesto in the 1930s that advocated for greater introspection in the presence of art. By the 1950s she evacuated the figure from her paintings, and focused only on color, structure and mood. By the 1960s she hit her stride with even more formal reductions and a refined color palette. So began her mature period, from which *Blue Planet* derives. From the *Planet* series, the square canvas perfectly encapsulates Lundeberg's iconic biomorphic imagery, which she worked on exclusively at this time.

Art critic Dave Hickey compares Lundeberg's Hard-Edge painting style as the Southern Californian counterpart to the East Coast's post-painterly school (Frankenthaler, Louis). *Blue Planet* was featured in the exhibition *Pacific Standard Time* at the Getty Museum in Los Angeles.

© Helen Lundeberg



Matilde Pérez (Chilean, 1916-2014) *Untitled*, 1973 Stainless steel with lacquered copper collage 35.25 x 35.25 inches

Matilde Pérez was a prolific creator of kinetic and Op art in South America. She lived most of her long life in Santiago, Chile, but an important trip to study in Paris in 1960 transformed her perspective on art. There, she met Op art pioneer Victor Vasarely; his influence was so great that Pérez incorporated his ideas and techniques for geometric abstraction into her own processes. Pérez has several large-scale public sculptures installed throughout Chile.

The untitled work from 1973 uses stainless steel for its mirror-like surface with lacquered copper tiles affixed atop it in a geometric composition. The kinetic quality of Pérez's artwork becomes activated by a viewer's presence.

In 1975, Pérez co-founded the Kinetic Research Center at the School of Design at the University of Chile, but the project was soon disbanded when Pérez left her academic post during the regime of military dictator Augusto Pinochet. Pérez also joined art peer groups such as the Group of Five (1953), the Rectangle Group (1955-1962), and Shape and Space (1962-1965), which made advancements in connecting the arts, mathematics and the sciences.



Robert Rauschenberg (American, 1925–2008)

Eco-Echo VI, 1992 Screenprint on aluminum and Plexiglas, electric motor, steel, bicycle wheel and chain and hardware $88 \times 72 \times 23$ inches

Eco-Echo VI combines two of Robert Rauschenberg's sustained passions: technological experimentation and art-activism. The windmill with screenprinted blades spins in the presence of a viewer from an interactive sonar device installed at the sculpture's base. Rauschenberg created the artwork in response to pressing climate change issues and possible solutions for clean, renewable energy.

Rauschenberg collaborated with engineers and scientists early in his career, such as his work with Bell Laboratories in the mid-1960s to produce sound and light artworks, and the influential 1966 event series Experiments in Art and Technology, or E.A.T. Rauschenberg initiated fertile interdisciplinary collaborations among the arts and sciences.

In 1970, Rauschenberg designed the first Earth Day poster. He dedicated the latter part of his career to activism projects such as human rights and environmental activism. *Eco-Echo VI* was conceived after Rauschenberg attended a United Nations Earth Summit session on wind farms in 1990. For that conference he designed a poster that declared: "I pledge to make the Earth a secure and hospitable home for present and future generations." A bicycle wheel and chain also turns behind the rotating windmill blades.

Donald Saff, of Saff Tech Arts and a curator of prints at the Guggenheim, collaborated with Rauschenberg to produce the high-tech, interactive windmill artwork.



© Jennifer Steinkamp, Photo: Joseph Rynkiewicz

Jennifer Steinkamp (American, born 1958) *Bouquet 1*, 2013 Computer-generated animation Dimensions variable

Jennifer Steinkamp has been creating computer-animated floral imagery since 2002. Her mural-sized Bouquet, from 2013, imaginatively compiles several types of flowering tree branches from different seasons into a single arrangement. The animation appears to undulate in a slow, rhythmic wind.

Steinkamp may be considered an artist of the Light and Space genre because she has said that the immersive scale of her digital mural, which is projected directly on the wall, works to "dematerialize space" in the similar capacity of a James Turrell artwork, but with updated technology. Light and Space artists alter environments with virtual or illusory spatial elements, so Steinkamp accomplishes this using what she calls "hypersurface architecture," or a skin of cyberspace (the animation) atop real space (the gallery wall).

Bouquet 1 is also on long-term view at the American Consulate in Guangzhou, China, as part of the U.S. State Department's Art in Embassies program. Steinkamp is professor in the department of Design Media Arts at UCLA.



Anne Truitt (American, 1921–2004) *Sun Flower,* 1971 Acrylic on wood 72 x 12 x 12 inches

Although Anne Truitt's monochromatic column *Sun Flower* appears like a Minimalist sculpture, the artist instead identified with Abstract Expressionists and the Washington Color Field painting school. In 1948, Truitt enrolled in art classes in D.C. and there befriended her teacher Kenneth Noland. A 1961 excursion to Manhattan, to view Barnett Newman's paintings at the Guggenheim, empowered Truitt to pursue her mature style. Even as her influential peer Donald Judd dismissed her work as overtly referential to real life—for example, Truitt always titled her art after objects in the natural world, such as *Sun Flower*—she maintained a steady studio practice and a strong exhibition record. Truitt's first museum survey was curated by Walter Hopps at the Corcoran Gallery of Art, in which *Sun Flower* was exhibited.

Truitt was methodical in her painting methods. She painted many layers atop her wood supports, and finely sanded the layers to remove evidence of brushstrokes. Although her artwork appears simple, the process was labor intensive. *Sun Flow-er* has four subtle hue variations of yellow. These are painted in vertical bands on most sides. The yellows appear to vibrate, like a Barnett Newman "zip" painting. "What I want is color in three dimensions, color set free, to a point where, theoretically, the support should dissolve into pure color," wrote Truitt in 1979. A working drawing of *Sun Flower* reveals Truitt's careful diagrammatic approach to planning her painting/sculpture composite.

© Anne Truitt



Siebren Versteeg (American, born 1971) Long Division, 2005 Projected real-time digital program Dimensions variable

The title *Long Division* evinces Siebren Versteeg's characteristically wry sense of humor, for the projected image slowly divides itself, line by line, 50,000 times, until the entire picture plane is saturated with a single light. The process takes forty minutes, then restarts, but never in the same way.

The computer animation is the expression of a generative algorithm, and it appears to make line choices, or moves, although it is programmed to behave at random. The lines are pastel-hued, and in-person they produce an unusual optical experience—a vibrating effect, evoking the virtual space of the picture plane, of art, or cyberspace.

Long Division is literally a digital performance of mathematics, providing a conceptual structure—a code—over which a skin of geometric abstraction grows. Like a Sol LeWitt mural, Versteeg's digital mural is an instruction-based visual product. The artwork has also been compared to Mondrian's *Broadway Boogie Woogie*.

© Siebren Versteeg (detail)



© Leo Villareal, Photo: Joseph Rynkiewicz

Leo Villareal (American, born 1967) *Big Bang*, 2008 1,600 light emitting diodes, Mac mini, microcontroller, circuitry and anodized aluminum 59 x 8.5 inches

In 1997, Leo Villareal attended the weeklong Burning Man festival in Nevada's Black Rock Desert. He rigged a simple grid of nine strobe lights over his campsite as a wayfinding device in the night. Glowing, the lights echoed the stars above. "I found it not only to be a guide back but a very compelling piece of artwork," said Villareal.

This is Villareal's genesis story, and it accounts for many of the sensational optical experiences he produces in his large-scale sculptures—but that is just half of his story. Villareal is also skilled at writing the computer programs that animate his light sculptures, which often respond to the traditions of twentieth-century geometric and abstract painting. Villareal studied at Yale and NYU's Interactive Telecommunications Program, and worked at Palo Alto's tech think tank, called the Interval Research Corporation. Villareal's artworks are perfect collaborations of art and technology.

Big Bang is one of Villareal's most impressive gallery sculptures to date. The artwork uses 1,600 LEDs and custom-designed computer software to generate a whirling constellation of light, programmed to produce an infinite pattern. "There are things in nature that inspire me," said Villareal, "like wave patterns or natural systems that at first glance appear to be very complex, but when I study them further there are simple rules that govern them. That's what I try to get at in my code—building simple rules that refer to some of these ideas. " Light, said Villareal, is "universal and powerful. We have a deep attraction to it."



Leo Villareal (American, born 1967)

Scramble, 2011

Light emitting diodes, Mac mini, custom software, circuitry, wood and Plexiglas 60 \times 60 inches

Leo Villareal's *Scramble* is a direct response and homage to Frank Stella's 1968 Day-Glo stripe painting of the same title. After meeting Stella, Villareal was inspired to update the minimalist painter's masterwork by creating an animated light version, and honoring the double-concentric-square composition, a favored motif among hard-edge painters since Josef Albers. *Scramble* employs hundreds of LED bulbs and custom electronics programmed to continuously change its color gradient.

Stella's original painting version of *Scramble* served as set design for dancer Merce Cunningham's performance artwork, also called Scramble, with dancers wearing monochromatic costumes. Villareal's *Scramble* brings together color relationships and movement in his single work, much like the original staging of Stella and Cunningham's collaboration.



Photo: Joseph Rynkiewicz

About the Thoma Foundation

The Carl & Marilynn Thoma Art Foundation recognizes the power of the arts to challenge and shift perceptions, spark creativity and connect people across cultures. We lend and exhibit artworks from our collection and support innovative individuals and pivotal initiatives in the arts.

The Thoma Foundation's art collection is the basis for exhibitions, loans and educational programming, including this thematic exhibition on a growing area of our collection: computer, software, electronic and light artwork. The Foundation also has strong holdings of modern and contemporary painting, Spanish Colonial painting and twentieth-century Japanese bamboo sculpture.

Artwork from the collection is displayed at two dedicated venues: Art House in Santa Fe, and Orange Door in Chicago. Light / Space / Code was presented at Orange Door in Chicago from 2014 to 2015, simultaneous with an exhibition of digital and light art, titled *Luminous Flux*, at Art House in Santa Fe. Recent artwork loans to museums and universities include the Art Institute of Chicago, Oklahoma State University, the Blanton Museum of Art and the Indianapolis Museum of Art.

Educational programming including school or museum tour groups at the Thoma Foundation can be arranged by contacting our staff.

For more information: www.thomafoundation.org