THE FIRST CIRCLE ARCHIVE

RADICAL HUMANISM

NATASHA CHUK + CLAUDIA HART

Lynn Hershman Leeson, *Roberta's Construction Chart #2*, 1976
Chromogenic print, 22 15/16 × 29 5/8" (58.3 × 75.3 cm).

We Stand on their Shoulders

Maryanne Amacher

Ericka Beckman

Dara Birnbaum

Harold Cohen

Hollis Frampton

Lynn Hershman Leeson

Shigeko Kubota

Nam June Paik

Robert Rauschenberg

Lillian Schwartz

Michael Snow

Stan VanDerBeek

Woody + Steina Vasulka

Table of Contents

In the Beginning

Claudia Hart

I work in trans-media. This means that I produce 3D animation, and by using it as digital source material, I also make sculpture, paintings, prints, installations, and theater. The style of my art is a version of magic realism, meant to evoke fairy tales. But this is a story of disenchantment.

Part of my practice is to reflect on the media and its impact on broader social and historical forces. My artistic life runs along the tracks cleared by the internet. The upheavals the internet has engendered informs it; my relationships have been shaped by it. I searched it for friends and collaborators and found a community that I nourished by using it. The internet has also engendered and proliferated the explosion of new technologies initiated in America by WW2 arms production, which was expanded by the Cold War arms race that followed.

As a 3D computer animator, using its tools to produce everything else that I make. It all started when I saw the *Toy Story* premiere at the Berlin International Film Festival in 1995. I fell in love with its styling. I decided to learn how to do what Pixar did so well – to make uncanny artificial pictures. This style resonated with me, mirroring the artificial booming world of my American childhood – the world of Coca Cola, strip malls, and Barbies. *Toy Story* reflected the fake reality that I lived in. But strangely, it also reassembled my favorite period of art history, like the early Renaissance, when artists first adopted mathematical perspective, painting pictures that were eerie, with their cool, detached precision.

In the beginning, 3D animation required powerful computers only found in institutions. But as those things go, around the same time that I saw *Toy Story*, personal computers became more powerful and much easier to use than when they first appeared in the late 80s. It was the beginning of "user-friendly" operating systems. I got a Mac Powerbook 100 in 1991, a couple of years after Web 1 hit. Then, the Windows operating system arrived. I became a user, quickly addicted. It was clear! The internet and computers were about to change everything. I felt that real-fake 3D pictures like the ones that inspired me in *Toy Story* were iconic. So in 1996, I put money down on a powerful Dell personal computer. It cost $5,000. By the time I paid it off, the start of the millennium had passed, and Web 2 arrived. The knot was tied. Web 2 brought with it popular commercial email servers like Compuserve. I embraced it, and with it befriended my future husband, the Austrian media artist Kurt Hentschläger. He also had

e-mail! I'd found love, but with the internet, I also found my art in both form and content.

I track the simulacrum. When I started in the arts that meant 3D computational pictures. I considered them to be a new form of painting. But this was painting morphed,combined with sculpture and with photography in its way of making. I also thought of these kinds of iconic pictures as a new computer culture emerging in the shadow of the internet and of new user-friendly personal computers.3D pictures are hollow. Although they implement empirical, scientific data to model realistic effects, they are totally synthesized. They are not copied from a reality that you LOOK at. These are fictional pictures. Utterly imaginary. Nevertheless, computational pictures simultaneously represent our world as it really is, an empty world of hype, of branding, marketing, and misinformation. The world of advertising is one of desired outcomes rather than real ones. 3D synthesized pictures are fakes. Their reality is therefore fluid. They can be produced from scratch by a human using a computer. Or by taking a photo shot with a tangible camera then manipulated. Or more recently, they are fully simulated AI images. AI imagery can be produced even more easily than the other varieties of easiness before them. A user writes verbal descriptions. The computer sort of listens to those commands, roughly concluding its version of what is supposedly a literal description (but since language is also fluid, not so precise, limited, strange things happen). AI tools, unless customized, draw on their own histories. This means derived from pictures found online, the cultural memory of the internet. Whatever can be scraped. It is also necessarily biased. It takes what it can get. This is a memory filled with memes and funny cliches. Its tastes are populist: the best-of hits of the Western World.

I believe that pictures alter our cultural values and the consciousness of everyone. People everywhere are bombarded by computational pictures, a space of ultimate fluidity. With computers, reality flows, even fake ones. Pictures are easy to make, easy to erase, stretch, distort, and modify. And are therefore ultimately expressive.They reflect and modify our notions of being in the world, of time and by extension, of history. They also express the American creed, the ideology of innovation that drives the American version of consumer-driven capitalism. Very innovative! How great! The American Dream.

A long-gone famous artist once told me that my "problem" was that I couldn't tell the difference between a picture and reality. But isn't a picture all that reality actually entails? So computational pictures must necessarily have destabilized our cultural notion of it! In the first decade of

the millennium, I called this notion real-fake-ness. I wrote about it, taught about it, and co-curated exhibitions on it with the artist and author Rachel Clarke. I retired from teaching in 2023, so I don't have to do that for a living anymore, but I am still trying to decode what it is that computational culture has wrought.

At the moment of this writing in 2025, Donald Trump is president and in alliance with Elon Musk, the tech industry libertarian billionaire. Together they institute a radical regime change, one that erodes the freedom of the press and America, puts an end to the America-as-melting-pot project, and threatens martial rule. This moment also metaphorically marks significant digital transformations. Of crowdsourcing into mob rule. Of political debate into a 24/7 internet stream of marketing and recriminations. From Web 1, to Web 2, to the internet's latest iteration as Web 3-AI, I have seen in its various transformations also the transformation of my youthful ideals. From gender fluidity as a symbol of personal liberation, into fluidity restaged as propaganda, misinformation and lies, now wielded by a federal/corporate/tech alliance.

My response to this evolving context was to invite the media theorist Natasha Chuk to collaborate with me on the *First Circle Archive* in the spring of 2024. *The First Circle* began as a proposal for an archive. I thought of it as a search for my own artistic identity. I never went to art school, and as a result, was alienated from my peers. As I approached my 70th birthday, I decided to ameliorate this problem. I began by making the rubric below, based on my own life and artistic practice in the broadest sense. Natasha and I then began an extensive series of interviews and studio visits. We did not know where it would lead. In the end, we were surprised by the coherence of the group of 36 artists that are now part of the archive. In addition to being digital pioneers, we all share a common attitude, one that Natasha and I call "radical humanism," and what I feel is an attempt to break the technocratic and logocentric by bringing those tendencies back to the body. What follows are our stories.

The Rubric is a set of rules that I created as a kind of cultural paradigm, and in so doing, discovered my own relationship to a broader media art history. It is also my origin story.

The Rubric

1. The artist was born between 1945-1960, is still actively making work, and in so doing, is an artistic expression of the American post World War II culture.

2. The artist is not a professionally trained engineer or a trained computer scientist and is self-taught. The artist does not produce "scientistic" work, meaning art extolling scientific method, does not deploy data visualization, is dominantly logocentric, or adopts the strategies of applied science.3. The artist started with some form of analog media and reoriented when computers became available, finding them significant, as expressed in the interrelated form and content of their work.

4. The artist embraces imagery that is expressive, figurative and representational.

5. The artist was creatively working with computing, from 1995-2005 (or before), when personal computers transitioned from open-source, Unix-like operating systems (such as Linux), to those created for the more user-friendly Windows or Mac OS. This period also marked the transition to web 2.

6. The artist created work that is discursive but not documentary, and that reflects on the impact of technology on culture and human consciousness with the intention of reimagining art under its influence.

The First Circle of artists includes:

Adrianne Wortzel
Annette Weintraub
Chico MacMurtrie
Claudia Hart
Copper Frances Giloth
David Rokeby
George Legrady
Grahame Weinbren
Guillermo Bert
Jennifer Steinkamp
Jim Campbell
Joan Truckenbrod
Jordan Crandall
Joseph Nechvatal
Julia Heyward
Keith Sanborn
Kurt Hentschläger
Les LeVeque
Leslie Thornton
Lev Manovich
Lorna Mills
Lynn Hughes
Mark Klink
Michael Rees
Nancy Burson
Nina Sobell
Paul Wong
Peggy Ahwesh
Penelope Umbrico
Perry Hoberman
Ricardo Dominguez
Tishan Hsu
Toni Dove
Ulysses Jenkins
Wenyon & Gamble
Will Pappenheimer
Wolfgang Staehle

Adrianne Wortzel

Adrianne Wortzel, *Cretaceous Colorado*, 2007
Video, Steel vessel, Digital Video Photo Frame Tablet, Steel hardware, 12 x 7.5 x 4 in, Infinite but each repeated loop is 13:12

An archeological artifact in the form of a steel vessel which, when opened revealing rare footage of the cretaceous indigenous creatures roaming the ancient seas of Colorado.

My engagement with computer technology in my art practice began in the early 1990s when I was a student in the MFA Computer Arts Program at the School of Visual Arts. SVA admitted me to the program solely on the merit of my paintings. Oddly enough, these paintings were made by flinging small particles of paint on canvas, akin to pixels, to "build" ancient architectural forms in two dimensions. In this system, three-dimensionality appears only through spattered chiaroscuro. Prior to that, my closest experience with automation was word processing at a console the size of a mainframe.

My watershed moment came with the introduction of the first text browser: LYNX. At a screen with my cohort of sterling peers, we looked on in wonder as one of us clicked on a hyperlink and it took us THERE, like the Polar Express. There have been many more technological moments like this before and since, some providing more profound changes to our culture and science, but this particular phenomenon sparked my computer origin story, and I hark back to it now as the Wild West.

I was inspired by the prescience of Ted Nelson's Xanadu – a hypertext system before hypertext was possible, and Joseph Weizenbaum's linguistic tour-de-force scripting of ELIZA, kidnapped as a serious therapeutic tool.

Another inspiration was The Mercury Project, led by Ken Goldberg (1994). In waiting for one's turn to tele-operate a robot participating in a faux archaeological dig, one not only "went" there, but the power to "act there" was made accessible ubiquitously.

When Mosaic, the first visual browser, was introduced, it was gratifying to take it into the future by depicting a "futuristic" web browser experience. I did this in the now defunct Macromedia software, simulating impossible WWW programming feats that are now ho-hum. It was this kind of duality, a bird's eye view simultaneous with enraptured immersion, that became prevalent in all my work that followed. I was at home in the realm of pluralistic anxiety. The right way, the righteous path, was random access which validated Any Way, Any Entry, Any Path. I thought this was literary democracy as well as a system that matched my mind.

Adrianne Wortzel

Adrianne Wortzel, *SEE NO EVIL*, 2021
Iris Cloth Cover, 100#T Cougar Opaque Paper, Bookmark Tassels, Handsewn Signatures, Samsung Galaxy Tablet, 11.5 x 9 x 1.25 in.

A 21st Century secular book of hours, featuring a biographical text chronicled by a fictive, anxious, urban person, includes 165 pencil drawings inspired by Albertus Seba's Cabinet of Natural Curiosities, algorithmically placed over the text to create unique *readings in the twenty volume series.*

I was enthralled by the serendipity of particles coming together and splitting apart and at fusion, becoming more than the sum of their parts. Computer technologies made magic by juxtaposition: by the sequences of two states -- 1s and 0s. This confluence of opposites, put to proper purpose, paralleled my interest in collaborations between unlike minds, Lovelace/Babbage, Lamarr/Antheil, Laurel/Hardy.

Such a bipolar paradigm, along with its cousin: Boolean Logic, accounted for anything and everything. Adjacent and dual symbols, and the resulting complexity, did not require abundance. But that was then, before the inevitable clutter and noise set in to create the biggest rave in communication history.

Computer technology allowed for new interior and exterior worlds replete with strategies for dramaturgy. I did work in MOOs (object-oriented multi-user dungeons), acting out through virtual text-based avatars in theatrical scenarios. This fueled my desire to create "real" clunky avatars, mechanical avatars embodied in engineering, and sparked 20+ years of working with robots as character actors. I created stories played out in many circumstances: theaters, virtual venues, robots and telerobots travelling the streets like troubadours, in museums as performance productions, inside the belly of bridges as archaeological archivists, and embedded in artificial intelligence laboratories as Darwinian creatures.

These experiences resonate in the work I do today and will persist moving forward. Today, computer technology persists in my art practice as a facilitator of the code it processes. This is particularly evident in my algorithmically produced artist books, which randomize clusters of text for perpetually new readings and initiates an augmented reality experience. In another genre, Morse Codex is a series of 95 round and rectangular panel paintings spelling out the seven deadly sins in Morse Code. There is no computer usage, just a hats-off to the language of early communication codes.

My interest now lies in our relationship to why and how technologies are sparked, the protocols and strategies for their development, and sustaining the tenderness and deployment of imagination on the bright side of human endeavor.

Annette Weintraub

Top:
Annette Weintraub, *Sampling Broadway: Pandemonium*, 1999
Website. Panorama created in QTVR, RealityStudio and LivePicture plugins. GIF animation and QuickTime audio.

Bottom:
Annette Weintraub, *Sampling Broadway: Pandemonium*, 1999 (detail)

My visual default came from years of being a painter. Art school formation before computer technology was available was richly centered on space and color for traditional media. I also had a techy side—I loved math, including geometry and algebra, which was considered really weird for a teenage girl.

As a graphic designer, I was introduced to computers in the early 1980s through *U&LC*, the magazine of the International Typographic Company. *U&LC* promoted the coming changes in design and type and predicted the mass disruption of these industries. When I started university teaching in 1983, I was charged with converting a program amusingly called 'commercial art,' to the incoming technologies. In 1984, I installed an early IBM paint system (EASEL) and then set up a lab with the first Macintosh and early-generation scanners and printers. While I was hooked, I didn't immediately see how to integrate this into my practice, and it took some time before the transition felt right. At the time, I was working on multi-panel paintings that explored decorative architectural elements and situated these elements in a stage set space. The paintings (11x13 inches) were shown in grids of 9, 16 and 25; collectively these paintings articulated a grammar of ornament.

With the arrival of the first color Mac, the Macintosh II in 1989, I started making digital images. I was drawn to the luminous additive color of the computer screen, which related to the intense coloration of my architectural paintings. My first images consciously replicated the paintings. I began with scans of black and white crayon drawings and then in Studio8 software (8-bit), added layers of incandescent color. Drawing was limited with a mouse, but the images were vibrant. Next, I engaged directly with the limitations of the software. I worked in black and white, combining scanned photographic fragments and overlaying the dithered patterns that were a feature of early paint software (lines, grids, bricks, dots). These were stand-ins for levels of gray and referenced the underlying pixels. I progressed from small laser images printed on rag paper to large tiled and laminated laser prints (31x47 inches) to bypass the limited output options. *Disintegration/Reconstruction* (1991-2) celebrated the visual dynamics of urban space and the constant construction and destruction of the city. Then, inspired by the artificial light of Las Vegas, I returned to color and made large, tiled and laminated wax-based color prints in the series *Night Light* (1993-4), incorporating not only images but fragments of signage.

Annette Weintraub

Top:
Annette Weintraub, *Contested Spaces, Myrtle Walk #8*, 2018
Panoramic website: audio/ambient sound, continuous horizontal scrolling. Cinema4D, Photoshop, Audacity, Javascript. Print version: 7x92 inches.

Bottom:
Annette Weintraub, *Contested Spaces, Myrtle Walk #8*, 2018 (detail)

Everything changed in 1994. I saw an image of Hiroshige's *The Great Wave*, slowly loading line by line in Netscape 1.0 on a colleague's Ethernet-enabled computer and embraced the web as a new platform. My first web work, *Realms* (1995), managed connectivity limitations by pairing a simple text and image. I started writing HTML. My work expanded from the purely visual and somewhat formal, to storytelling and thematic interests (the dynamics of urban space, sense of place, how memory is embedded in geography). The web works that followed, including *Sampling Broadway (1999),* shown at the Whitney Biennial 2000, extended my work into animation and audio. For *Sampling Broadway,* I stood in insane oncoming traffic on Broadway (Houston Street, Canal Street, Park Row) and shot 360° panoramas using a first-gen Nikon digital camera and a panoramic tripod head. The panoramas were compiled into QTVR movies using proprietary plugins (no longer supported); the viewer triggered the audio and GIF animation via hotspots. I was interested in the totality of simultaneously reading, hearing and seeing.

Fast-forwarding eighteen years, I returned to the panorama in *Contested Spaces (2018)*, integrating 3D models, photographic fragments and ambient sound and using Javascript to make continuously scrolling panoramas that recreated meditative walks in my studio neighborhood.

As painting was a default way of looking at the world in the past, digital media is my default now. The way I see is shaped as much by 3D modeling as it was previously by painting. Sometimes I see an object as it would appear as a low-polygon 3D model or find myself observing space or light the way I do when I'm working in a virtual environment!

Chico MacMurtrie
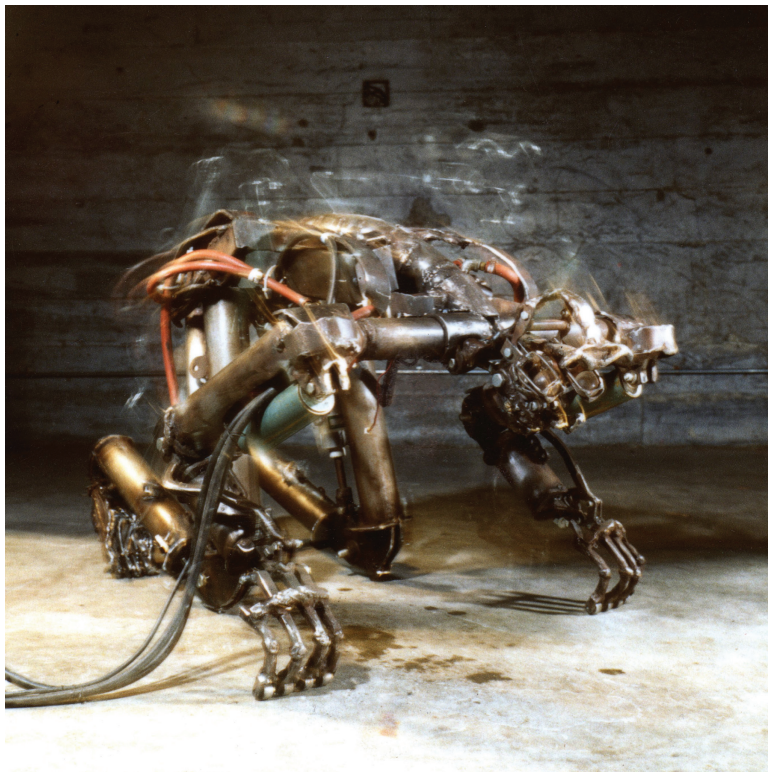
Chico MacMurtrie, *Tumbling Man*, 1989 - 1991
Steel, pneumatics, computer controlled telemetry suit for interactive control. 6 feet tall by 2 feet wide fully extended, 250 lbs.

In 1982, I began working with film, eventually completing *Ollin*, a four-cycle film series combining animation, performance, and puppetry. The puppets ranged from large-scale figures that I controlled with my body to miniatures that were puppeted within the films. Through this process, I discovered how animation could transition into mechanical systems.

My first machine exhibition was my thesis show at UCLA in 1987, where an engineer friend built a controller with a timing system triggered by motion sensors to control six machines. The centerpiece, *Ollin*, was a 30-foot machine that "swallowed" audience members upon entry. Once inside, they could trigger its four cycles—the films embedded in monitors that served as the machine's eyes and memories—or interact with other machines in the installation.

I integrated computers into my practice because I wanted to bring the dimensionality of my films into physical space, merging my previous experiences in dance, theater, and performance into a new media installation. As my work evolved into machines, collaborating with computer programmers allowed me to create a more immersive, total art experience.

After creating over 300 robotic, mechanized metal, and inflatable pneumatic sculptures either as live performances or as installations, I continue to rely on computer automation. My soft-machine practice and research in soft robotics have evolved alongside the ongoing robotics revolution.

I moved to San Francisco in 1987, then the epicenter of machine art. There, I met artists building machines and programmers interested in exploring creative applications for code. Many of these programmers, bored with their day jobs, attended machine art performances and sought collaborations with artists.

I met Ned Kahn, an artist working at the Exploratorium, who introduced me to a dream team of engineers eager to help bring my ideas to life. I showed them two of my earliest machines—a sculpture called *Primitive Squatting Man* and another work entitled *Tumbling Man,* which I consider to be the grandparent of all the robots that followed. The head engineer handed me the key to his toolbox, and the rest is history.

I found myself in residence at the Exploratorium, equipped with a budget and a team to develop my first outdoor machine-art performances. Using a radio-controlled suit, I was able to animate *Tumbling Man* through the movements of my body, all made possible with computer interfaces.

Chico MacMurtrie

Chico MacMurtrie, *Border Crossers* performance at the US/Mexican Border wall, Naco Arizona, Naco Sonora Mexico, 2021
High tensile fabric, pneumatics, batteries, air pumps, radio-controlled computer interfaces, Electric motors, steel rubberized wheels. 18 feet 6 inches tall by 30 feet long by 55 inches wide, on each side of the border.

These performances quickly gained attention, drawing hundreds of people. More importantly, they attracted a network of coders who would collaborate with me for the next 30 years.

Inspired by my 1987–89 residency at the Exploratorium, I founded **Amorphic Robot Works (ARW)** in 1991. It has become a constantly evolving collective of artists, engineers, and scientists, all exploring the potentials of machine movement, intelligence, and responsiveness. Our shared goal is to create robotic and interactive sculptures as reflections on the human condition.

Over the years, ARW's technology has evolved from repurposed circuit boards and early machine languages to complex servo control systems, vision systems, and dual redundant ladder logic systems. Often, we developed new tools and techniques alongside the sculptures themselves. By 1992, my collaborator, Geo Homsy, introduced the first multi-channeled, MIDI-controllable computer system. Our bipedal and quadrupedal machines, typically constructed from metal frames with pneumatic muscle systems, were inspired by the mechanics of human and animal locomotion. By the mid-1990s, ARW had produced hundreds of kinetic machines, forming a *Machine Society* parallel to our own.

While I was focused largely on creating robotic sculptures out of metal for the first decade, since 2000 I have also been making soft **machines**, using handmade inflatable components and high-tensile Tedlar fabric.

Using computers has allowed me to draw out the machines' capacities for movement, gesture, expression, and sound as an echo of the living body. Routine human motions hold immense expressive power and fluid topological shifts—like a face resting in a hand, skin gliding over relaxed muscles. I am drawn to the organic movement and the transformation of sculptural forms.

Computers have an important functional and, to a lesser extent, aesthetic element in my work. I have always feared they would one day control human society. My most recent soft-machines, the *Border Crossers* and *Dual Pneumas,* are metaphors of living systems and entities encouraging human-machine interaction in ways that run opposite to corporate and military technologies that surround us. They offer an alternative vision of robotic sentience — with the machine appearing vulnerable and ephemeral as it transforms through a sequence of motions. They strive to achieve simple gestures or actions as if searching for basic dignity or a sign of their existence.
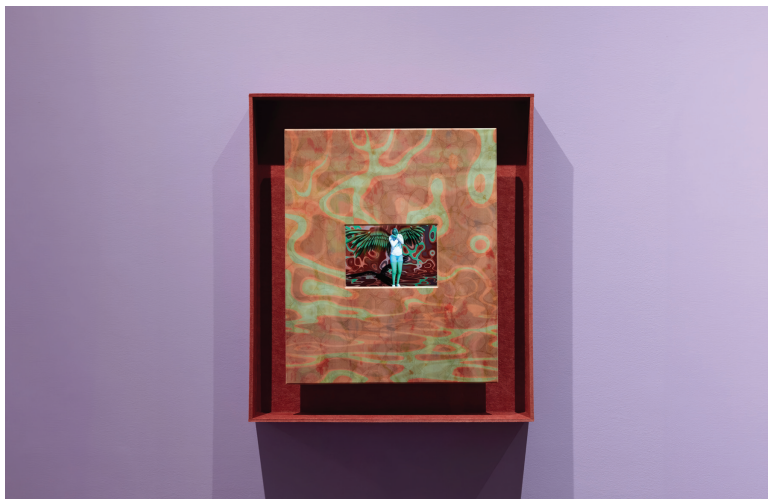
Claudia Hart
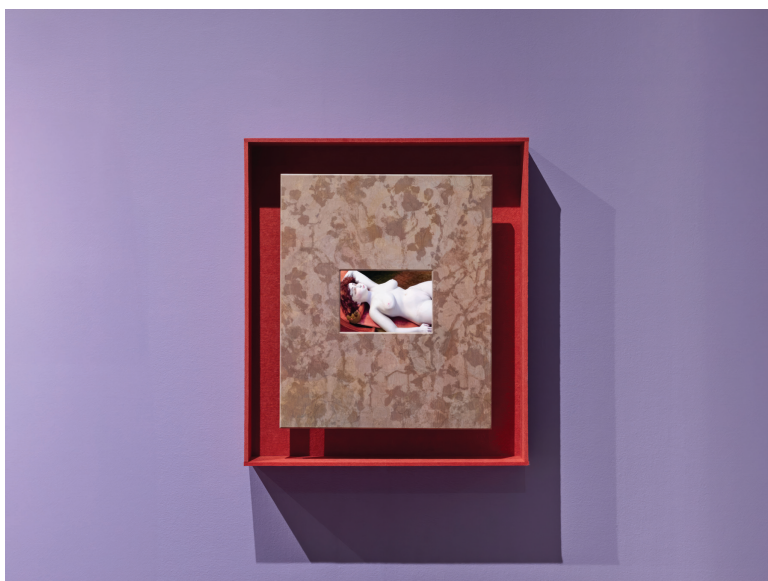
Top:
Machina (animation), 2002, editioned.

Bottom:
Machina (Illumination), 2002-3/2025
3D animation, media player, 5.5in x 8 in monitor, pigment suspended in resin, acrylic paint and varnish, ash wood, felt 20 X 24 x 10 in., editioned.

It all started when I saw the Toy Story premiere at the Berlin International Film Festival in 1995. I fell in love with its styling. I decided to learn how to do what Pixar did so well – to make uncanny artificial pictures. In the beginning, 3D animation required powerful computers only found in institutions. But as those things go, around the same time that I saw Toy Story, personal computers became more powerful and much easier to use than when they first appeared in the late 80s. It was the beginning of "user-friendly" operating systems. I got a Mac Powerbook 100 in 1991, a couple of years after Web 1 hit. Then, the Windows operating system arrived. I became a user, quickly addicted. It was clear! The internet and computers were about to change everything. I felt that real-fake 3D pictures like the ones that inspired me in Toy Story were iconic. So in 1996, I put money down on a powerful Dell personal computer. It cost $5,000. By the time I paid it off, the start of the millennium had passed, and Web 2 arrived. The knot was tied. Web 2 brought with it popular commercial email servers like Compuserve. I embraced it, and with it befriended my future husband, the Austrian media artist Kurt Hentschläger. He also had e-mail! I'd found love, but with the internet, I also found my art in both form and content.

Machina (2002) is a 3D animation that compresses painting's time and space into a dreamlike narrative. Featuring a character whose slow, drowsy movements capture the nuances of a single moment, the piece uses advanced virtual reality techniques to create a sensual, organic representation. Inspired by Titian's Venus and Baroque painter Peter Paul Rubens, Machina introduces sensuality into the virtual realm, with the character occasionally opening her eyes to engage the viewer's gaze.

Claudia Hart

Fallen Angel: Bertile (Illumination), 2024/2025
3D animation, media player, 5.5in x 8 in monitor, pigment suspended in resin, acrylic paint and varnish, ash wood, felt 20 x 24 x 10 in., editioned

All photography is courtesy of bitforms gallery, New York, by Flaneurshan.studio

Bertile. Father was Trialia, of the Lost Pod, Mother was a crocodile. Suffers for us.

Fallen Angels are fictional beings crafted by the artist as part of a mythology of children from an imaginary lost "Pod" of Archangels who live at the bottom of the ocean. There are seven Archangels in Hart's legend that have all had the misfortune of falling in love with beings who are not angels, but other species. As a result, they have found themselves banished to the ocean depths, but not before fathering the Fallen Angels, who are advanced beings with special gifts. Fallen Angels were performed live by Claudia Hart and Eva Davidova, motion-captured. *Bertile* was performed by Eva Davidova.

Copper Frances Giloth

Copper Frances Giloth, *A Bird in Hand - 7*, 1983, 29" x 21 ", plotter drawing on rag paper.

The plotter drawing "Bird in Hand - 7" is part of the Wisconsin Series. It started with my experiments using the ZGrass UV-1 computer and a video camera connected through a video digitizer. I captured a sequence of 16 consecutive images and chose four for the first layer of this drawing. Another group featured a cardinal. I then programmed the pen plotter to draw video by analyzing the raster image and drawing from left to right like a video scan (unlike the X, Y Cartesian coordinates typically used for plotter prints). Sending the drawing through the plotter for multiple passes caused the bleeding of both me and the bird, as the proverb of a bird in hand collapses the future.

I studied traditional figurative sculpture at Boston University. During my senior year, 1975-76, I had the opportunity to meet and hear Louise Nevelson speak about her work. MIT had just purchased one of her sculptures, *Transparent Horizon*. I was moved to hear how she was influenced by her father, who operated a lumberyard. It made me think about my father's work at Bell Labs and how he spoke about the development of new technologies. At that point, I had two goals: to make art and to support myself.

Seeing Louise Nevelson's work inspired me to move away from the figure, so I enrolled in a free MIT seminar on welding techniques. The seminar covered both theory and practice and was quite advanced for me. I learned about different types of welding, and the instructor mentioned that the General Dynamics Shipyard in Quincy, MA, was open to hiring women. I applied, got the job, and began classes with a woman who had been a welder during World War II. I was thrilled to have a job related to my art practice and to learn from a real Rosie the Riveter! Along with one other woman trainee, I was assigned to a team of welders. My boss used to call me "Miss Lovely of the Springtime." Oh well. The project at the shipyard involved building the hulls of the 1000-foot LNG (Liquid Natural Gas) tankers. These are the ships that dock far from ports because if they explode, it's bad!

One day, while getting new protection filters for my mask, I walked past the site where they were cutting metal pieces to make the steel sections I had been welding. I stopped to enquire , and was told that it was a computer-controlled flame cutter programmed to precisely cut shapes. These shapes were then welded together into the steel sections on which I was working. In passing, I thought some of these sections looked like Louise Nevelson's sculptures. This is the moment when it clicked. I wanted to make sculptures with these laser cutting machines.

My boyfriend at the time was at MIT, and he said I would have to learn to program a computer. OK, maybe.

At the same time, my older sister said we could travel to Egypt and Africa in the fall, if I could earn enough money. Since one of my other influences was Egyptian sculpture, I decided to go for it. I quit my welding job in early September, and we left. When we arrived in Egypt, I was stunned by the massive ancient figures and beautifully painted narrative drawings; I had not fully appreciated the contrast in ancient Egyptian art between the flat, colorful narratives and the immense solid yet subtle sculptures.

Copper Frances Giloth

Copper Frances Giloth, *Immersive Virtual Reality: Labyrinth of Fables*, 2010-2020

In 2010, I discovered the former site of Louis XIV's 1665 Labyrinth at Versailles, once adorned with 39 fountains illustrating Aesop's fables. Inspired, I created a virtual reality reconstruction, starting with a GPS-based ARIS app and evolving into a Unity project made in collaboration with Jonathan Tanant. In 2019, we started using HTC Vive for immersive realism. Granted access to the Versailles archives, we photographed 39 fountain remnants to create 3D models using photogrammetry.. The final models are displayed in a virtual model of Labyrinth.

Eventually, we arrived in West Africa, where we spent much of our time in the markets. It was there I saw the simple, beautifully crafted bowls and plates used by the families we visited. I made a connection. I wanted to create artworks that were functional and accessible, and clearly rooted in my culture. I also decided that the most utilitarian tool I could use would be a computer; I was now ready to learn to program.

I returned to Chicago, enrolled in a Fortran programming course at University of Illinois, Chicago. It was the last class ever offered there to use punch cards for programming. My first program was about 10 lines long and had at least 30 errors. I improved and realized that the structure of a program worked the same way as an armature did for my figurative sculpture. My professor said that I was the first artist he had in his class and suggested I take more courses. I took Assembly language and another Fortran course, and then was accepted into the Electronic Visualization MFA for the Fall of 1978. I never looked back. I had no idea how I would integrate the computer into my practice; I just believed it would happen, and it did.

As I reflect, I see my connections to Louise Nevelson's abstract shapes and Egyptian narratives, but also to short stories (especially by Somerset Maugham), the humor and flatness of Paul Klee drawings, the videos of Martha Rosler, and to feminist ideologies in general. My love of books AND pictures came together in the animations and drawings I made with a computer as a graduate student and continues to this very day.

David Rokeby

David Rokeby, *Very Nervous System*, 1983-1991
Video camera, computer, synthesizer, custom interactive software; dimensions variable.

Very Nervous System on the street in Potsdam 1994
The artist interacting with the Very Nervous System installed on the main pedestrian street, Potsdam, Germany, 1993. Using computer vision and algorithmic composition techniques, it creates music in real-time, interpreting and accompanying physical movements.

I first started playing around with computers while at high school in the mid 1970s. At the time, I explored Joseph Weizenbaum's ur-chatbot *Eliza* and programmed on the weekends and during the summer for a local engineering company. I had a natural feel for writing software, and the experience I had accumulated put me directly in line for major software engineering positions at the age of 19. But then I took a bunch of left turns... back towards the visual art and music that had equally engaged me in high school. I lived in a loft, worked as a waiter, and landed at the Ontario College of Art in 1981 which, unbeknownst to me, happened to have a tiny department called 'Photo-Electric Art' headed by an acolyte of Marshall McLuhan. There I could take courses like 'Programming for Artists', 'Cybernetics for Art', 'Art in Motion', and the like. It had not really occurred to me at that point to combine my interests in computers and art, but OCA was a perfect environment in which to explore this possibility. We built Apple II clones and programmed them in Basic or Assembly Language. There were no frameworks or libraries to work with, so you had to create everything from scratch. For speed, I wrote everything in Assembly Language, which is a bit like creating sculptures out of atoms.

As I sat at my computer in my studio (where I was also executing some very bad painting), I found myself thinking a lot about the way that my body felt uncomfortable – almost inconvenient – as I sat painstakingly writing programs. I felt the urge to find a way to invert this relationship, to find a way to create a situation where the computer allowed me to more fully experience and embrace my embodied experience. Through many fits and starts, this led to the creation of *Very Nervous System* (1982-1991), a system where a computer responds in real time to your body movement with music.

David Rokeby

David Rokeby, *Hand-held*, 2012-2016
Interactive installation: depth sensors, video projectors, computer, custom interactive software; 4 meters x 4 meters x 3 meters.

Hand-held presents an empty space filled with an invisible 3-dimensional volume of images. Images and texts reveal themselves on the surface of a user's open hands, changing as a user's hands move up, down, forward, back, left, right.

Of course, if I really think about it, this 'memory' is partly fiction. Another 'truth' would be that I started playing around with body-based interaction before incorporating the computer into my work. I was etching circuit boards to allow me to use light-dependent resistors to control parameters of an analog synthesizer to respond to shadows cast by movement, and I was pretty bad at the messy etching process. I kept having new ideas and had to make new circuit boards for each new direction. It was very frustrating. I realized that the computers that we were building at the school should be able to replace these circuit boards with what was essentially a reprogrammable circuit. And this maybe is truly the story of the advent of my use of computers in my artwork.

I have continued to use computers in my work ever since. In the intervening time, computers have gone from something very few people had direct daily experience with, to something a vast majority of us engage with for hours every day. This has added social, political, and psychological dimensions to my initially very personal exploration. But my interest in the disjunction between computation and embodiment persists as the strong guiding force behind my work up to this day. A decade later, in the work *Hand-held* (2012-16), I explored the spectre of tactility in our digital connections and engagements. And, in addition, in the thirty-five years that I have been exploring artificial intelligence, I have also been trying to get a real intuitive grasp of what it means to think about and create and live with 'intelligences' that are profoundly disembodied.

George Legrady

Loch Ness *researchers now say* this 1934 picture was faked

George Legrady, "Loch Ness", from the *Equivalents II*, 1993
Custom Software, Ink Jet print. Variable scale.

A text photo caption from the New York Times was parsed to get numeric values which were used to shape the abstract composition of the cloud-like image realized in custom software. It is an early study in text-to-image generation, to explore how language could shape visual form.

My background is in a conceptual approach to photography. I transitioned to computing from large format photography where I created images to study the syntax and visual semiotics of the photographic image. Through a chance encounter with the AI artist Harold Cohen in 1981, I was given access to use his mainframe facilities (DEC PDP-11) in his UCSD studio for a number of years prior to desktop computers. I learned Unix and C language on his system.

Just prior to meeting Harold, I produced a double spread commission titled Artificial Intelligence for a special issue on photography for the art theory journal Parachute in 1981. In this work, the intent was to model the ELIZA conversation as a way to give viewers the possibility to imagine the color of the objects in the black and white photos. I was very much seduced by the power of "executable language," You write a piece of code, and it does it!

George Legrady

George Legrady, *VOS4 (Screen capture from Voice of Sisyphus)*, 2012
Inkjet print on Hahnemühle Bright White paper. 12" H x 16" L.

Voice of Sisyphus is a time-based study of a single photograph, that is continuously filtered by a custom software in different ways. The audio composition is created out of the real-time filtering of regions in the photograph and the sampling of pixel clusters which are turned into sound.

My research and practice are based on the study of how image-generating machines such as cameras, computer imaging systems and software inadvertently redefine the data they process, and how this affects the content and meaning of the images, objects, and time-based media that these image-generating machines produce. I am also committed to creative coding as an artistic authoring practice. Trained in classical music as a child, the idea of mathematical coding (music notation) by which to generate an aesthetic event/expression was ingrained early in life.

Grahame Weinbren

Grahame Weinbren, *Sonata,* Interactive cinema installation produced 1991-93, exhibited internationally 1993 - 1998

Three Pioneer LD-6000A Laserdisc players with videodiscs (Videodisc materials: 90 min 16mm film & 300 35 mm slides and stills transferred through SD video to 3M Laserdiscs), MS-DOS 386 computer w/ specialized boards and peripherals, Crosspoint Latch 6119 analog video switcher, Carroll touch frame (suspended), Monitors and Speakers, Architectural installation materials (various), displaying three interwoven cinematic narrative-streams, based on texts from: Tolstoy, Freud, and the Apocryphal Book of Judith, navigable by pointing through a picture frame enclosing embedded infra-red sensors.

Image 1: Tree with Wolves and Chows, based on the dream of Freud's patient known as "the Wolf Man."

It is 1981. They show me a videodisc. They explain what it is and how it works. And I realize that the language, the possibilities, and the significance of cinema are changed forever.

The museum architecture firm, Ramirez and Woods, won the commission to design the US Pavilion of the 1982 World's Fair. Their proposal included the first public displays of touchscreen interactive video installed throughout the exposition. They engaged a team of recent MIT graduates to manage the technology. Since the job of UI designer didn't yet exist, the firm looked for an unusual film editor to take on the development of the interactive video stations. I was hired.

In partnership with Roberta Friedman, I'd been making 'avant-garde' films since the early 70s, seeking fresh ways to structure cinematic time while addressing real world issues. My day job was as a freelance film editor.

Videodisc is now an outdated vinyl disc the size of an LP. It stores data as rings of variable microscopic pits converted to images and sound as the disc spins, one frame per ring, fifty-four thousand sequentially numbered rings per side, to display thirty minutes of video or any number of still images. Instead of having to transit frames sequentially—the serial access required by videotape or film—with a remote controller, the videodisc can immediately display any frame as a still or starting point of a moving image clip. So image sequences can be determined at the time of presentation. This is significant. The filmmaker becomes the designer of a map of video trails for the viewer to explore.

Grahame Weinbren

Grahame Weinbren, *Sonata,* Interactive cinema installation produced 1991-93, exhibited internationally 1993 - 1998

Image 2: Judith of Bethulia / Sophia Tolstoy with Wolf

I decided to pursue the technology I learned on the Knoxville job (what is the Knoxville job?)as a continuation of my experimental film work on non-linear cinematic structures. The resulting interactive cinema works are composed of film sequences as brief as a fraction of a second or as long as twenty minutes. I designed paths through the array of sequences, each of them containing multiple connection points. Through a continuously active interface, any user interaction produces a logical change—i.e., every interruption results in a "good" video edit or transition, including audio changes and text additions. It is not about choice. Viewers do not *choose* between alternatives—they explore a database of cinematic materials along multiple routes already laid out, the result of every interruption programmed, but not known in advance. It is like turning blind corners in a city without knowing what you'll find, but it's invariably relevant or interesting.

Our worlds are disorderly and disorganized, unrestricted and loose. Streams of perceptionand inner experience are interwoven with actions that impact on our immediate environment, generating new experiences. Time advances relentlessly while our consciousness staggers in and out of it, memories of the past intermingling with hopes for the future as we react to events of the present. Lived experience does not parcel itself into linear, closed structures, though we sometimes represent things that way in order to tell stories about ourselves. The five interactive cinema pieces I built between 1981 and 2006 each attempt to reflect a non-linear picture of life.

Guillermo Bert

Guillermo Bert, *Nalleli, Leading The People*, 2023
Installation view of a group of life-size Warriors, in the studio of the artist.

When I arrived in the United States from Chile, I studied fine art, but my dyslexia made precision tasks challenging. Fortunately, the early Macintosh computers arrived just in time and became my lifeline. I started using them from the very beginning, and they helped me land a job at a Spanish newspaper, allowing me to navigate the world of design without a formal background.

Over time, I began integrating computers into my art. They enabled me to plan and visualize complex projects, transforming my ideas into tangible installations with precision. From neon texts to intricate sculptures, the computer became my essential tool for shaping and executing projects across various media.

Now I use computers in many ways. For example, in my *Warriors* series, I scan 3D real-life characters, slice the models using architecture software, and cut them with a laser to create intricate sculptures. Augmented reality brings these sculptures to life, allowing viewers to hear the stories behind each piece.

This evolution reflects how computers have been pivotal in my journey, continually opening new possibilities for representing my ideas.

Guillermo Bert

Guillermo Bert, *La Bestia*, 2014
Textile with natural fibers & bar code, 36" wide x 60" tall.

QR code to the testimonial of a Guatemalan immigrant's harrowing journey by bus, foot, truck, and La Bestia from his hometown to Los Angeles.

Jennifer Steinkamp

Jennifer Steinkamp, *Impeach*, 2017
14 x 48 feet.

персик is Russian for peach. The billboard is located at 257 S Spring St, Los Angeles.

Photo Credit: Dino Zhang

In order to write this story, I pulled my copy of Gene Youngblood's 1970 book, *Expanded Cinema,* off my bookshelf. I doubt my destiny would play out the way it did without this historical document. In 1982 I was introduced to computer graphics at Caltech. At the time, I was a 24 year-old student at Art Center College of Design in Pasadena, and they had an exchange program with Caltech. I enrolled in a course called Video Art taught by Gene Youngblood. He showed us early computer animation and structuralist cinema. I was mesmerized by Hollis Frampton, Steina Vasulka, and Ed Emshwiller. One evening, while driving home from class, I experienced a satori enlightenment; light energy shot out of my head for what seemed like a minute. I had to stop the car. I knew this was significant, I knew I needed to pursue computer art.

The next day, I asked Paul Hauge, my Department Chair at Art Center. if I could rearrange my curriculum in order to help me focus on my new career interest in computer art. He recommended I drop out of school. I accepted his advice. Luckily, I have a knack for being in the right place at the right time, because I was quickly hired by a small computer animation company run out of a house in Hollywood called Campbell & Gericke. They hired me because I knew how to make storyboards. They had recently purchased a Hewlett Packard Desktop Computer from Bo Gehring and Associates, programmed in BASIC by Claus Schneider, whom they also acquired along with the computer. Not knowing anything at all, I learned how to make 3D wireframe models for commercials by changing lines of code in the BASIC program. I started to use their computer to make my own animated art.

I then enrolled at CalArts. Low on finances, I only stayed one semester. While I was there, I learned to use Cubicomp computers in a class taught by Vibeka Sorenson. After this I decided to move to New York in 1985. I worked at a computer animation company; we typed UNIX scripts in order to create rendered images. One of our clients recommended me for my first teaching job at Pratt Manhattan; they had a lab full of Cubicomp computers. After a couple years, I decided to move back to Los Angeles. I became a TA for Jim Blinn's computer animation class at Art Center. Jim Blinn is a computer scientist who invented many of the software tools we are now using today while he was at NASA's JPL. In addition, Art Center happened to have a couple early Silicon Graphics computers. Nobody knew how to use them; I taught myself, and I started teaching classes. It helped a lot to know UNIX from my previous job experience.

Jennifer Steinkamp
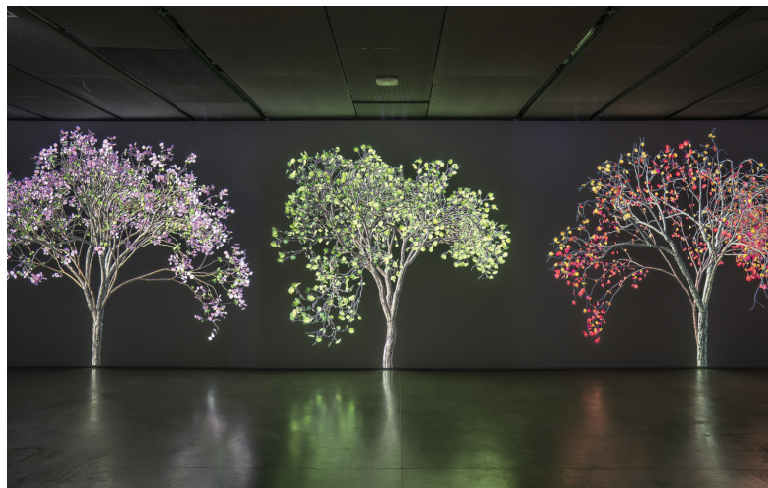
Jennifer Steinkamp, *Dervish*, 2004-2005
Size variable: horizontal: 8 - 12 feet high x 10.6 - 16 feet wide.

Espacio Fundación Telefónica, Madrid, Spain, photography by Jennifer Steinkamp

Art Center purchased more SGI computers; I was able to use this lab to make my early computer animated art with Alias Software, now known as Maya. I also re-enrolled as an undergraduate Fine Art major. I finished my BA degree and finished a Master's degree as well. In 1988, I exhibited my sexist slide show at EZTV Gallery projected on their Hollywood building. These were computer-modeled sexist phrases I overheard people saying. In 1989, I created a dual cross-town installation called *Gender Specific, presented* at The Santa Monica Museum of Art and Bliss House in Pasadena. From this point on, I became an installation artist working with computer animation and architecture.

The dimensional simulated world inside 3D computer graphics immediately intrigued me because I had never seen anything like this before. The 1980s were very exciting for computer software innovation. And now, with the eventual advent of quantum computing, AI and massive amounts of data crunching, the world is going to see changes far beyond what we now know. To quote that famous line spoken by Margo Channing, played by Bette Davis, in *All About Eve* (1950), "Fasten your seatbelts, it's going to be a bumpy night." !

Jim Campbell
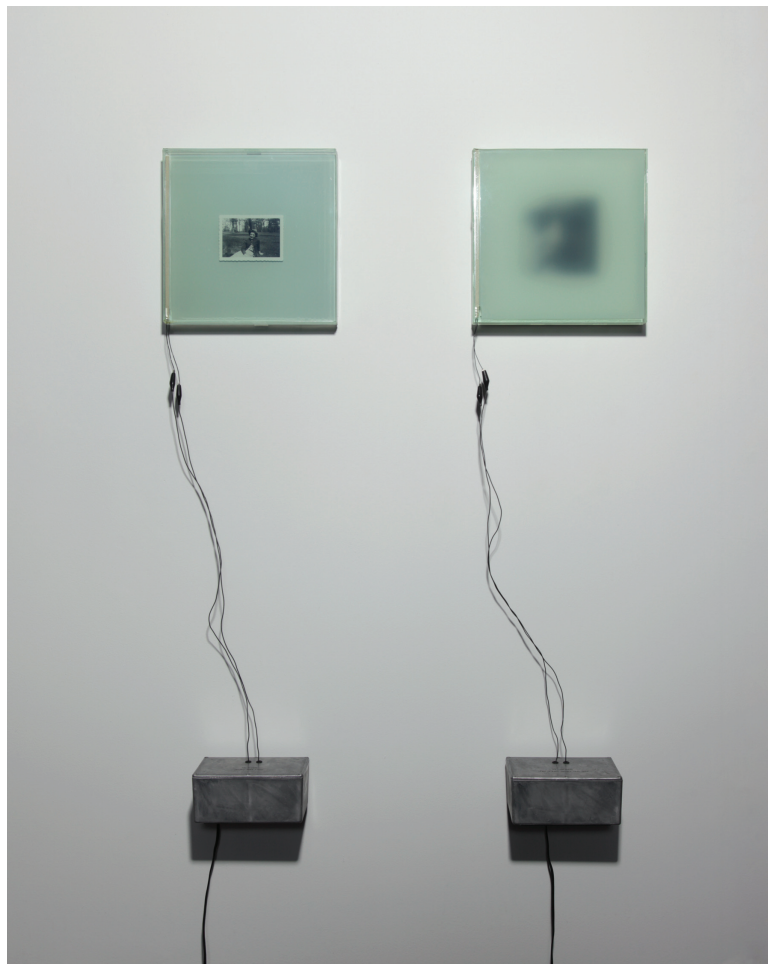
Jim Campbell,
Photo of My Mother, 1996; *Portrait of My Father*, 1994 to 1995
Custom electronics, glass, photograph, LCD material, 71 x 15 x 6 inches.

Portrait of My Father: A photograph of my father is visible for an instant and then disappears. This process happens over and over again at the rate of my heartbeat which was recorded over an 8 hour period one night while sleeping.

Photo of My Mother: A photograph of my mother slowly transforms from foggy to clear at the rate of my breath as digitally recorded for one hour, as though I am breathing on the glass in front of the photograph.

For 25 years I worked in Silicon Valley as a hardware design engineer creating algorithms that made video images clearer. Starting in 1983, I worked at Faroudja Laboratories, a company that specialized in video image processing intellectual property. What was unique about this company was that the working process was driven by perception. The image was everything. We worked backwards from the image, versus forward from a technique or mathematical algorithm. Our ongoing quest was to identify and eliminate the noise, artifacts and blurriness that get in the way (either by distracting us or by masking parts of the image) of seeing a moving image clearly.

Starting in 1988 and ever since, I've used what I learned from my day job to design custom electronics for my artworks. Early on, this allowed me to make works that at the time were impossible to create without custom hardware. Computers used to be very slow! Harder to describe, I also took from my job ways of looking at an image while simultaneously stepping back to look at my process of looking at the image.

Over time, I went from working full-time to working two or three days a month, making art for the remainder of my time. It was important to me to keep my work life and thinking process separate from my art life. I even had two different names: "Jack" (my legal name) at work, and "Jim" in the rest of my life. Left-brain Jack generated patents and right-brain Jim made art.

Two examples stand out from the things that happened at my day job that I brought into my artwork, one specific and the other more general.

The first artwork that I ever made was also technically the most complicated— trying to do something that, as far as I knew, had never been done before. I made three works that dealt with the theme of mental illness for an exhibition that I put together with a friend in San Francisco. For one of these works (*Interactive Hallucination*), I was trying to give viewers a first-person view of what it might be like to be mentally ill, by creating a live video "mirror" image of the viewers on fire.

Jim Campbell
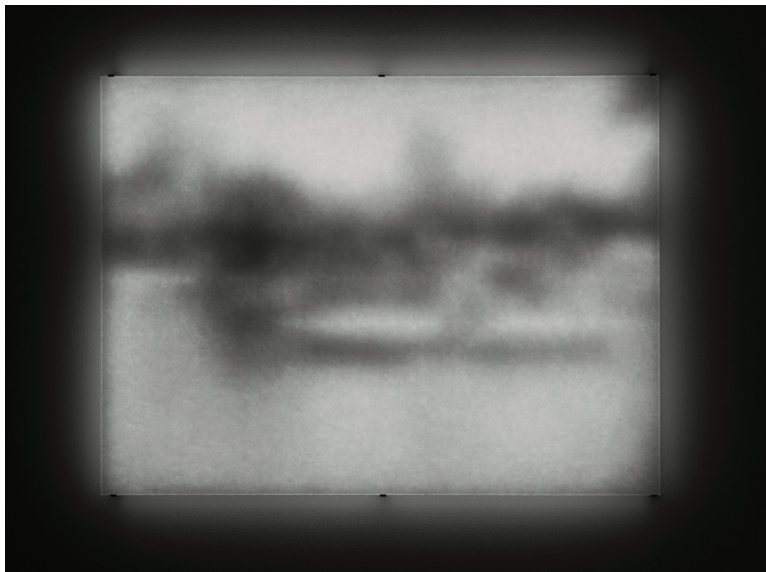
Jim Campbell, *Drift*, 2022
Custom electronics, 1,728 LEDs, treated Plexiglas, Kozo MM-2 rice paper, 33 x 44 x 2 inches.

Drift displays an image of a person in a rowboat. The distance between the camera and the rowboat slowly changes, making it at times hard to resolve the figure or even the vessel. Sometimes, all that is recognized is the movement of an oar. An LED panel is mounted on the wall and projects through a blank piece of textured rice paper mounted a few inches in front of the LED panel.

For this artwork, my technology needed to isolate the viewer from the rest of a live camera image. A blue screen or green screen was too artificial of an environment to create the intimate effect that I was looking for. In my day job ,we were working on time-based video noise reduction. One of the technologies we used for this process was a *frame store*, a device that stored a single video frame. We reduced video noise by averaging a sequence of video images in multiple frame stores.

I used this technology and methodology in a different way in *Interactive Hallucination* to create a live system that separated the viewer's image from any video background. I started by grabbing a freeze frame of the empty room. My system then compared this frozen image, pixel by pixel, with the live image, and superimposed flames onto any changes that occurred in the image of the room. These changes were the live images of the viewers (and their shadows) entering the frame, and the viewers then saw themselves on fire in the video image. Many of my works following *Hallucination* continued to incorporate frame memories, exploring simple analogies with human memory and time perception.

In the late 1990s, my day job (along with the rest of the media and technology world) shifted profoundly to thinking about moving images as data, as information. In 2000, my focus shifted from interactive viewer-driven artworks to exploring the presentation and perception of digital images. The works looked at how little data and how little information are actually needed to describe different types of meaningful and poetic moving images. In very low-resolution display devices, the digital structure and its content are inseparable. Viewers are invited to become aware of their perceptual processes as they try to resolve the contradiction of the physical digital structure of the display with the soft fleeting imagery that it contains.

Looking back at my day job and my art, at "Jack" and "Jim", it's clear that it wasn't really a split as much as it was a blur. In both, I was, and still am, more interested in how an image is felt than how it is seen.

Joan Truckenbrod

Joan Truckenbrod, *On Becoming*, 1984
Cibachrome Color Print, 30" W x 24" H.

Digitized image superimposed on live video, image captured from monitor in real-time.

The creative freedom in programming a computer to make a series of drawings underlies the trajectory of my artwork. Beginning in 1974, the potential of creating unique artwork by programming a computer was unlimited. I was creating a series of drawings by hand and simultaneously developing algorithms with subroutines that transformed variables to create sequential drawings using a pen plotter. For me, the variables in programming are like pebbles on the beach: each time the tide comes in, there is a new configuration of pebbles that disappears with the next pulse of tides. With an intimate connection to the natural world, my programs incorporated mathematical descriptions of natural phenomena in the environment that were palpable yet invisible - like wind currents and the light waves reflecting off irregular surfaces. These experiences were embodied in my pen plotter drawings.

For me the "raw material" of programming was *data*, which had no inherent artistic form and was malleable. The computer was a multidimensional tool with the potential for creating visuals, sound, animation and physical forms. In the 1980s, I developed a book about the multiplicity of modes of creative expression titled *Creative Computer Imaging*. Propelling my images out of the computer, I began to create textiles. It was important to inject a physicality into this process.

I received an Apple computer with matching grant funds from Apple in 1976. With the accessibility of this personal computer, I envisioned creating fiber artworks. These programs were time-based, displaying one image at a time on the monitor. To create the patterned sequence on fabric, I turned the monitor upside down on a 3M Color-in-Color copier with a backlight setting and made a color copy of each image in the sequence on heat-transfer paper. Each of the copies were trimmed to the image and hand-ironed onto polyester fabric. The experiences of the natural phenomena were embodied in the patterns on these "tapestries." The first and largest of this series, *Electronic Patchwork,* is 60 inches wide by 84 inches high, referencing computer patching of early computers and patterned quilts.

Joan Truckenbrod

Joan Truckenbrod, *Objectification*, 2002, Fiber Installation, 42" W x 54" H x 18" D.

Two textiles suspended from gallery ceiling 18" apart, Dye Sublimation, Foreground Image is on Polyester Voile, Background Image is on Polyester Charmeuse.

Using computers in my practice I created interactive installations, layered fiber artworks, and layered digital photos in which digitized images were superimposed over live video, and photographed off the screen. Programming on a Tektronix Raster Graphics terminal, I photographed the screen image that was communicated to the 3M Scan-a-Mural plotter to create large printed tapestries. The largest is 11 feet wide by 7 feet high, titled *Positive Parity*. It is in the collection of the Textile Department in the Art Institute of Chicago.

The unbounded nature of computer programming inspired my explorations into creative thinking.. I was developing sets of instructions, algorithms, and subroutines that were unique to my creative process, and creating personal sets of drawings. As the computer had no preconceived notion of artworks, I imagined a field of experiences that were possible to create using this process. I was not content to work "inside" of this virtual space of the computer, but was interested in creating artwork that mediated between the physical and virtual realms. Creating textiles, I materialized the abstract constructs created through programming. I wanted to create work that materialized the digital, injecting a tactility.

Programming became a powerful creative process as the ongoing and limitless transformation of the values in variables in the mathematical formulas that I employed created unanticipated changes from regular repetition to entropic and irregular fluctuations in patterning.

As a digital artist I continue to embrace digital tools, working at the threshold between parallel realms of the digital and physical, virtuality and materiality. This synthesis is unique, expressing a complexity of ideas, forms and materials. This includes digital Jacquard weaving, 3D scanning and printing, and laser embossing, which is closely related to textiles.

Digital Jacquard weaving is a paradox of rigid, linear thread forms and an extreme range of processes, structures and materials. I am currently working with a TC2 hand digital Jacquard loom from Digital Weave Norway. This loom requires a synthesis of analogue and digital programming to create textiles, unlimited in color, textures, weave structures and sculptural textile forms. The resonance of the original Jacquard loom is important to me because it inspired the design of the first computing device and the use of punch cards as the mode of communication. Textile forms are powerful as they reference potent roles in arts and culture, embodying rituals of passage throughout one's life from embodying rituals of passage throughout one's life – from birth, through changes in social roles, until death.
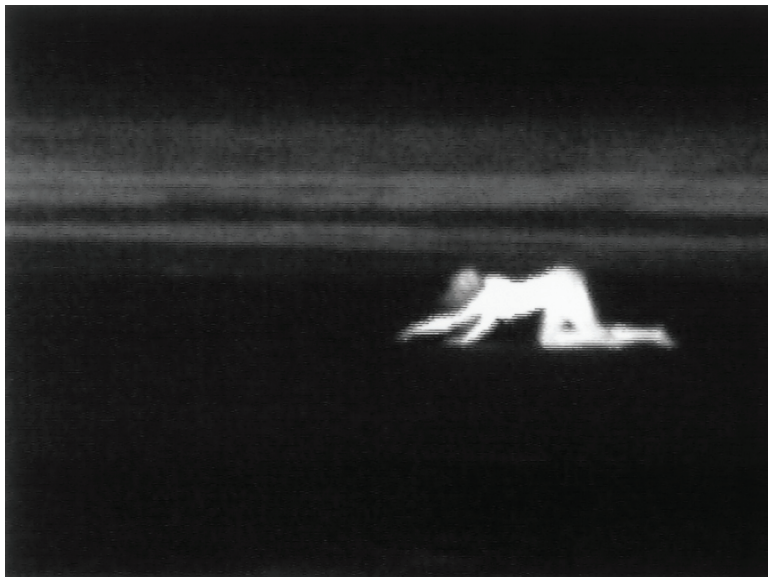
Jordan Crandall
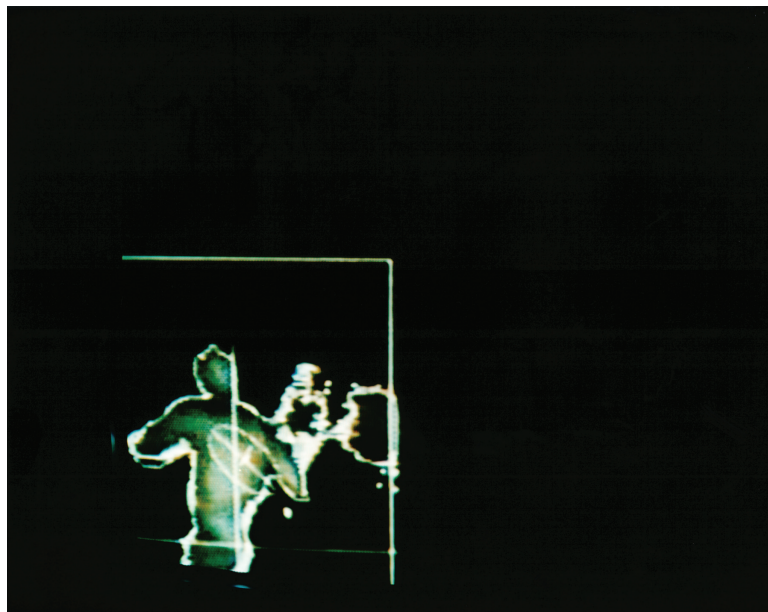
Jordan Crandall, *Drive, Track 1*, 1999
Photograph, 8 x 10 in.

The first time I started using a computer was around 1991. I had a rudimentary laptop with no hard drive. Around that time, Wolfgang Staehle had started a BBS called *The Thing*, and he gave me a modem so I could participate. Wolfgang was the one who really got me started. It took some time to figure out how to connect, but once I did, I was hooked. It was like magic — you could download what people had written and upload your own texts in response! It's hard to imagine now that such a simple thing could feel so thrilling and revolutionary. It was the first time that I participated in a forum with other artists and thinkers, and it gave me the confidence to express my own ideas. I think my intellectual development as an artist began then.

I was editing a publication called *Blast* at that time, and as the 90s progressed, *Blast* increasingly took inspiration from the networks that were forming — not only the BBS, but listservs, chatrooms, and role-playing networks like MUDs and MOOs. It was a time of radical experimentation and optimism. What interested me was not only the content of the online interactions, but the structure and form of the network itself — how it helped shape thought and social relation, produce domains, objects, and rituals. Discourse. I didn't choose computation as a subject matter for my work — it just became part of my world, part of the structure of how I viewed things. I was performing it, enacting it materially.

Jordan Crandall

Jordan Crandall, *Shore*, 2000
C-print mounted on aluminum, 12.5 x 24 in.

In the later 90s, I became interested in how computation was connected to perception and embodiment and this led me to research military technology. I'm not exactly sure how this came about. Military technology is a field where technologies of visualization are most explicitly connected to technologies of control, and to the erotics of power. I was also interested in the history of cinema, media philosophy and theory. I saw connections that I could explore. I created video installations that integrated cinematic forms with new surveillance and tracking technologies. I explored techniques of targeting and the weaponization of vision. This led to a whole series of works, beginning with *Drive* in 1999. The video installations, performances, and writings I've done since then are all engaged with computational advances in areas like unmanned systems, autonomous vehicles, artificial intelligence, simulations, and such. Bodily enhancements and extensions. The focus is often on new techno-imaginaries, new ways of figuring selfhood and corporeality. New relational modes and intimacies. My newest work, *Autodrive*, is about the emergence of artificial superintelligence in the vehicles of everyday life — vehicles of transportation, but also vehicles of communication and co-presence. For me, what is significant about computation today is how it enables systems of human-machine intelligence — human-machine composites that are already becoming part of our world, ingrained in the forms we commonly use. Cognitive assemblages that we are becoming intimate with, intrinsically tied to and immersed within.

Joseph Nechvatal
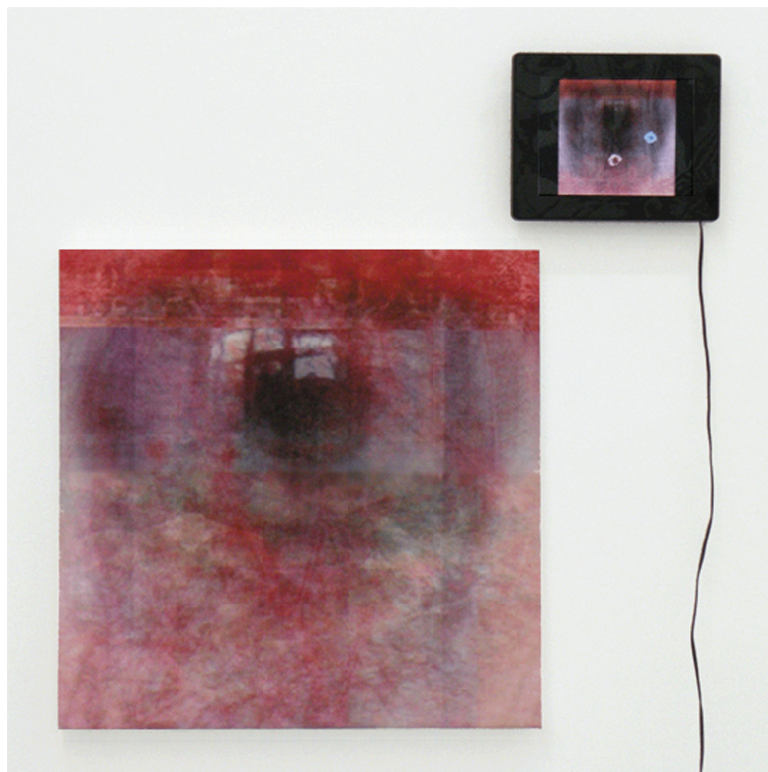
Joseph Nechvatal, *scOpOphilia*, 2009
Digital animation screen and computer-robotic assisted acrylic on canvas, 19.7x19.7".

Photo courtesy Galerie Richard, Paris.

When I was studying art at Southern Illinois University in Carbondale, among the courses I took in 1973-4 was a course in FORTRAN. I had been studying Marcel Duchamp and conceptual art, so computer code seemed like a relevant extension of those art interests. After a year of MFA graduate work at Cornell, I moved to New York City in 1975, and undertook further graduate studies in aesthetics at Columbia University (principally with Arthur Danto) while working as an archivist on La Monte Young's Fluxus art collection for the Dia Art Foundation. Fluxus became an influence on my computer-based work that began in 1986, through the intermedia art theory of Dick Higgins, Alison Knowles's computer poem *The House of Dust*, James Tenney's Bell Labs computer music, and computational word works of Eric Andersen and Dick Higgins.

In the early 1980s, I had art exhibitions at The Kitchen, Gallery Nature Morte and elsewhere and these led to a move to Brooke Alexander Gallery in late 1984. After I had a second solo exhibition there in late 1985, one of the technicians at the midtown graphic art lab that I used told me about a new computer-assisted technology for producing large-scale digital paintings at the Computer Imaging Services in Torrance, California. CIS was at the time the only place in the United States for realizing digital paintings. In early 1986 I adopted this new technique, and this move into the digital world opened up several new possibilities for my art. It also signaled a shift in concern from my nuclear war focus to a wider one about contemporary media overload and the coming role of computer technology.

In 1986 there were two related computer methods I used to paint, Scanamural and Megaprint; both invented in Japan. Megaprint's scanner generated digital images in a proprietary format that it stored on an onboard tape drive for execution at up to approximately 25 x 54'. Both machines used digitally guided airbrushes loaded with cyan, magenta, yellow, and black inks to spray onto canvases temporarily affixed to a large drum.

Joseph Nechvatal
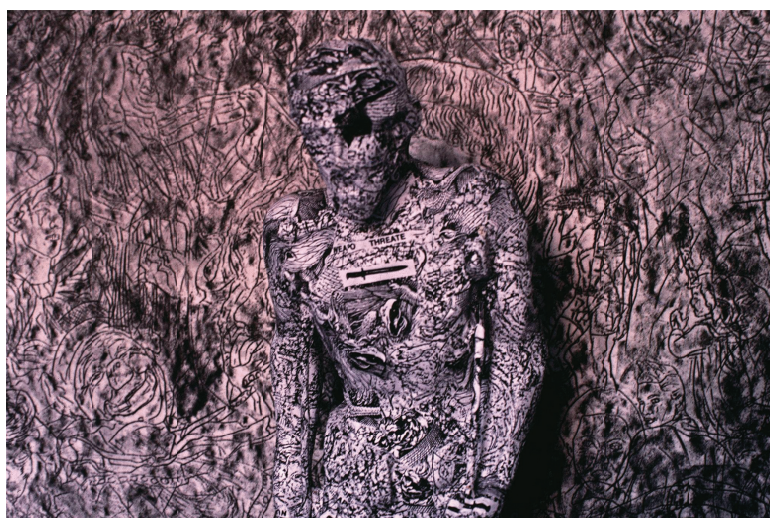
Joseph Nechvatal, *The Informed Man*, 1986
Computer-robotic assisted acrylic painting on canvas, 82x116".

Provenance: Brooke Alexander Gallery (NYC), Elaine Danheisser Foundation (NYC), Emmanuel Javogue Collection (Miami).

I employed both methods for realizing my work. I first used Scanamural in 1986, while after 1987, I most often used Megaprint because it utilized water-based acrylic pigments and I was able to paint directly onto cotton muslin canvas through airbrush nozzles using a computer-generated signal. This gave my paintings an airbrushed soft appearance that suited my conceptual and aesthetic objectives perfectly.

As a result, my imagery evolved considerably under the impact of this new digital technology and my deepening concern with computers as mass media.

In 1990, I had a solo exhibition at the Musée des Beaux Arts in Dole, France, which led to two overlapping residencies in 1991–1993 in the town of Arbois in the Jura region. The Atelier Louis Pasteur in Arbois and the Saline Royal in Arc-et-Senans both supported new ventures in art and technology at that time, and upon invitation, I relocated there in mid-1991. The Saline Royale (Royal Salt Works) had been repurposed by the Fondation Claude-Nicolas Ledoux into an art-tech center with assistance from the French branch of Apple Computer. I had a studio with a Macintosh IIfx and the assistance of a computer programmer, Jean-Philippe Massonie, of the nearby Université de Franche-Comté in Besançon. In this new setting, I produced a new body of work called the *Computer Virus Project*, in which I allowed a computer virus to invade my previous body of work.

The significance of computers has always been ideological for me and concerned with the fragile wedding of computer production and computer resistance. As example, in *scOpOphilia* (2009), I created a computer-robotic painting of an eye and set it alongside a video screen that shows a viral-like algorithm eating away the image. This is an example of my advocacy of the subversive power of viral noise within computer culture.

Julia Heyward
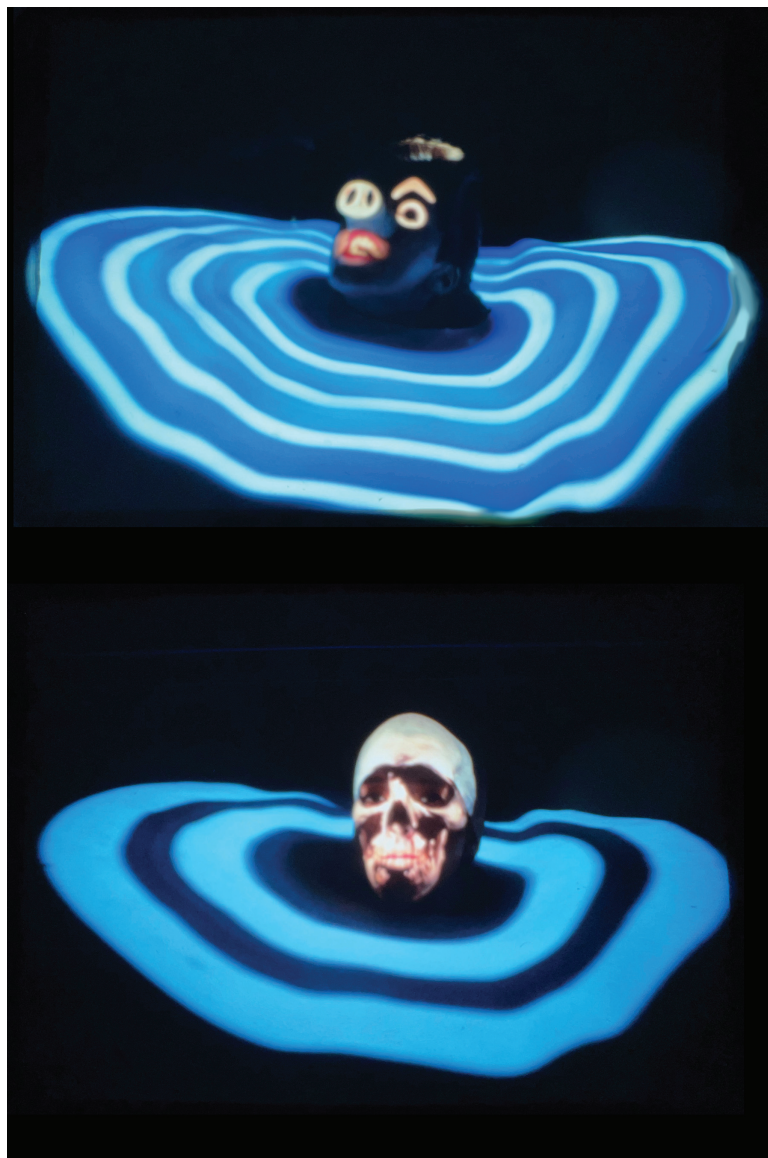
Julia Heyward, *Mood Music*, 1988
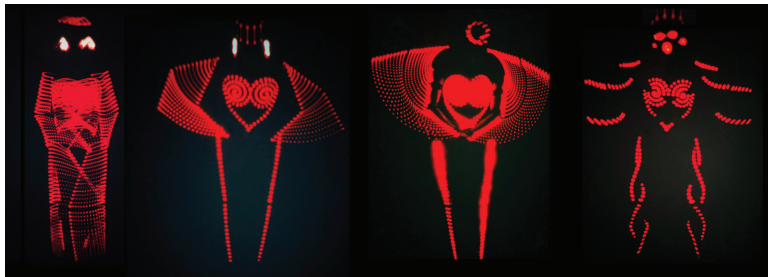Multimedia performance at the Kitchen, NY

Heyward performs her character Pighead, which shoots missiles out of its nostrils, continuing to shoot even post-mortem.

I moved to New York City to be in the Whitney Independent Study Program in the early 70s. I abruptly stopped painting and started doing live performances before the term 'performance art' was even used. At the end of our program we had a show at the Whitney Museum on the first floor. I did a performance involving a large cardboard billboard with arranged strings of Xmas tree lights spelling palindromes. I controlled the lights with homemade switches and was basically naked, dressed only in a paper bag. People threw drinks at me, and the faculty was embarrassed. Today I see this as my first attempt at controlling and sequencing events. Welcome to my blend of handmade technological art.

Throughout the 70's I continued to make solo performances with slide accompaniment, firing the slides for a split second using a homemade device that advanced the slides and had a dissolve feature. I was into subliminal imagery and its effects on memory and mental influence.

During this period I had multimedia bands typically involving wall to wall visual projections for our live performances. From these early years grew a desire to make the prerecorded/preprogrammed projected media responsive and in sync with the live performers. We had a projectionist who knew the show and manually advanced, dissolved, and live composited the film and still images together, simultaneously projecting them onto walls and screens. Sometimes it took two people to run the visuals. Eventually we started using more sophisticated programming modules. The best arrangement is (and was) a combination of handmade devices with manual control combined with electronically triggered events, allowing the media to breathe with the audience. A much more organic relationship between the media and the live elements would have to wait a few decades before computers had enough fire power and ram to solve our problems. This was the beginning of my work thinking interactively, which takes a lot more computing power and wouldn't arrive for the average consumer until the late 90s.

Julia Heyward

Top:
Julia Heyward, *Mood Music*, 1988
Multimedia performance at the Kitchen, NY

Heyward performs her character Mood Thing in an L.E.D. outfit with programmed light sequences and a custom sculptural control.

Bottom:
Miracles in Reverse, 1997 CD-Rom/2025 Re-engineered as interactive software

Audio sampling was another early computing technology that entered the performing world. The 70s brought loopers that were typically 8-bit live sampling and looping stomp boxes that guitar players used. Soon the quality was 16-bit and singers found them. The basics of computing – input, processing, storage, and retrieval – expanded with layering features producing orchestral effects that could be built and deconstructed live. The 90s brought long-term storage and MIDI that allowed more complex triggering devices. I had the Akai sampler that could process the sample with features like 'stretching' the duration without changing the pitch. You could also assign the samples to MIDI keyboard devices and play the samples more organically with the live music. Key to making successful samples is looping, which involves editing an audio file to loop going from end to beginning seamlessly. For me, loops are the building blocks of interactivity.

At this time, non-linear video editing software really streamlined post-production, especially for independents. It also afforded flexibility in alternative timelines that led to various paths narratively, cinematically, and psycho-emotionally for the end viewer. This pushed me further into non-linear thinking, eventually involving branching that enables the user a choice of which path or direction to take. Non-linear editing also led to making visual loops for the stage, which laid the groundwork for my late 90s interactive work.

Miracles in Reverse is the end product of this relatively long evolutionary process of merging multimedia, performance and new music. The interactive DVD-ROM is a self portrait, but a self as a process, not a fixed entity and the interactive user/player is part of the process. With rhythmic movements of the mouse the user can play my 'life movies' like a musical instrument. This has led me to non-linear structures and interactive interfaces while retaining my cinematic aesthetic and deeply personal narrative. The ever-present aim in my work is to make multimedia that speaks to and comes from the deepest internal reservoirs where fact and fiction, spirit and flesh, particle and wave mix and morph without losing connection with the world at large. This kind of work takes a lot of computing power, but the work always has a foot in the ground.

The computer is the universal tool that delivers information and connectivity to all. It brings facts and spreads lies, with gatekeepers to rank them. We can see where that has led, and the pyramid of wealth it has produced. The upside is that the technology from corporate professional tools has made its way into semi-professional and consumer tools giving us tools to record life, create fiction or fight the 'bros.' The computer is not only the production tool but the universal distributor!

Keith Sanborn

Keith Sanborn, *Semi-private sub-Hegelian Panty Fantasy,* 2001
Digital video, stereo, hi-fi sound, black and white and color, 4 minutes.

I have several origin stories, but the earliest connection to computers I remember was when I was around 6 or 7 years old. I was visiting Chicago on a family vacation. We visited the Museum of Science and Industry. In one darkened room, there was a luminous table with a tic-tac-toe grid. You could play against the computer. Although I already knew that any such game should end in a draw, I quickly realized that this game was designed so you could beat it. You can imagine I felt pretty clever, as none of the others who tried managed this feat.

A year or two later I wrote a kind of one-page story: I invented a computer that would make robot soldiers. I ordered my robot legions to take over the world. Then, thinking that Caesar and Napoleon had failed because they had failed to adequately consider the dimension of history, I had my computer invent a time machine and ordered my robot legions to invade and conquer the past and the future. The story ends: "Now I am Master of the Universe! Past, Present, and to Come." So much for mixing science and Catholicism.

I didn't integrate computers into my practice until nearly 20 years later, when I studied Assembly Language Programming with Hollis Frampton in Buffalo on the newly-minted Sol 20, one of the first reasonably powerful and affordable computers for hobbyists. There was no software, so you wrote your own. Storage and memory were also slow and limited. As a group, we wrote DEMON: a Data Editor MONitor, in effect, a higher level language. It allowed us to load into memory and scan audio that we had digitized with the Cromemco Dazzler. Given the small amount of memory — 64k for the operating system, the program and the digitized data — we opted for a kind of micro-surgical approach; a program written in DEMON then assembled would allow for much longer output by segmenting and repeating the audio data. This could be recorded on ¼" audio tape. When it crashed, this was called "artificial stupidity."

My first individual efforts used a Commodore 64 for audio editing and the creation of a game, a deadpan parody of popular shooters. After the program started, a text would appear reading: "PRESS ANY KEY TO SHOOT." When a key was pressed, a gunshot sound played, then a second text came up: "GAME OVER" and the player was locked out of the keyboard. This was around 1987.

Keith Sanborn

Keith Sanborn, *Mirror,* 1999
Digital video, stereo, hi-fi sound, black and white and color, 6 minutes.

I wasn't totally hooked, however, until I got an Amiga 2000 with a Video Digitizer, a genlock, a prototype of FinalCut and a titling program that adds subtitles to video. The titler allowed me to create a work called *THE GIFT.* It tells several stories with animated text using various versions of Mack the Knife for a soundtrack. The titler also allowed me to create subtitled versions of several Situationist films, which I had translated.

Before acquiring the Amiga, the majority of my work had been on 16mm film using preexisting images, aka "found footage." The 1990s was the age of VHS, and "video stores" greatly expanded access to commercial films. I had long been interested in copyright violations. And what better way to sum things up than a work using the warnings at the head of video tapes to frighten away the inevitable bootleggers. This gave rise to *The Artwork in the Age of Mechanical Reproduction by Walter Benjamin as told to Keith Sanborn.*

Mirror and *Semi-private sub-Hegelian Panty Fantasy (with sound),* included in this survey, were later outgrowths of this practice, involving ripped DVDs and DV video.

The computer is my basic working tool for post-production. I collect images with my iPhone, from physical media, from on-line sources, and with a DSLR camera. My computer allows me to edit, refine, and output my work at a quality comparable to the low-end of professional media production. I can create a DCP to show in a proper theater. I have access to the same post-production tools "professionals" do, though I don't have the budgets, the studios, or the interest in them that "professionals" do. What a hideous word: "professionals." The only ones more repulsive to me are "creatives" and "impactful," both products of the industrial commodification of consciousness. So, computers lend the technical support allowing me to critique industrial processes in "industry standard" formats.
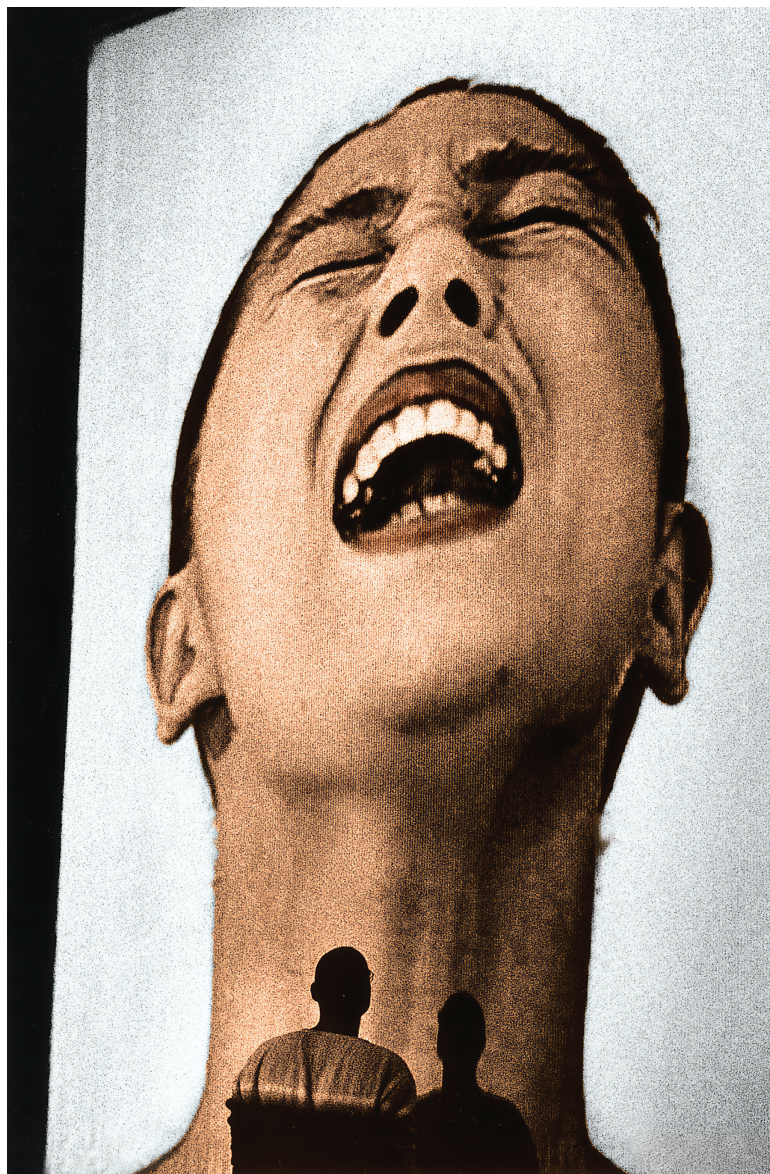
Kurt Hentschläger

Kurt Hentschläger, *PARADOX PILE*; 2023-2025
Series of 3D printed, modular sculptures, 7 to 9ft (2.3 to 3m) tall.

I bought my first personal computer, a Commodore Amiga 500, sometime in 1988. Initially, it was for a light matrix project I was working on with a friend. After that ended, I started a deep dive into the puzzling abyss that was computing. Without question, it changed the trajectory of my life overnight. I remember not leaving my apartment for much of the following year, consumed by the experience of learning, grasping the (constantly crashing) alien system, and soon creating art with it. Bear in mind, there was no World Wide Web yet, or much available help for any exotic problems, and almost every problem proved exotic. There was little digital periphery to connect to, mostly monitors, dot matrix needle printers and 1.44 MB external floppy disks; hard disks were entirely unaffordable to me. Imagine entire programs and projects fitting onto one 1.44 MB data disk – or a few of them. They also corrupted easily, for no apparent reason. It is quite impossible to relay the difference between working with a computer then and now. Suffice to say, it felt like building a homestead in the vast and empty American West, where there were few neighbors, miles apart, and supplies were scarce and hard to come by. Thus to make "arable," develop and maintain this new territory required a healthy level of self reliance, ingenuity, flexibility and patience. As well as community building, which mostly meant local, physical interactions and exchanges. Everything about the beginning of my personal computing experience seemed like participating in the building of a new and visionary world. The emergence of a digitally-informed world radioed a promise of Utopia, a fresh start, a place without legacy baggage and restrictions of the compromised past (of Austria) nor of the corporate and institutionalized giga-systems of today. The sense of a brewing seismic shift was, in my memory, a defining feature of that period.

Looking back, I didn't consciously make a decision. Once I was hooked onto my Amiga, it seemed clear that personal computers would play an essential role in everyday life going forward. As a young and idealistic artist, my intuition was that if I wanted to truly be called a contemporary artist, I needed to become computer literate ASAP.

Kurt Hentschläger

Granular=Synthesis, *Motion Control Model 5*, 1994-1996
Audiovisual performance & installation, 4 channel video, 9 channel audio, duration 30-44min.

by Granular=Synthesis (Kurt Hentschläger and Ulf Langheinrich)
Photo: Kunstverein Hannover

In the early 80s, I studied in Peter Weibel's class at the Academy of Applied Arts in Vienna, which was one of the early new media programs in Europe. That was the first time I saw (and used) home computers, which at the time still felt tedious and really a waste of my time. But these machines certainly projected a sense of science fiction. For me as an avid sci-fi reader, it was like looking at a new dawn, the potential for a radically different culture. Hard to overstate how much writers like Arthur C. Clarke, Stanislav Lem, Philip K. Dick and William Gibson inspired me and my generation. I was especially taken with Phillip K. Dick, and came to appreciate him as an American relative in mind and sensibility to Franz Kafka. Dick's dark, psychology-driven visions of a predominantly dystopian future share Kafka's pessimistic surrealism and subversive take on mankind's boundless follies. Sci-fi's prominent topic of artificial intelligence systems turning against their human creators in an act of blatant interference with ambitious dreams of god-like creator status, early on framed digital technology as much of a hazard as a blessing. To that, I feel we have come full circle.

Today computers are everything. They are essential, omnipresent and it is impossible to imagine the world without them. Also, the utopian promises of the beginnings have been shattered wholesale. The negative side effects of the ever growing digital layers coating our planet seem to be multiplying by the day. So my attitude has changed significantly. Euphoria and excitement about technology and the next new thing have drained out of me, for the most part. Often, I feel annoyed and embarrassed by the shallow, greed-driven, attention deficit disorder society that I now live in. Still, I continue to use computers for art work and life. I don't see myself becoming a sheep farmer quite yet. Although, I do love my garden! Having returned to creating material sculptures – based on 3D printing – feels like a more balanced and wholesome practice. That is, ignoring the plastic and microplastics created...
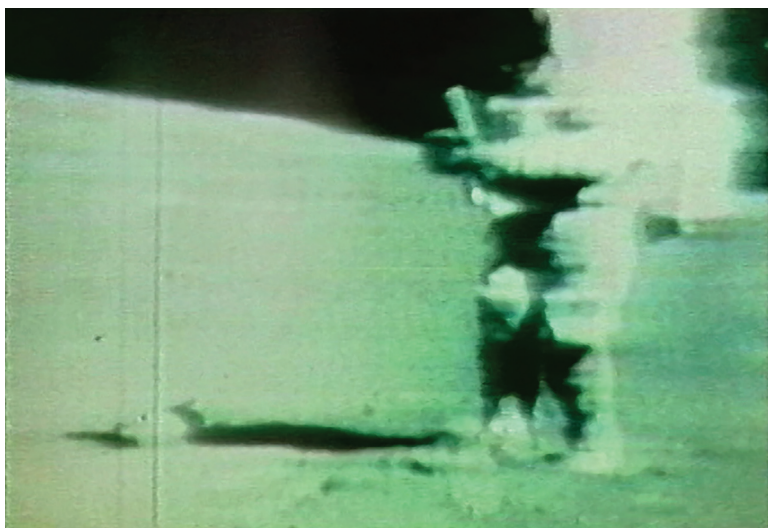
Les LeVeque

Les LeVeque, *dIRe Warming Bouquet*, 2020
Video still, 1 minute.

In the mid-1980s I wanted to make a mashup of lies, truths, and histories that appeared as an unpredictable, everchanging, unending, real-time flow of textual information. I was able to borrow an IBM PC and had a friend who was a computer programmer and could write a random generator program. I gathered and entered the fragmented lies, truths, and histories into a database and installed the computer and the intertextual poetry program in the gallery. My practice, at that time, could be thought of as multi-media that drifts toward moving image, sound, and electronics.

A multi-media art practice is a mode of consciousness, a way of being in the world, and re-presenting (reimagining) that world. "This (practice) requires a medium, of course, but the properties of that medium, the techniques that define it, do not constitute the exploration they facilitate" (from *A Medium Matters: The Myth of Computer Art* by Gene Youngblood, 1983). This first integration of a computer into my practice was in part out of specific necessity and part of a larger conversation about media art, technology, and access. It also triggered an interest in disordering and reordering moving image and sound information and led to experimenting with Commodore Amiga Computers. These early investigations materialized as a body of work titled *Questions Concerning Technology*. The work was several years in the making and was exhibited at Artists Space in 1990. This work consisted of kinetic television machines that aggressively gestured and made noise. The televisions displayed computer animations of human bodies, processed sounds and audio feedback.

Les LeVeque

Les LeVeque, *Flight*, first frame video still, 1998
7 minutes

In May 2020 I began a process of direct infrared exposure (dIRe) onto bouquets of Lilies. The effects of the electromagnetic radiation were documented with thermal cameras, both still and video. Below is selected documentation. The flowers used in this project were grown in the Hudson Valley on the ancestral homeland of the Munsee and Muhheaconneok (Mohican) peoples.

I continued to modify my temperamental Amiga computers to increase image resolution and improve the accuracy of moving image control. This resulted in a number of experimental videos that were frame-by-frame edited and often structurally encoded with messages. In the short movie flight (1998) (included in this archive project), the computer's discrete control facilitated a frame-by-frame re-edit of a short NASA 16mm film of an astronaut walking on the moon and tripping over a rock. In this re-edit, every other frame is the first frame of the NASA film. During the movie the flickering images of the standing astronaut and the astronaut mechanically walking separate from themselves, culminating in the separated astronaut's disappearance into white light as they trip over the rock. The soundtrack is an abrasive synced re-edit from broadcast audio of Armstrong's first step on the moon. Perhaps this movie presents a dispositif, its anthropocentric subject, removed from the earth, isolated, a heroic American man, in a moment of national technological triumph. My comic/tragic animation of a struggle and bodily escape ends back at the beginning, at the start of the step every thirtieth of a second during its 7-minute duration. Multitemporal, It could play as a closed loop. To premiere this piece at the 1999 Sundance Film Festival, because at that time they only showed films, I was asked that it be transferred to 16mm film. This changed the frame rate from 30fps to 24fps and changed the rhythm of the movements. I loved the request and the destabilization of the authority of my computer project. Perhaps the psychedelic viewing experience allows tripping on a trip and offers a dream outside the dispositif. "The past has to be continually re-narrated, and the political point of reactionary narratives is to suppress the potentials which still await, ready to be re-awakened, in older moments"(from the unfinished introduction to the unpublished work *Acid Communism* by Mark Fisher, approximately 2017).

Leslie Thornton
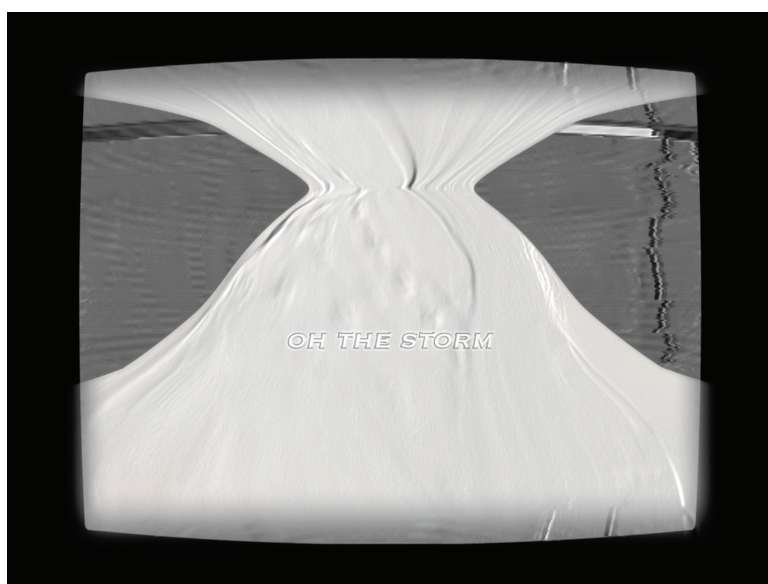
Leslie Thornton, *The Fold*, 2012/2023
Digital video, aspect ratio 4/3, mono sound, 4 minutes 43 seconds.

The final episode of the project "Peggy and Fred in Hell."

From bombs to touring the apocalypse

As a young child I had an unfortunate awareness of technology exceeding the boundaries of its makers. My father and grandfather worked on the atom bomb during World War II and in the 1950s their stories still hung in the air unspoken. Like soldiers returning from battlefields they lived in silence, not because of horrors witnessed but secrets kept, in an arrestment of language itself. An apprehension of the ambivalence between technology and the self, the social, the local and the global was fixed in a Cold War childhood and set a course for what would become my life's work. My first physical contact with computers was on a terminal attached to General Electric's mainframe in Schenectady, New York in 1969. It was made available to my advanced math class in high school, then taken back a month later as we were using too much processing power. It had become our rabbit hole.

I did not adopt the computer initially as a tool, rather it was central to the back-story of what became an epic project. In 1983 I began *Peggy and Fred in Hell* (1983-2015), a media work that spanned over 30 years in the form of short episodes and feature-length assemblages. The initial vision for the project includes an AI entity studying human affect. The dominant narrative is of a world that has collapsed in its own excess. Two children remain, cast adrift in the detritus of culture. At first they appear as protagonists playfully inhabiting their domain. By the end of the series they are fragmentary subjects for data analysis.

Peggy and Fred in Hell is not linear, but a stacked space with its own logic and narrative. It's about 'time,' including technological time. The project was filmed and edited and presented over the course of 30 years as a growing and unbounded set of incarnations. Throughout the making of the series, changes in the technical apparatus and in the social world are reflected in the form itself. Cinematic time devolves into surfing the net-time, devolves into vacant excess.

Leslie Thornton

Leslie Thornton, *GROUND,* 2020
4K digital video, stereo sound, 13 minutes 31 seconds.

A key technical moment was the introduction of non-linear editors (NLEs) in the early 1990's. It freed up the physical and technical demands of 16mm film editing, and allowed for a fluidity closer to writing. It also made effects readily available. (Prior to digital effects the only readily available options in film were fades and dissolves.) This opened another door to image-building and the imagination. By the late 1990's, in the episode called *Have a Nice Day Alone,* digital manipulation erased any coherent sense of focus, redistributing form and meaning centrifugally. Digitized effects punched through the sanctity of spatial and logistical continuity. We were plunged into an abyss of artificiality coming at us from all sides.

The images of two children with whom we formed an attachment are eaten up in fractal bursts. The entire project finds closure in 2014 in the final episode, *The Fold,* in which an exhausted AI entity emerges and accounts for both its own origin and its interest in these beings. Its voice is almost tender. And then it breaks, fizzes out. It ends.

In a more recent work, *Ground,* one can make out the figure and voice of a physicist describing his research on charged parity dissymmetry. His voice carries throughout, but otherwise most everything, his body included, is reduced to a digital infrastructure—grids, lines, frequencies—such that there is no representational image except in the viewer's imagination. It is a banquet of allusion. I too live in the same trap as nearly everybody else. Having worked with film, video and basic digital technologies I come from a place that can make today's abundant image-making landscape alienating. I am in no way enchanted. I know that I will continue to film in the material world and search its archives. I need to keep my own version of doom-scrolling through online imagery in check. That's easy enough when I remember to step outside with a camera or recall that there is a limitless abyss around each certainty. And lately I am beginning to realize that a surplus of means and subject matter is not so much the problem; arbitrariness and indifference are the problems. That's the screaming white noise. It is the very precise shape one renders that keeps the wailing at bay, and that produces new possibilities for awe.

Lev Manovich
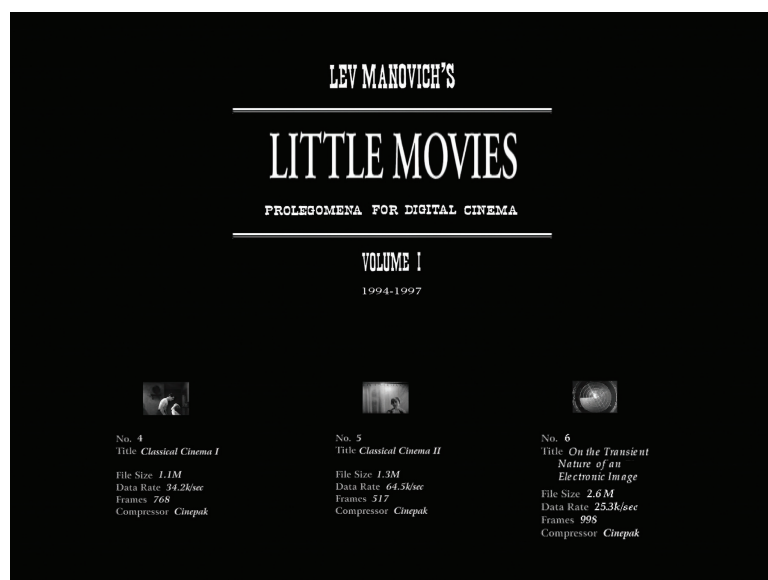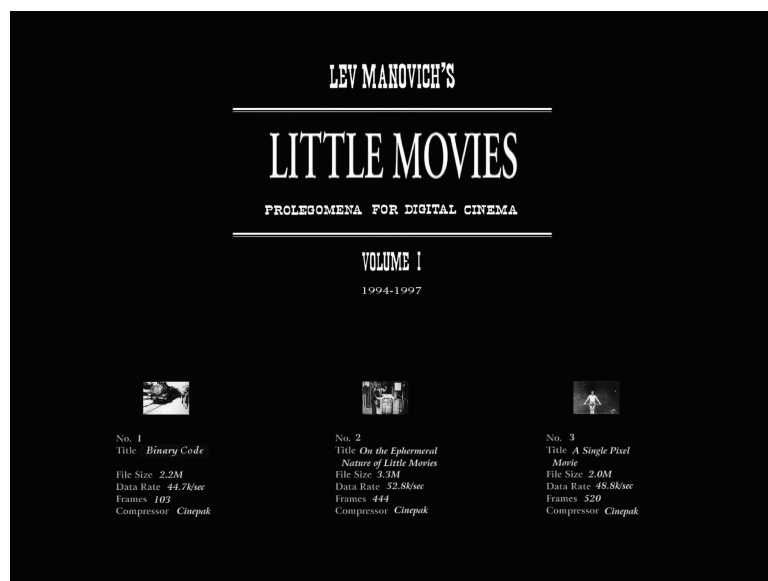
Lev Manovich, *Little Movies*, 1994
Six digital videos, variable length, resolution 160x120 pixels.

My first experience with computers was at the age of 15. I described this experience in the opening page of *The Language of New Media* (The MIT Press, 2001): "Moscow, 1975. Although my ambition is to become a painter, I enroll in the so-called "mathematical" ("matematicheskaya") high school which in addition to a regular curriculum has courses in calculus and computer programming. The programming course lasts two years during which we never see a computer. Our teacher uses a black board to explain the concepts of computer programming. First we learn a computer language invented in Soviet Union in the late 1950s. The language has a wonderful Cold War name: Peace-1 (Mir-1.) Later we learn a more standard high-level language: ALGOL-60. For two years, we write computer programs in our notebooks. Our teaches grades them and returns them back with corrections: missed end of the loop statement; undeclared variable; forgotten semi-colon. At the end of the two-year course we are taken—just once—to a data processing center, which normally requires clearance to enter. I enter my program into a computer but it does not run: since I never saw a computer keyboard before, I use capital O whenever I need to input zero."

After immigrating to NYC in 1981, I was able to start making my first digital still images and computer animation in 1984. The interest in the possible intersections between cinema aesthetics and its history and digital media became an important theme of both my artistic and theoretical work, including my book *The Language of New Media* (2001). As an example of a digital art project that also deals with this theme, here I will describe my project "Little Movies" (1994-1997). I made this project in 1994 when the World Wide Web was just beginning to become popular. I expected that eventually we would have the ability to include digital video in web pages, but it was not yet possible at that time (this capacity was only added in 1996). Anticipating that this would eventually become possible, I created a series of six very short digital videos. Their resolution was only 160x120 pixels, and each video was less than 3 MB in size. Both the form and the content of the videos offered reflections on the evolution of media technologies, making a comparison between the anticipated addition of moving image format to the web still to come, and the emergence of cinema in the 1890s. As I wrote in my project statement: "I wanted to turn the network limitations into a new aesthetic. Is it possible to create films with the resolution of 1 pixel? Is it possible to have a meaningful and an emotional experience under 1 MB in size?"

Lev Manovich

Lev Manovich, *The Architecture of Nostalgia*, 2022
Digital image created with Midjourney AI image tool, edited in Lightroom, and upscaled with Gigapixel AI.

During the 1990s - exactly one hundred years after its birth - cinema was being reborn on a computer screen. CD-ROM technology has progressed from a slide show format, to the superimposition of small moving elements over static backgrounds, and finally to full-frame moving images. This evolution repeated a similar nineteenth century progression: from sequences of still images (magic lantern slides presentations), to moving characters over static backgrounds, to full motion (the Lumieres' cinematograph). Moreover, the introduction of QuickTime in 1991 can be compared to the introduction of the Kinetoscope in 1892: both were used to present short loops, both featured the images approximately two by three inches in size, both called for private viewing rather than collective exhibition. The Lumieres' first film screenings of 1895, which shocked their audiences with huge moving images, eventually found their parallel in 1995 CD-ROM titles where the moving image finally fills the entire computer screen. Thus, during cinema's centennial, it was reinvented on a computer screen.

"Little Movies" is a lyrical and theoretical project about the aesthetics of digital cinema, and a eulogy to its earliest form: QuickTime. Beginning with the supposition that every new medium relies on the content of previous media, "Little Movies" featured key moments in the history of cinema as its logical subject.

As time passes, the medium becomes the message, that is, the look, more than the content of any media technology of the past is what lingers on. "Little Movies" reads digital media of the 1990's from a hypothetical future, foregrounding its basic properties: the pixel, the computer screen, the scan lines.

Lorna Mills
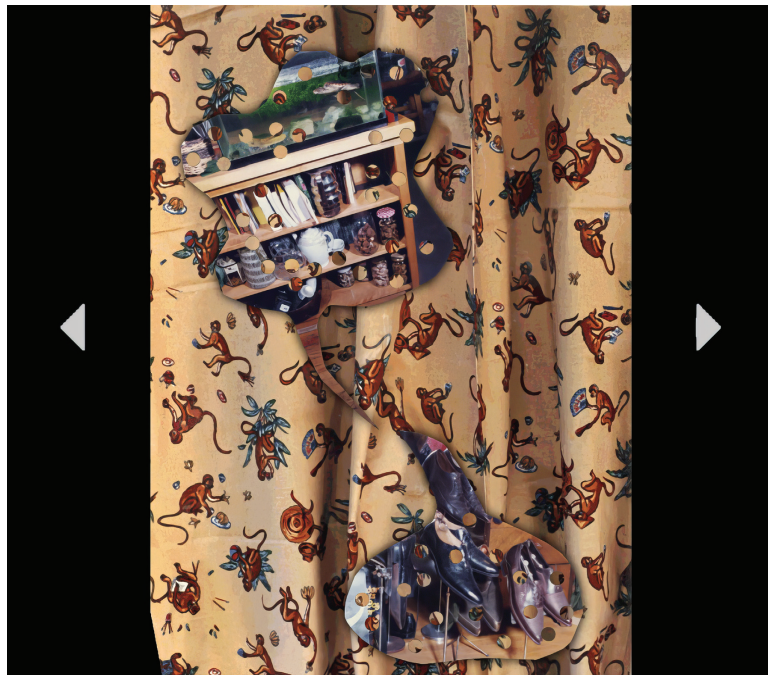
Lorna Mills
The Man They Couldn't Deconstruct because he Knew Too Much, 1994
Screen shot from Interactive CD-Rom

Before I turned on a computer for the first time, I was quite comfortable with analog technologies, such as photography, super 8 film, video, and painting. My oldest brother was a senior systems analyst working on the UNIX platform, but I wasn't interested in what he did because, without any background in computer science, everything about it was inaccessible to me.

For most of my 20's I was working as an impossibly arrogant waitress working two to three days a week supporting my art activities for years, but eventually I was fired for speaking out on my employers' illegal labor practices. Fortunately, the personal computer revolution was in full swing, so I enrolled in a class for desktop publishing. I had zero interest in desktop publishing; I just wanted to learn how to turn the damn thing on.

This was 1993, and I thought I had arrived at a big party way too late. But I was excited to be there. The most defining discovery for me was the humanity behind computer systems; the amount of collaboration it took to create the user interface for all the software I was learning. The other surprise was that I was a very good problem solver.I went on to learn the early multimedia programs like Director and Flash and taught myself how to write code at a time when there were few manuals but a lot of experienced and generous programmers (who were also learning those same software). I worked professionally as a game programmer and made a few interactive art game pieces early on (delivered on floppy disc and CD-Rom), but it wasn't the art I wanted to make. Probably because I loved the code writing so much that I didn't care what the end product did or even looked like. It was my own private Idaho, but I believe art has to be gregarious in some way. It has to connect with a viewer.

Lorna Mills

Lorna Mills, *Danse du chimère*,2024
Animated GIF. Installation shot.

In 2003-2004, the golden years of blogging, I teamed up with the brilliant artist/curator/writer Sally McKay, posting on her site. (I still do.) It was where I was introduced to netart, and since I no longer believed I had any chance for a career in the traditional art world, I just threw myself in with no expectations other than the pleasure of a new community of artists and new art to explore. I initially only played with HTML, but Sally worked with animated GIFs using photographic and video sources. With that I saw an incredible potential for using snippets of my video footage to make something that was new to me. In earlier years, when I was making experimental (meaning unwatchable) super 8 films, I was totally entranced with editing rather than shooting. I loved looking at each frame in every damn second, so I found animated GIFs with their abbreviated motions and their implied acknowledgement of cinematic illusion to be confounding and exciting. I also discovered the wide world of animated GIF makers, who didn't position themselves as artists, and I reveled in the excesses of all that moving image production that had nothing to do with art and everything to do with the internet.

I found my feet as an artist by collecting, altering and collaging those GIFs into something strange that were digressions from narrative, could embrace the particular and the peculiar, then expand into universals, and just as quickly contract into the peculiar. This formality—coupled with the sometimes inane, absurd, frenzied, desperate, random, crude, incomprehensible, puzzling, loving, cruel and chaotic contents of found GIFshas engaged me ever since.

Lynn Hughes

Lynn Hughes, *Perversely Interactive System*, 2003-2004
Collaborator: Simon Laroche

Interactive video and sound work using a custom biofeedback interface to control the image of a woman in the distance with her back turned. If the participant succeeds in controlling their internal level of stress, she approaches the viewer; but if this provokes viewer excitement, she stops.

I first decided to use a computer in an artwork in 1986. I was a Visiting Painting Professor in Regina, Canada. My paintings used scientific imagery and I was preoccupied with the relationship between analytic and synthetic methods of thinking and acting: a child's fascination with bugs versus clinical dissection in a lab, for example. At the end of my tenure there, I had a double exhibition, *Suzuki Soup* – paintings at the city art gallery and an installation show at an artist-run space. One of the installations consisted of a small room dedicated to a love story between a personal computer – a sexy new Commodore Amiga – and a bonsai plant. The computer executed a simple branching algorithm, repeatedly generating tree patterns on screen, highlighting how both machine and plant shared this fundamental branching structure. At the time, the exhibition was met with general incomprehension, although I realize now that it foreshadowed some of the current cultural focus on the non-human. Looking back, I also see that an enduring interest in the relationship(s) between science and technology and the arts was surfacing in my practice. This was part of a broader preoccupation with tensions between binaries that goes back as far as I can remember.

The need to deepen my grasp of science and technology later led me to pursue a graduate degree in the History and Philosophy of Science and Technology. After fifteen years of near-monastic devotion to a personal studio practice, I needed to challenge my analytic brain and better comprehend the Western scientific and technological paradigm that both surrounded and shaped me. This transition gradually steered me toward a practice engaged with contemporary technology.

My first interactive piece, *Perversely Interactive System* (2003-4), explored the relationship between a virtual figure projected on a life-sized screen and a participant using a custom biofeedback interface to control this digital counterpart. The work extended my interest in contesting binaries. The biofeedback interaction fostered a deeper, enigmatic connection between physical and virtual bodies while probing the tension between desire and fulfillment. A subsequent work, *Alt_Ego,* revisited biofeedback to question notions of passive and active and, specifically, of action and agency in video games.

Lynn Hughes

Lynn Hughes, *Alt_Ego*, 2015- 17
Collaborator: Kaho Abe

Wearable (costume based) physical–digital game. The game plays with ideas of control and agency, of passivity versus action and of linear versus non-linear control.

Crucially, my evolving practice included creating contexts for other artists and designers who were working to produce meaningful, critical work with emerging technologies. In 2000, I secured funding for Hexagram, an inter-university institute for research-creation in art and technology. This was the first time Canada's innovation sector had directed major funding toward artists and designers focusing on content rather than technical development. Beyond providing space and equipment, the grant established a community that transcended both university boundaries and the French/English divide (another one of those binaries!). Hexagram continues to thrive today as an expanded inter-university network. I persisted in this community-building work, not least because it enriched my own practice. In 2008, as my work shifted towards an engagement with art games, I collaborated with a sociologist to found TAG (the Technoculture, Art and Games Research Centre), Canada's first games research center.

Computers today are ordinary because they are so integrated into the everyday. I think many artists now feel compelled to reassert the complexity and the significance of the physical – the stubbornly material. It seems telling that explainability remains one of AI's most intractable challenges. While AI represents a new computational frontier, it resists the more linear analysis that characterized the previous computational revolution. This is even more pronounced in quantum computing, where superposition and action-at-a-distance almost demand metaphorical thinking. Perhaps the most vital emerging realm is computational biology, particularly as it integrates AI. As biology merges with powerful new computational methods, I suspect that the mystery and density of both domains —as material mediums -– will take center stage. The very notion of working with "computers" now seems quaint or at least underspecified. What does this mean for art? Perhaps it is too obvious to say that it means artists grappling with increasingly compelling and complicated technologies. I hope it means more collaborations — sometimes wonderful, often difficult — with people from other disciplines, including scientists and technologists.

Mark Klink
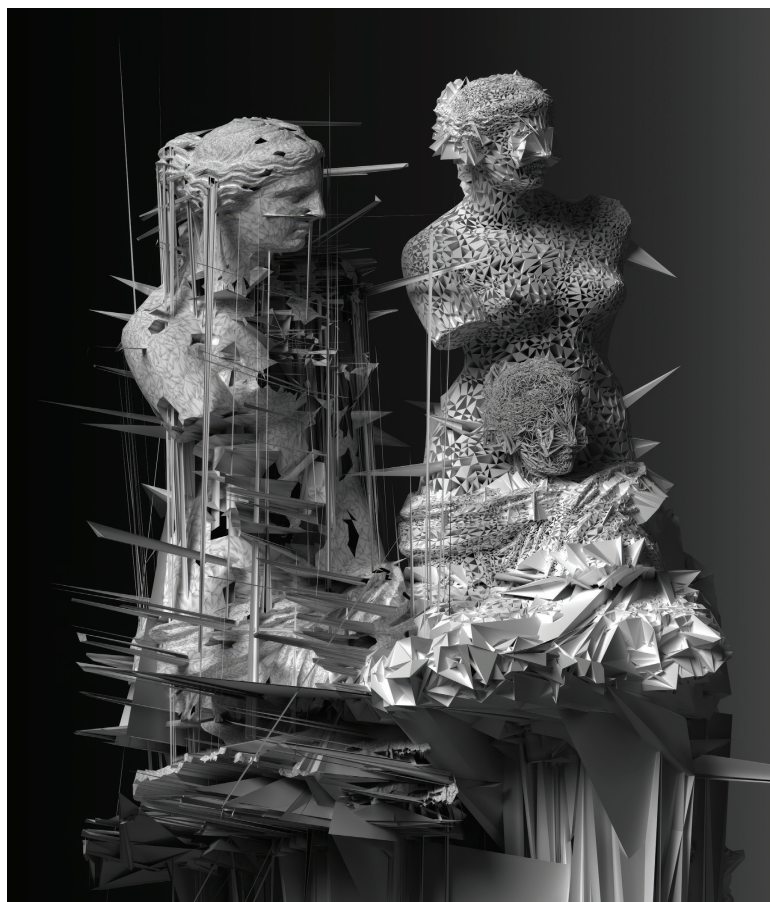
Mark A. Klink, *Venus de Milo*, 2018
png image, 2400x2800px

It was while visiting Morrill Hall, a museum on the campus of the University of Nebraska in Lincoln sometime during the late 1980s, that I encountered an early Mac running Rand and Robyn Miller's *The Manhole.* That was the moment that I realized that a personal computer might be an instrument for personal expression. However, such computers were still quite limited and prohibitively expensive ... it would be a while before I could take the next step.

In 1991 I was finally able to purchase a Mac LC. It came with a free copy of Hypercard – the same authoring software the Millers had used to create their games. In short order I became something of an expert. In addition to mastering Hypercard, I taught myself the C programming language so I could write code extensions for Hypercard and thereby allow it to perform tricks that went beyond its basic capabilities. I designed, programmed, and created the artwork for a children's point, click, and explore game. Many of the personal computers on which the game would run were still only capable of displaying black and white pixels, so all the graphics were laboriously constructed pixel art.

As to why I started down this path – I can't give a simple, clear, answer. It was just that this was a fascinating, novel universe ... a distinct break from what came before, with endless possibilities.

However, I wasn't ready yet to dive too deeply into those possibilities. Although both in terms of education and practice, I had a background in more "sophisticated" forms of art, particularly "process art," and had exhibited hyper-detailed, "obsessive-compulsive" ink drawings in various galleries, that was not my focus when I first began working with computers. Instead, I was concerned with creating work that fit within prevalent video and computer game conventions.

I also became aware of the advances in 3D software. The movie *Toy Story* was a revelation but again, computers and software sufficiently powerful were out of my reach. I had a friend who owned a high-end Macintosh and a copy of Bryce 3D. I got to experiment a bit, but my opportunities were limited.

Mark Klink

Mark A. Klink, *Synthetic Flower 03.1* , 2014
png image , 2400x1920px

Fast forward to the early 2000s. The 3D modeling and rendering software Blender became open source, and personal computers powerful enough to run it became accessible. It is at this point that I mark the beginnings of my current practice, focusing on the experimental in 3D art. At the same time that I was learning Blender, I was still working, within popular conventions, making pop art. Gradually, however, I moved beyond those conventions. I thought at that time that the things I made were purely play, but in retrospect, they seem prescient. I continued the deep dive.

In 2014 I had a breakthrough. I had experimented with Glitch, where artists open digital 2D image files with hex editors and mangle the data they contain. Often the result is a broken file that will no longer open – but, sometimes the result is strangely beautiful. Today such effects are all too familiar and have become a convention of their own, but at the time, the approach was still fresh and surprising. It occurred to me then that similar "glitching" could be done with 3D files. 3D file formats are nothing more than long lists of numbers defining the 3D coordinates from which a model is constructed. One can open these files with a text editor and alter the numbers in various random or designed ways, changing how the model will appear. I was astonished and pleased by the results of these experiments and began posting them online. I also wrote up several tutorials explaining my methods. Those tutorials became quite popular within a certain niche. We are glitching in 3D!

At that point, the floodgates opened. There is scarcely a convention or technique within the realm of 3D modeling that can't be challenged or broken in some way. And then, anything is possible. The computer is the most flexible, powerful, and empowering instrument that has ever been at the disposal of visual artists. We are at the beginning of a new era. It's a privilege to be part of this transition, with one foot in the past and one in the future. Choices made now will shape what follows, and I hope that the future will be as open and as expansive as possible.

Michael Rees

Michael Rees, *Ajna 2*, 1996
Stereolithography resin, 10" tall.

Code Made Flesh: The Intersection of Computation and Sculpture

How computers enter a culture is like anything else. They flicker in strange corners, emerging through odd aesthetics and whispers of a new world. Intrepid people try them, with promising results. In early 80s art school, my professor had ties to MIT, and technologists would drift through, murmuring about the transition from carbon-based life to silicon.

A few artists picked up Amiga computers, learning to program feverishly. Though the results were underwhelming, they still burned with zeal. Years later, Jaron Lanier would capture this zeal in *One Half of a Manifesto*, describing the instant when programmers seized the pixel—as a "metaframework" that could subsume all possible images. If something could be reduced to bits, it could be cracked, controlled. It was as if we had become gods of vision, commanding all images as mere rearrangements of digital matter.

It was exhilarating to imagine such futures, yet they felt distant. The prospect required a trip to RadioShack, a pocket protector, memorizing the transistor color code — encoded in a misogynistic mnemonic. Nah... I cast myself instead in a Henry Miller *Quiet Days in Clichy* mold, a bohemian artist, not a scientistic technologist.

Around the same time, artist Frank Gillette presented a lecture on his experiences with ARPANET, the precursor to the internet. He described synchronicities across circuits, an emergent connectivity that he cautioned was both utopian and dystopian.

It wasn't until the 1990s that these fragments began to coalesce for me. The shift came when computers began to control tools, machines, objects. They were not just making images; they were making the physical world. Sculpture, which had always been informed by the objective physical, now had a digital counterpart (objects dreaming, or dreaming up objects). It could be speculation, metaphor, or folly. But once computers could translate code into material form, something metaphysical was afoot: the word (code) made flesh.

Rodin's dictum, *"The history of sculpture is carving; modeling is its destiny,"* found new resonance in the transition from subtractive manufacture to additive manufacture — 3D printing. Another of Rodin's missives, that sculpture was the accumulation of its silhouettes, was influenced by the 1860s work of Francois Willeme's *Photo-Sculpture*, or a machine to make objects from photographs. Thus, the automatic manufacture is first bound up with sculpture.

Michael Rees

Top:
Michael Rees, *Putto 2x2x2*
Patinated bronze, 9" x 11" x 9"

Bottom:
Michael Rees, *Putto 2x2x2 (animation)*, 2002-03
Screen Grab 1, 80 seconds.

My first works in 1990 stood at odds with the emerging computational paradigm. These desultory, linguistic-based sculptures were inspired by conceptual art, Beuys-ian shamanics, and the abject body. I named them *Do Be Do Be Do, Study Study, Caduceus, Word.* And yet that utopian binary fervor was building in me, as I began to see if I could draw it on the computer, I could make it in the world.

The echoes between art and computing were undeniable. Frank Stella's "What you see is what you see" is translated to WYSIWIG (what you see is what you get). Bruce Nauman's shape-shifting tunnels paralleled industries refining algorithmic geometry. Joseph Kosuth's *One and Three Chairs* became a perfect metaphor for the way code skinned data into an image, a song, an object, a link. John Simon's *Every Icon* might have been an inspiration to Lanier's essay. Code, in essence, was designed to be ready-made. Again, Kosuth's *The Ready-Made Made Ready* was an apt description of open-source software itself.

Then came the haunting images from the *Visible Human Project.* A deathrow inmate imaged by every contemporary means, to produce navigable, three-dimensional models of his entire anatomy. This digital dissection extended a lineage from Vesalius's anatomical engravings drawn by Titian to Leonardo's secret empirical codices, to the fetishistic renderings of Jacques-Fabien Gautier d'Agoty. The internet flooded with composite images: computer-generated imagery juxtaposed against Leonardo's meticulous hand-drawn studies. Each image carried a valence of history, metaphor, understanding, and error; an entire epistemology.

I read these images as any symbolic drawing drenched with historical, psychological, metaphysical shells.

I picked up digital tools not to pursue novelty but to solve aesthetic problems. I sought to realize sculptures that blended anatomical traditions—Eastern, Western, speculative. The computational ability to reconstruct form, layer by layer, with transparency and precision and reify it, helped me with my *Ajna* series. Morbid anatomy seemed uncanny within this environment.

This is a brief map of those converging forces: human anatomy, art history, contemporary artists, the binary control of matter, a sculptor's hunger for materiality, and the moment when the configurable machine became a medium —a space where form, code, and flesh intertwine. All the while, the dystopia unfolded. But that's a subject for another day.

Nancy Burson

Nancy Burson, *Aged Barbie,* 1994
Polaroid Spectra image output directly from the computer. *Aged Barbie* was a commission for Marvin Heiferman's book, *The Art of Barbie,* later rejected by Mattel as too controversial.

By the mid-1980's I was known as the pioneer of facial morphing, considered to be the first artist to apply digital technology to photographic portraiture. I'd been interested in the interaction of art and science since the inception of my career as an artist. My mother was a lab technician, and my favorite memories as a child were our visits to the bacteriology lab; enchanting, quiet moments in which I would do fake experiments with real blood.

When I moved to NYC in 1968, I saw MoMA's exhibition, *The Machine as Seen at the End of the Mechanical Age,* and realized that art could be interactive and fun for the viewer. I had an idea to create an interactive age machine that would show viewers what they'd look like when they were older. Very few people knew anything about computers at that time – and I didn't either! I knew Robert Rauschenberg a bit from the art scene, so I decided to connect to him and through him to EAT, (Experiments in Art and Technology), the organization he'd just formed to bring artists and scientists together. I was told I'd have to wait for the technology to catch up to my idea, and seven years passed until a computer graphics consultant I met through EAT finally suggested that I get in touch with Nicholas Negroponte at MIT.

In 1976 it was still easy to pick up the phone and call someone of importance! Dr. Negroponte was head of the Architecture Machine Group at MIT, which later became known as the Media Lab. I told him I had an idea to age people by computer, and he agreed it was perfect timing for me to collaborate with the students there. They had just attached a camera to a copy stand, and then to a computer, a connection that later became known as a 'digitizer' or scanner. It took five minutes to scan a live face. We had to lay the subject underneath the copy stand and tell them when to blink. The interaction became one of the first times that a computer interacted with a live image of a face. I left MIT with a videotape of three faces aged by computer, and when one of the images from the video got some press, the images went the equivalent of what we now call "viral."

Nancy Burson
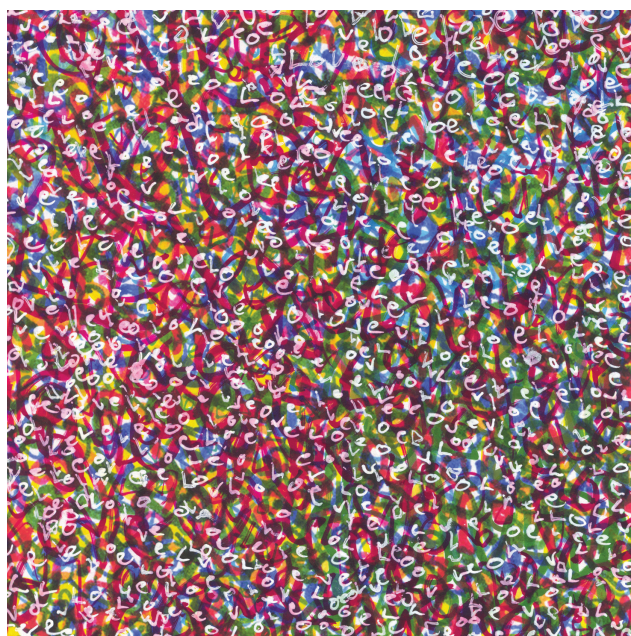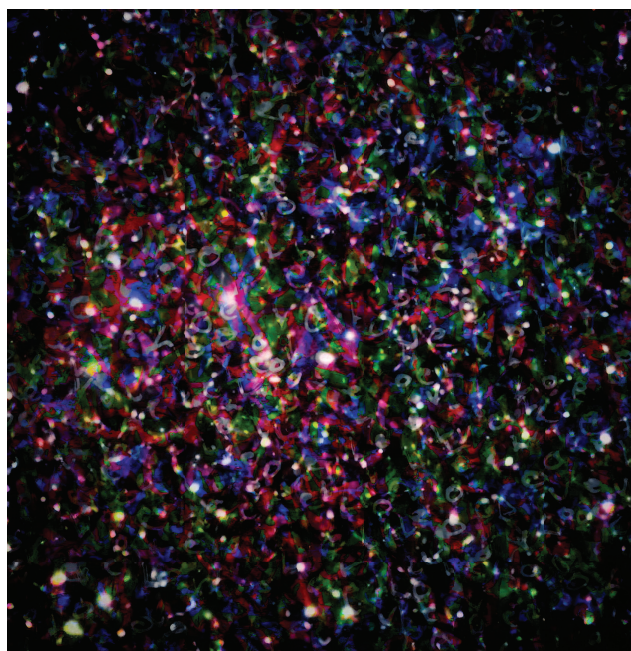
It was Thomas Schneider, a student at MIT , who developed the original triangular grid system for facial morphing, a version of which is still used today for everything from SnapChat to the most complex AI technologies. Dr. Schneider was my co-inventor, and in 1981 we were awarded what was described as a "pioneering" patent called *The Method and Apparatus for Producing an Image of a Person's Face at a Different Age.* That was a decade before Photoshop!

By 1982, I began to produce computer-generated composite portraits. They went "viral," and became photographic canons , ending up in many museum collections around the world. . I also worked out a formula to age missing children in response to a request from the parent of a missing child. They were actually successful in bringing several missing children back to their parents, when their aged faces were aired on national TV in the mid-80's. The software was acquired by the FBI and the methodology of that software is still used by law enforcement to update both missing children and adults today.

Top:
Nancy Burson, *Projection of Love Through the Stars*, 2024
AI assisted animation, still frame, An amalgam of several drawings of the word L-o-v-e written ad infinitum and both handed for brain balancing. These drawings of love's letters appear in conjunction with a fly through of the Sirius Constellation using AI and other effects in collaboration with Efren Mur.

Bottom:
Nancy Burson, *L-O-V-E (drawn both handed for brain balancing)*, 2024
Archival colored pens. 5.5 X 5.5 inches, from the Love's Letters Drawing Series (2024), drawing produced by the repeated rewriting of the word LOVE

Nina Sobell

Nina Sobell, *Chase*, 2005
Clay, 36" W x 18" high x 12" deep

Tension.

My journey with computers began in 1969 with interactive video when I invited viewers to deconstruct my sculptures at Cornell. It was there that I first grasped the concept of art as a collaborative process, one that could transform the observer into an active participant. This foundational experience would later inspire my work with computers, leading to an exploration of brainwave interactions and the unconscious mind.

In 1972, I was working in my studio with my friend Mike Trivich in Venice, California. We began experimenting with an audio Alpha Wave biofeedback device. The idea was simple yet exciting: what if we could visualize our brainwave activity? Mike, a systems engineer, proposed a unique approach using his homemade oscilloscope. By connecting our brainwaves to the X and Y axes, we could observe Lissajous patterns on the screen. When our brainwaves synchronized, the pattern would form a complete circle; when they distorted, it indicated a divergence in our mental states. This made me envision superimposing these patterns over our faces, creating a visual representation of our mental and physical interactions. We were excited about the possibility of communicating telepathically. This was somehow an extension of my desire to have viewers communicate with my sculptures. I hoped to be able to communicate with Mike without language, directly, from one object to another.

I reached out to people at UCLA, hoping to find a scientist who knew more about this. I connected with Dr. Barry Sterman, who directed the VA Neuropsychology Lab there. He agreed to let us use his EEG equipment, but specified one condition: we had to demonstrate the non-verbal dialogue between two participants during our first visit. With Dr. Sterman's DEC PDP-12 lab computer, we monitored the brainwave interactions of two participants. Using two cameras, a video mixer, and Mike's oscilloscope, we captured our non-verbal communication, reflecting both synchronous and asynchronous brain activity. After our positive results, we were welcomed back to the lab. This was one of the earliest attempts to visualize non-verbal communication through technology.

In 1979, my quest for accessing computers to develop graphics for what I started calling BWD – *Brain Wave Drawings* – led me to The Computer Store, owned by former Rand Think Tank employee, Dick Heiser. After I began working there, I met programmer and engineer Chris Matthews. He built an analog-to-digital converter that enabled us to generate computer images from brainwaves. I proposed using satellites to transmit them remotely.

Nina Sobell
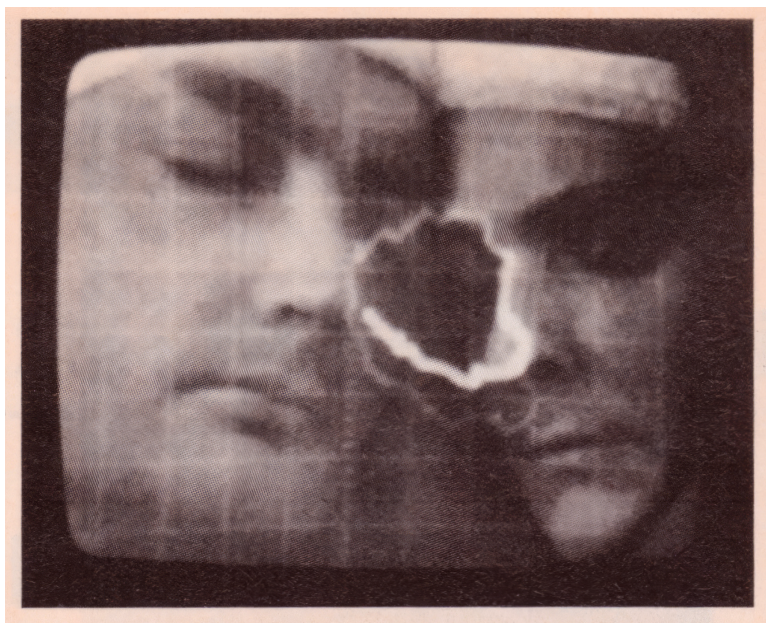
Nina Sobell, *BrainWave Drawings*, 1974

Two people forming a circle by emitting the same identical brain wave simultaneously.

Screen Shot 8.5" x 11" of interaction with the installation

I developed computer animations to make my BWD, using a color-keyed digital electroencephalograph on an Apple IIe, for an installation at the Artist and Computer Show in 1983. It was all about misusing tools meant for science to do something for art.

Tragically, my daughter, Cori Shearer, received an HIV blood transfusion and died as a result. This prompted me to leave LA for New York to seek help and paused my computer project for nearly ten years. After her death, during my mourning period, I made figurative clay sculptures, culminating in the live performance, *Exhumed,* presented at DCTV in 1990. It was cathartic. I was looking for someplace to edit *Exhumed,* so I contacted NYU's ITP, where I became an artist-in-residence. I started back with computers and made new animated *Brain Wave Drawings.*

In 1992, I collaborated with my then creative partner, Emily Hartzell, on a BWD installation at the Bronx River Arts Center. I returned to the same obsession – a way to make inanimate objects "speak," my way of bringing back the dead, bridging cyberspace and physical reality on the cusp of Web 2.0.

Emily Hartzell and I launched the web's first live performance series, *ArTisTheater,* with Naoko Tanese, Sonya Allin, and Jesse Gilbert as the collaborative group, *ParkBench,* a safe place to sit in cyberspace, at the NYU Center for Advanced Technology. We used one of the web's first remote-controlled cameras to turn our studio into a time-based public installation, researching web video as a medium.

While at NYU CAT, I discovered a remotely operated internet camera. In 1995, I created the first interactive remotely controlled figurative sculpture, where participants directed the addition of clay via the internet. I then took that camera to the streets, resulting in one of the first webcams allowing people to remotely access a physical space, fostering a shared experience. These themes -- our desire to merge with another, transcending death, and the limits of the body – have been my abiding themes, from my earliest days as a young artist, to the present, as an aging one.

Paul Wong
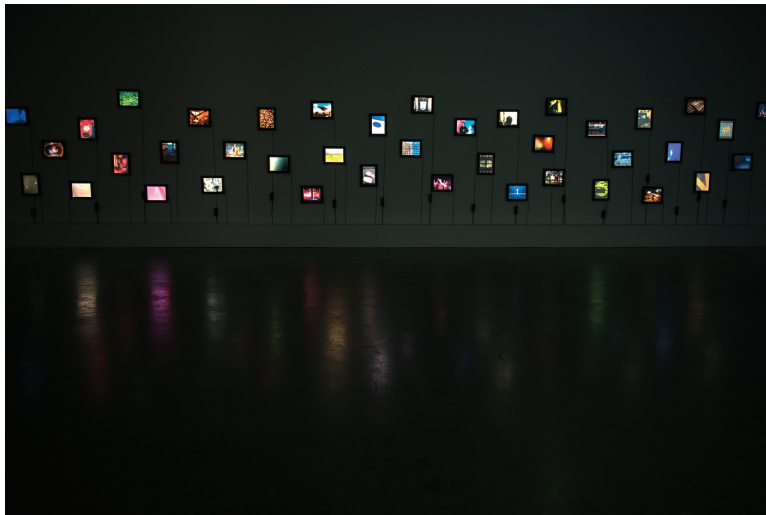
Paul Wong, *#LLL Looking, Listening, Looping*, 2014
GIF, video, and photography looping on 40 10x12 digital video screens, installation dimensions variable.

Photo by SD Holman.

My computer origin story began with the Matrix conference organized by Michael Goldberg in Vancouver in 1973. I was a volunteer.

The registration fee — for the hundred-plus delegates who came from around the world through the Satellite Video Exchange Directory — was that they got to deposit a video and then take away another video that somebody else deposited. I registered people and their videos, and made duplicates for the exchange. From that collection of 100 titles, we started the Video Inn Library (Satellite Video Exchange Society, 1973), now the Vivo Media Arts Center, which includes over 8,000 titles. Maintaining and growing that network was a travel guide to the world for me. It was my first alternative multichannel universe.

It was an incredible gathering: Sharon Grace from San Francisco, Walter Wright with the Paik-Abe video synthesizer, contact improv dancer Steve Paxton, and Fujiko Nakaya from Japan were there. I had full exposure to leading practitioners of video at the time, and they included social justice warriors — people who wanted to do things at an educational broadcast level. There were people doing synthetic retina massage work, a direct link into the digital sphere, and people performing with multiple cameras and multiple monitors. This was anything but mainstream television.

As a 17-year-old, I was taking it all in. These radical, revolutionary people were full of love and concern. They looked to the future and the possibilities of controlling one's own means of production and distribution.

The beginning of computerization was also the beginning of synthesizers and things like desktop publishing. They had a do-it-yourself ethos. We published the Satellite Video Exchange Directory annually until 1978, which transitioned into Video Guide magazine, published five times a year until 1993. I was trying to access each new little thing that allowed for more automation through a particular computer assistant or chip, shifting from analog to the electronic revolution into the digital sphere.

Paul Wong

Paul Wong, *Earthworks in Harmony*, 1974-2024
B&W video, single channel, sound, 31:20 min.

Image courtesy Paul Wong

When I first came onto the scene, it was a time of anti-war, anti-art, anti-commercial galleries, anti-Hollywood cinema, and anti-broadcast television. It was a time that favored the idea of artists making multiples. I could make a videotape and send it to you. You could show it in your living room, you could show it to your friends, and I could do the same. It was totally independent, it was underground, and there was no goddamn expensive framing, crating, and shipping to exhibition galleries. From the very beginning, there could be this free flow of art and information done through the mail.

I've experimented with all kinds of digital platforms, starting in 2000 when the Internet finally started to work, and I could send out into the world whatever I could make. When the smartphone came out in 2007, suddenly everyone had mobile cameras, and even the worst resolution then was better than what we'd ever had before. Phone cameras are still my primary tool because I keep upgrading them to get higher resolution. I can make something and share it instantly, or just have access to recordings on me all the time. I no longer carry cumbersome tools. Of course, I'm reliant on the corporations that own and control the platforms and apps, but I can easily slam things together. I can mix them. We can do this together. And then a lot of that becomes the content. The form and content all blur into one. This change completely elevated everything that I was doing previously and brought me to new and old audiences.

I'm currently Artist in Residence at the University of British Columbia with a chance to experiment with 3D printing and excavating all of my black-and-white negatives from the 1970s and 80s to make photographs in a darkroom.I'm also collaborating with scientists at Forestry who have developed a now patented super black wood called Nxylon. It's the darkest non-reflective wood in the world, and it's sustainable. I've come up with the idea of creating the opposite of a blingy, flashy, brilliant, light reflective patterned diamond to create an edition of a Nxylon Black Diamond that is completely light-absorbent. When you flip it around, after it absorbs all the light, it's a pyramid. This new material and 3D printing technology allow me to work with light in a new way, toward a different kind of photo object. So, as a lens-based artist, someone who's always concerned with light, now I'm making a black hole!

Peggy Ahwesh

Peggy Ahwesh, *Verily*, 2017
Video Still from 9.5-minute Video Loop.

Not exactly an origin story or an "ah ha" moment for me, since it was all along a slow process of integrating 'new' technologies into my practice, but memorably, in the early 1990's I started working with Pixelvision video. This was/is a Fisher-Price video camera for kids that records a very low-res B&W video onto a cassette tape. I liked the soft, painterly quality of the image and I embraced the jerry-rigging that had to be done to get the thing to work. It was a great time of discovery for me to go from Super 8mm film to video and embrace the potential of the computer.

I remember distinctly the introduction of Firewire in the early 1990s as a development that changed everything. It solved a lot of the hesitation I had about the image quality of video; and it offered an integrated working system and was not too pricey. I loved working with mini-DV and the early generations of digital cameras. These days, I have stopped trying to keep up with the changes and upgrades and new versions and improved gadgets (blah, blah, blah), since it's a losing battle and not that productive! I just try to keep it fun and experimental and not to be shy about dipping into 'new' technologies such as the drone, AI and 3D software since I find my imagination wants to go there.

Peggy Ahwesh

Peggy Ahwesh, *She Puppet*, 2001
Video Still from 15-minute Video.

Re-editing footage collected from months of playing *Tomb Raider*, Ahwesh transforms the video game into a reflection on identity and mortality. Trading the rules of gaming for art making, she brings *Tomb Raider*'s cinematic aesthetics to the foreground, and shirks the pre-programmed "mission" of its heroine, Lara Croft. Ahwesh acknowledges the intimate relationship between this fictional character and her player. Moving beyond her implicit feminist critique of the problematic female identity, she enlarges the dilemma of Croft's entrapment to that of the individual in an increasingly artificial world.

Voiceovers: Yuko Aramaki, Samuael Topiary, Eva Waniek. Quotes from "The Book of Disquiet," by Fernando Pessoa, "The Female Man," by Joanna Russ, and Sun Ra. Thanks: Jon Di Benedetto, Su Friedrich, Keith Sanborn, Samuael Topiary, Karim Ghawagi, The White Box Gallery, Stella's Tombraider site. Funding: New York State Council on the Arts.

Description from Electronic Arts Intermix
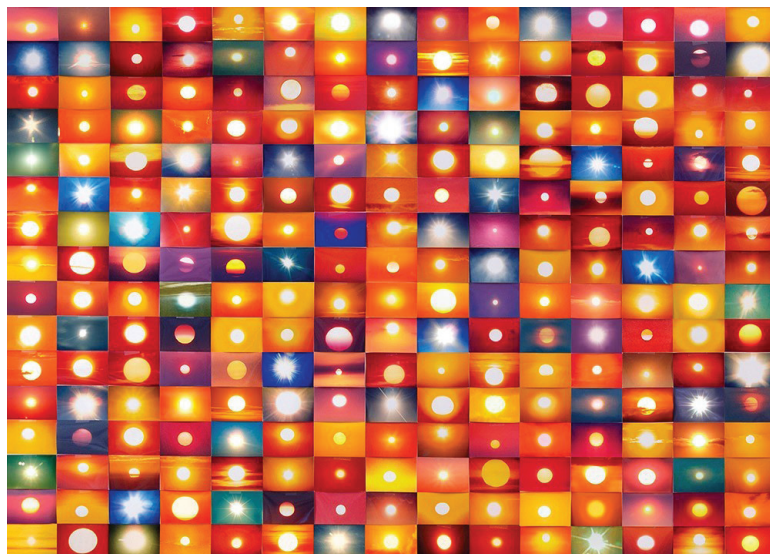
Penelope Umbrico
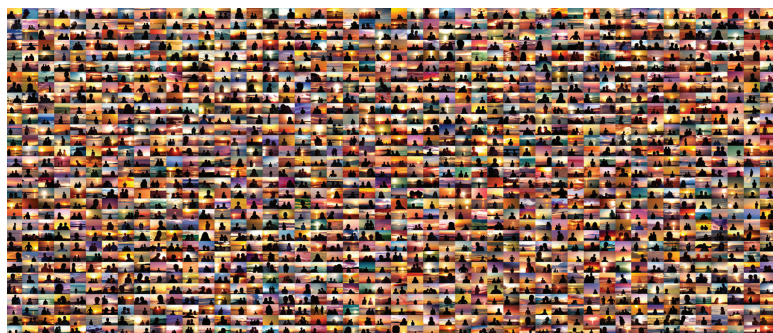
Top:
Penelope Umbrico, *Sunset Portraits from Sunset Pictures found on Flickr*, detail.
2006-ongoing, size variable.

Bottom:
Penelope Umbrico, *Sunset Portraits from Sunset Pictures found on Flickr*, detail.

Sometime between 1976 and 1980, when I was an undergrad student, a teacher needed an illustration of a "personal computer." He had no idea what one looked like, so he asked me to create one.There was a problem, however. I, nor anyone I knew, had no idea either! I imagined a small TV with an attached keyboard and came up with an approximation, which turned out to be remarkably close to the first computer my partner and I acquired a couple years later, minus the two slots for floppy discs (whose entire memory was equivalent to about 3% of the size of a current iPhone photo). It was an NEC, which we mainly used for word processing and then later replaced with a new Macintosh 128K that came with the early image authoring software, MacPaint. I loved MacPaint and made a bunch of awkward little drawings with it.

Computers weren't completely integrated into my practice at that point, but having one definitely influenced how my work was developing. I had a lot of fun playing around with them, obsessively tracking, updating, and using every new version. My work has always focused on what already exists in the world — the stuff, the way we collect and share, and the tools through which that is possible — so anything computer-related naturally fell into that category. I was using computers then solely as production tools — scanning and processing images in Photoshop, making layouts for press and publication. It wasn't until several years later, with Web 2.0 and the shift to user-generated content and social networking, that computers, the screens, and the web, also became the content and focus of my work. What we collectively make and share, and the technologies we rely on to do this, suddenly became exceedingly visible and accessible, offering a view into human behavior that wasn't there before.

Penelope Umbrico

Penelope Umbrico, *541,795 Suns from Sunsets from Flickr (Partial) 1/23/06*, 2006
Detail of 2000 machine c-prints, each 4 x 6 in

At this point, like most people, I think, I have a love-hate relationship with computers. I totally love digital space, how it affords access to so much. Photoshop is magic! The infinite space of canvas boards like Miro and Prezi are magic. Video communication is magic. Having used computers from the beginning, I find screen space comfortable, familiar. My computer — which consists of a linked laptop and desktop, hard drives, and multiple cloud-based storage/back-up systems — is a hybrid sketchbook-studio. Pretty much everything I think about, work on, produce, or exhibit, is there, all the time, whenever I need it, wherever I am. That's magic. It's also the "street" I traverse to research projects, and where, like on a tangible street, I often stumble upon unexpected information that propels a project forward. Its relationship to my physical studio space is fluid: I create things digitally to produce works IRL, and I digitize the material I find IRL for use in digital space.

Nevertheless, the tyrannical aspect of all technology — despite the popular mythology that computers and digital media are democratizing — makes me nervous. Most of us are aware that individually we have little agency over the algorithms governing our interactions with technology, and we willingly give up that agency, allowing this technology to replace nature with images of nature, the sun with screen light, concrete experiences with abstract ideas. Not to mention there are studies showing that these technologies contribute to addiction, depression, loneliness, or the post-internet hyper-consumerism that buries the Earth in more than 2 billion tons of solid waste each year, 62 million tons of which is e-waste. These things make me increasingly nervous.
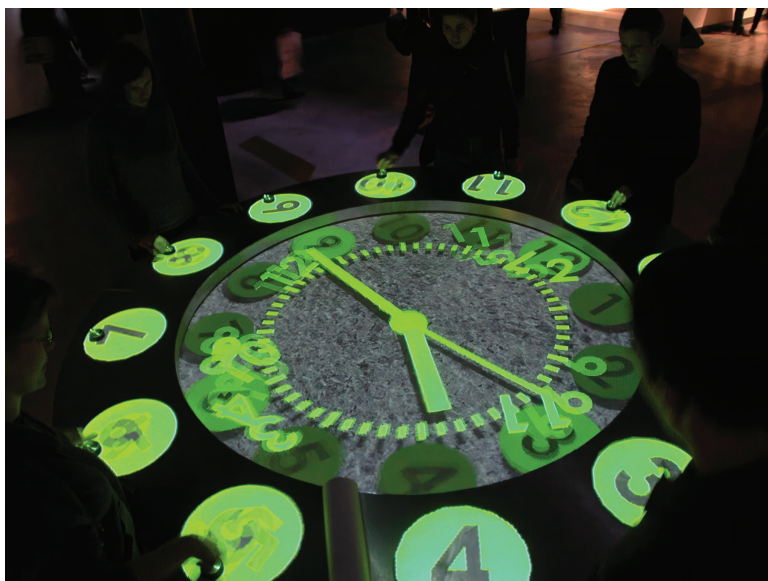
Perry Hoberman

Perry Hoberman, *Anaglyph Curtains*, 2003
Transparent plastic sheets with stereoscopic silhouettes that hover in space (viewed with 3D glasses).

Long before I had any access to computers, I knew them from science fiction.So at first computers and digital technologies (like androids and virtual reality) simply became subject matter in narratives that I presented as performances and installations in the early 1980s. These fictional computers were far more powerful, compelling, and eccentric than any of the real-life PCs that I was familiar with of the time, which seemed to be used for mundane bureaucratic tasks like data entry and bookkeeping.

I was initially drawn to using computers through my work in stereoscopic 3D. Because S3D requires a pair of images that are precisely registered, digital tools allow the kind of precision that is difficult or impossible in the analog, chemically-based medium of photography. Eventually, I spent some time playing on my brother's Mac 512K (with MacPaint) and realized that even with the severe limitations of resolution and color, this technology could be harnessed to create visuals for my 3D works that would have been impossible otherwise.

I decided that I needed a computer of my own, but the Mac was too expensive (and strictly black and white). So I purchased an Amiga 1000, which could work at resolutions up to 640 by 480, with up to 32 colors (!). The operating system lived on a couple of floppy disks (no hard drive). I started producing graphics for my performances, and at first I regarded computers primarily as one more tool to create graphics. But of course computers are more like bottomless toolboxes than specific tools, and soon I started writing my own programs (in various flavors of BASIC). My installations became increasingly immersive spaces with multiple projections that incorporated visitors' shadows into the mix, and as were facilitated by my experiments with code, I became fascinated by the possibilities of interactivity.

Perry Hoberman

Perry Hoberman, *Timetable*, 1998
An image is projected from above onto a large circular table. Twelve dials are positioned around the perimeter of the table. The functions of each of these dials changes and mutates, depending on what is projected onto them at any given moment. Dials can become clocks, gauges, speedometers, switches, steering wheels, and so on. A real-time 3D scene, projected onto the central part of the table, is controlled and influenced by the movements of the dials.

I've always been skeptical of the more utopian claims made of technologies – how the latest software or hardware is unprecedented; how it's going to empower us politically and socially; how everyone and everything is going to be connected to everything else. I've always tended to see my role as critiquing these claims and to avoid making work that simply promoted and demoed the latest cool tech.

Of course, the novelty of computers has faded as they've become ubiquitous and enmeshed in every aspect of our lives. Generative AI is merely the latest hype machine, following crypto-currencies, the metaverse, VR, social media, etc. But it's becoming increasingly difficult to ignore the real harms that come along with the explosive growth of these technologies: harms to the climate, to our politics, and to our psyches. Now that we've opened up this particular Pandora's box, it can't be shut.

Back in the early days, it was possible to see computers as something distinct from the rest of the world — to think about cyberspace, for instance, as some new and separate realm. That's become much less tenable now with internet-connected microprocessors embedded in even the most mundane household appliances. Making work with and about computers now just seems like the default. They do allow us to produce things and experiences that previously would have been difficult to conceive of, but now that they have become ubiquitous, they seem to flatten out the world, colonizing and replacing physical skills, techniques, and materials with virtual equivalents that leave out the grit and feel of life. Nowadays, I am instead driven to make installations and other works that don't simply live on a screen, but instead combine virtual and physical space.
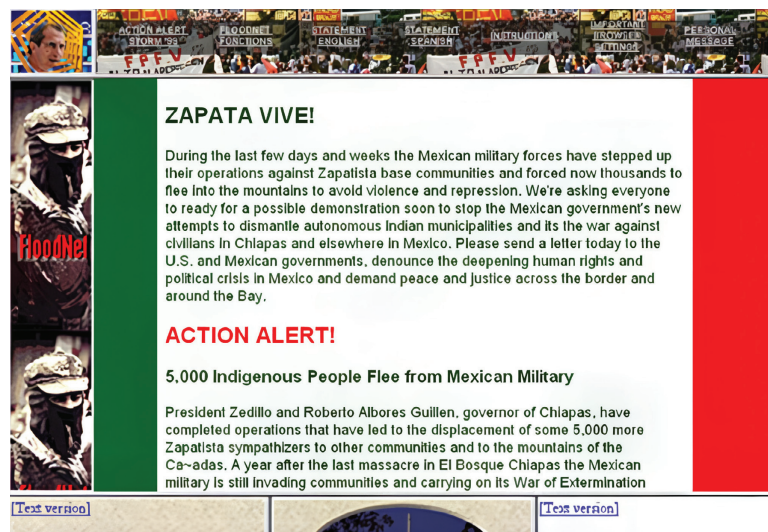
Ricardo Dominguez

Ricardo Dominguez, *FloodNet*, 1998

Computers entered my worlds via an RCA portable black and white TV that was gifted to me just for being born. This glowing machine of wondrous cathode kept me suckling the screen images that consistently framed my interest in speculative visions of the future, even now. The future represented by TV screen culture of the 1960s was often bound to something directly linked to computers or computing, mostly as reflections on Cold War science gone not just awry but completely off the rails. The ones I remember the most were the computer named the "MANIAC" used by the "Office of Scientific Investigation" in the movie The Magnetic Monster, or the giant killing computer in Kronos, and more specifically embedded in my kid mind was the mass planetary computers that destroyed an entire alien species in Forbidden Planet; these films were constantly playing on Saturday mornings on my local independent Las Vegas, Nevada channel 5. The screen questions concerning computing in the 1960s ran the gamut from The Computer Wore Tennis Shoes to Colossus: The Forbin Project.

The turn-key to considering the integration of computing as a performative matrix came from my early training in classical theater from Aeschylus to Teatro-Campesino. I was not only a screen child but a child of the theater. I started doing theater in elementary school in Las Vegas, a very theatrical city. At Southern Utah State College I did on the boards-training. Learning and practicing different types of theater methods and forms from realism to the absurd, from Shakespeare to git-prop theater, from musicals to performance art all led to the development of critical art or artivism or hacktivism in the 1980s. But the clear moment that directly led me to integrate computing into my theater practices emerged from the use of utopian plagiarism that we, Critical Art Ensemble, in Tallahassee, FL developed in the mid-80s, when we cut and pasted the word "Electronic" in front of Henry David Thoreau's On Civil Disobedience. This led us to develop the conceptual gesture of Electronic Civil Disobedience that focused on the qualities of value that "Data Bodies" would have in the 90s under the sign Virtual Capitalism(s) that would lead to the real body no longer having the value it once did. From that conceptual gambit came the need to start accessing computers and networks concretely. This has now become a standard for my research and practice at every turn, especially my co-created gestures with Electronic Disturbance Theater (EDT) 1.0/2.0/3.0. With EDT in the 90s we created the first tool for browser-based VR Sit-Ins called the Zapatista FloodNet. In those days browsers were brand new. In 2007, we developed the Transborder Immigrant Tool by EDT 3.0, a GPS (Geo-Poetic System) for those wandering the Devil's Highway between Mexico and the U.S. The core issue driving the work

Ricardo Dominguez

Top:
Ricardo Dominguez, Performance Intervention 2008 at Mexico - U.S. Border with Unknown Border Patrol Agent
Photo by Brett Stalbuam

Bottom:
Ricardo Dominguez, *Transborder ImmigrantToolConcept*
Showing working tool and screen-shot from Nokia-e71, 2010.
Photo by Brett Stalbuam

was how, at all levels, the computing arts might function as theater or performance art. How the screen and speculative allow for embodied gestures and reflections built on code-as-stage and the always-already performative matrix inside code in general.

I teach in the Computing Arts and Speculative Design program in the Department of Visual Arts at UC San Diego, and the performative matrix of computing and the screen continues to be my focus. Currently students are seeking to understand the potential aesthetic concerns manifesting machine learning, A.I., extended reality, and VR from one degree to another. I am more concerned with low-tech and no-tech, to create resonant speculative gestures. Since 2012, I have been focusing on dronology and its expansion on a planetary scale, specifically the use of unmanned aerial vehicles. This led to some fascinating encounters with the U.S. Border and Custom Patrol and Homeland Security during EDT 3.0 performances during the MexiCali Biennial in 2023 at the Mexicali and Calexico border wall. EDT 3.0 co-created singing border drones that share the cultures of the border from the sci-fi like words of Gloria Anzaldua to the sounds of Nortec to the new speculative border hacking university growing on the border. This shifts the ugly racialized history of the border as a site of fear, to express awareness concerning the conceptual and aesthetic depth of border communities as borderless cultural sites of invention and envisions prevention through deterrence policies that should not stop. The significance of computing is even more important in the current political climate in the future, if we as a species can make it that far.

Tishan Hsu

Tishan Hsu, *Interface Remix*, 2001
Archival inkjet on canvas. Diptych: 96" x 95".
Photo credit: © Annik Wetter, MAMCO Geneva 2024.

I began working with imaging software around 1997, as an unexpected evolution from my work with silkscreening and out of curiosity. The silkscreens were an effort to integrate an embodied image into a pictorial technological syntax, which was not available to me at the time. Expressively, I was interested in a more clinical "affect" in the work than what I could create with analogue media. I wanted a "factness" while simultaneously developing an illusionistic syntax. It was a paradox. That led to my use of photography. When the use of the desktop computer offered photographic digital imaging, the availability of the imaging software simplified the methods needed to create the syntax and could produce it in a technological process, which was critical for the conceptual underpinning of the work. This contrasted with the analogue methods I had used previously and allowed the work to move closer to an embodied technology, being of technology and produced by it. However, it took years to develop a way of integrating the digital computer interface with a haptic materiality in order to develop the range of "affect" that I was looking for.

Tishan Hsu

Tishan Hsu, *Breath 8*, 2022
UV-cured inkjet, acrylic, silicone, ink on wood, 48" x 62" x 5.5".
Photo credit: Pierre Le Hors.

My personal and artistic life are inextricably woven into the digital through the interface of the screen, which is embedded in the computer. Computers are the current interface with the digital. That could change as the technology of the computer evolves. Part of the language of the computer interface is the photographic image. In my work, I feel I am embedded in a digital, photographic matrix enabled through the computer that is allowing the work to unfold in unimagined ways. Computers and the digital have a similar impact in my personal life. They are merging.

Toni Dove
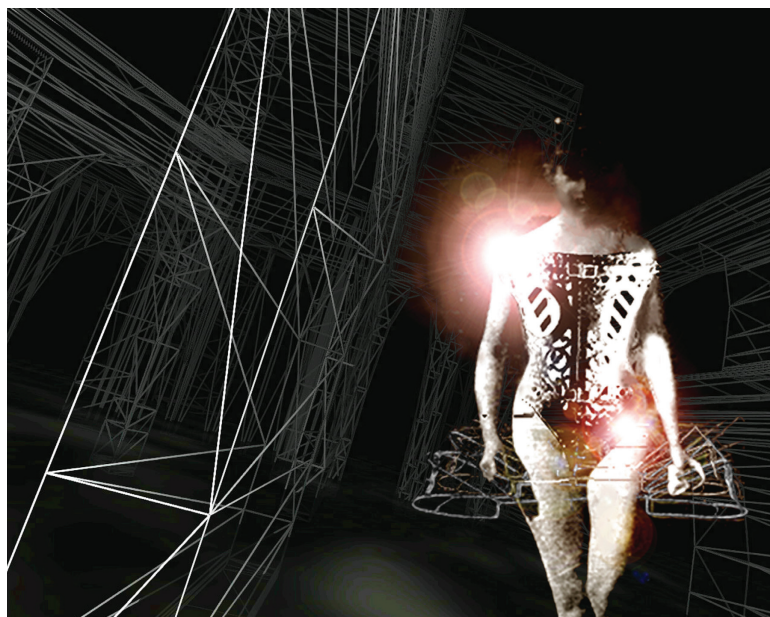
Toni Dove, *Coroner's Dream, Archeology of a Mother Tongue*, 1992
VR Performance, 1 hour.

In the 80s I moved away from painting and started working with collaged images, multiple slide projectors, and LaserDisc players. I was projecting onto three-dimensional scrims using sequences of slides made from black and white collages, trying to make movies that came off the wall and into the room with you. The art world was anti-narrative, and my interest in duration and storytelling moved me towards dance, music, literature, and film. My first computer had a floppy disk for a hard drive; I programmed instructions for dissolve units to animate slides and video using timecode on audio cassettes that played a soundtrack. It wasn't possible to manipulate images or do CGI in a home studio – the computing power didn't exist. I was making three-dimensional movies, a form of holographic stop-action animation that used tech that was trickling down from commercial trade shows. Artists have always been good at the subversive abuse of technology.

I started working with responsive environments at the Banff Centre for the Arts with *Archeology of a Mother Tongue* in 1992, a collaboration with Michael Mackenzie. It was one of the first, if not the first, narrative VR project. We were part of a Canadian government-funded Art and Virtual Environments Seminar on virtual reality that developed eight large-scale VR projects. The computers were huge, purple, and had their own refrigerated rooms, and the headsets looked like early deep-sea diving gear, but the vocabulary was surprisingly like what is current in VR. Commercial platforms did not exist. VR came from research in academic and military labs, where it originated as flight simulation.

At that time conversations with musicians became central to forming my language for interactivity. Musicians understood collaboration and duration -- and the bandwidth existed for interactive computing programming in sound much sooner than it did for visual material. I also found I could understand this new language through the idea of instrumentality. I wasn't drawn to the headset as an interface, but I found the feedback loop between the body and technology riveting: the sense of an almost *trompe l'oeil* encounter. It's an illusion tricking your body into thinking something is happening that isn't, using the body's perceptual apparatus to navigate media.

Toni Dove

Toni Dove, *Sunjammer 6: A Tale Blown by a Solar Breeze*, 2025
Alicia/dance rehearsal with installation, 10'x10'x10' scrim, 40 min.

I often describe myself by saying I'm an instrument builder. I make human-operated machines that tell stories. Each piece is a conversation between an evolving machine: a program (a hybrid AI system – small, proprietary, and customizable), interface technology, screens, robotics, media, and a developing script. The story becomes a viewer or performer-operated automaton. The interactivity has developed more and more to behave like a magnetic field that pulls you into or cements a connection to the experience. There is a pull between the horizontal: a sequence in time, and the vertical: the improvisation of interactivity. It becomes the spatialization of a narrative experience.

I love the potential magic of technology-based tools. But there is a dark side to using them. For me it's critical to consider why and how the tools we use are designed. We don't want them to use us more than we use them. Working with emerging technologies always carries with it the danger that you will be part of a process of accommodation to something problematic. Each evolution of the global computing platform brings with it new escalations. When people say AI will cause the human race to become extinct or be the salvation of it, they are speaking less about a technology and more about the market. If profit is the primary or only goal, then the potential for damaging secondary effects is ignored in the development process. Disinformation, deep fakery, political manipulation -- a spectrum of frauds is unfolding in front of our eyes in the wake of our predictions that they will happen. Technology develops at incredible speed. It makes a perfect marriage with consumer capital. There's always a newer product and there's no need to build in obsolescence. But institutions are slow and the legislative bodies that regulate new technologies get left in the dust of rapid development. Corporations are not interested in self-regulation. We see repeated evidence of this, and given their goals it makes no sense to expect it. The only way I know how to change this is collectively, primarily from the non-profit sphere; and hopefully government, if enough of us prod it, relentlessly. I hope we have time.

Ulysses Jenkins

Ulysses Jenkins, *Televiews and Cable Radio*, 1981
Courtesy of Electronic Arts Intermix (EAI), New York.

Over the many years that I've been doing my work, technology has changed and that means we had to change with the technology. Those changes have in some ways predicted how I approached my art practice. I started working with the Sony Portapak back in the early '70s, after Nam June Paik made this device his tool for making videos. I had a chance to meet him when I was in graduate school at the Otis Art Institute. Paik was a visiting lecturer at UCLA at the time, and my professor at Otis, Gary Lloyd, who was doing some of the earliest artwork with fax machines, introduced me to Paik. I had just finished making *Two-Zone Transfer* (1978) and had him look at the video. He gave me a response, saying that he thought it was good. This encounter helped me decide my direction, at a time when I was pondering whether to embark on a painting career or go into video and performance. So that's how everything got started for me—although I did make the video *Mass of Images* (1977) prior, which was the work that got me into graduate school.

… [Later] when I was doing all this virtual communications work and telecommunications art, I was trying to say that Black people are going to be in the future. When I collaborated with Kit Galloway and Sherrie Rabinowitz with the Electronic Cafe Network for the 1984 Olympic Arts in LA, I made a simulation of what video phone technology (our cell phones) might look like in the future. At that time, the only Black person I knew of who was in a futuristic show was the woman in *Star Trek*, Nichelle Nichols (as Lieutenant Nyota Uhura). She was a sister. Now there's recent talk about going back to the moon and sending new astronauts to try to make a settlement. They're going to send a sister. So, yay! for Black women!

From "Ulysses Jenkins," interviewed by Jareh Das, BOMB Magazine, Fall 2023

Wenyon & Gamble
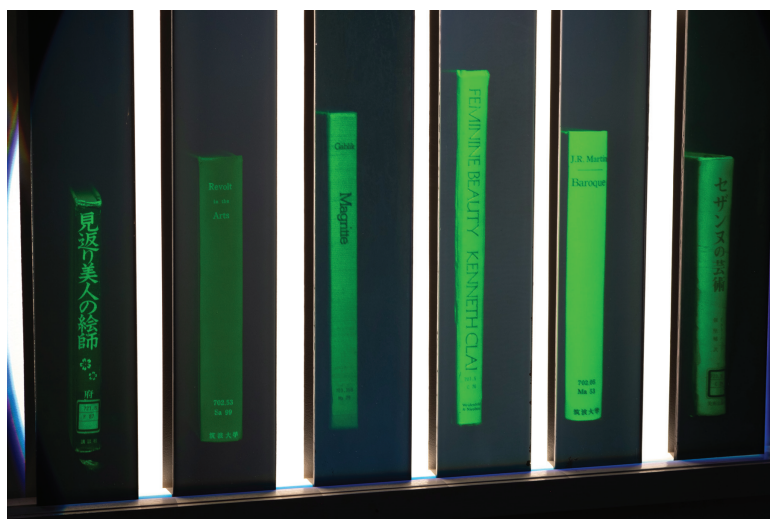
Wenyon & Gamble, *Bibliography*, 1992
54 holograms of books, selected from the Art Library of the University of Tsukuba, Tsukuba, Japan, detail: 6 books.
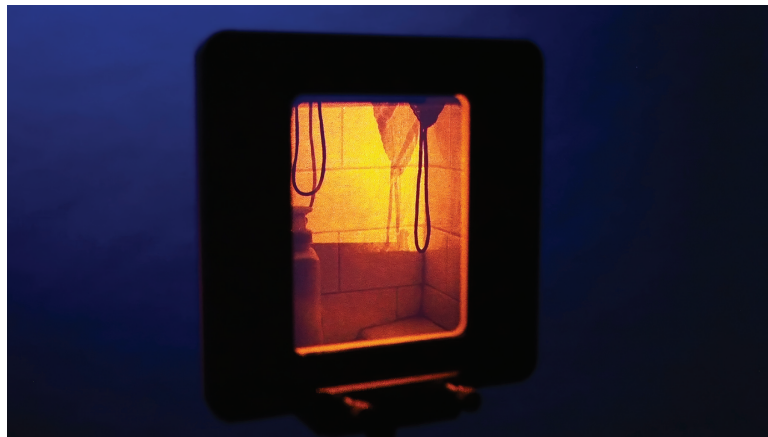
Copyright Wenyon & Gamble

Susan Gamble

We bought our first Apple computer in Japan in 1991, along with a Wacom Pad and a printer. I think we had our best fun at this early stage, when we taught ourselves how to use these tools. We produced simple black and white prints. I think everyone, when exploring the computer (or any other form of an emerging technology) finds something that works for them, only by experimenting. We taught ourselves holography. At that time, we were Visiting Professors of Plastic Arts and Mixed Media at Tsukuba University in Japan, so we also taught our students there how to teach holography. At the same time, we combined our first black and white digital prints with holograms, using the holograms to weight our paper prints, mimicking the way antique scrolls were displayed in Japanese museums.

We went on to produce digital photographs with the new digital cameras that followed on the heels of computers. I remember that a moment arrived at the end of the 1990s when it seemed like everything in our lives -- the administration, our communication by email, and our art -- all required a computer, and we seemed to be in front of a screen all day long. At that stage, and especially for photography, the endlessly increasing license fees required to update and use Photoshop were aimed at commercial users, not artists. It was at this point that we returned to holography, as with this kind of out-dated technology, we needed no permissions nor had to pay any fees!

Holography is rather like the daguerreotype of 1839, given to the world by the French government. Holography was gifted to the public by Denis Gabor, placed into the public domain when it was published in Nature in 1947. Although holography is often considered unsuccessful as a commercial product, because of its free use and lack of patents, it contrasts particularly with the ongoing restrictions of digital and computer imagery. Interestingly, many of its practitioners -- including ourselves -- never studied holography at art schools. Holography, the way we practice it, is essentially an analogue process, an antiquated new technology that we embraced because it was actually free!

It's ironic that the computers that we all hoped might liberate our work and practice when we discovered them in the early years seem to come with restrictions, since all of our computer data has become the new real estate, and we are all data managers now!

Wenyon & Gamble

Wenyon & Gamble, *Intimate Space*, 2024
Laser-transmission hologram on 4" x 5" glass, yellow laser, blue light, artists' frame and stand.

Copyright Wenyon & Gamble

Michael Wenyon

My first digital experience was with a fictional computer on television in the 1960s. One evening, as I watched the local news with my British father in our Dayton, Ohio living room, the English cartoonist Rowland Emett appeared with his *Computer for Those who Try to Forget.* The fantastical construction resembled his later design for the flying car in *Chitty Chitty Bang Bang.* Emett's machine satirized the grandiosity of technology by employing useless everyday objects: a common brick took the role of 'solid state memory,' for example. The absurdity amused my father and I. VAfter that, I would never take technology too seriously.

I grasped how important computers would be to me when I first ran mathematical programs on a teletype machine. I was a student of optics at Imperial College, London. Before that, I had waited days to discover the outcome of punch-card programs, and I was losing interest. The teletype's clattering response to commands was alive, a delight by comparison. Now, it seemed, the computer was really paying attention to me. I was in control.

Today I regard computation as a legitimate cheat in mastering the material world. With 'technology' in general, I feel that the physical world, the substances and optical phenomena that underlie human vision and allow holography, are beyond formulation and can only be known empirically, through the senses. I like that. Show me the picture: make it, experiment with it, look at it, and try to understand it.

Will Pappenheimer

Will Pappenheimer, *Mixed reality installation*
Custom augmented reality app on Apple iPad Pro, character animation, ASMR internet video sources, table, domestic and medical objects, lamp and chair.
Dimensions: 22"w x 24"d x 54"h , installation variable, animation: 7:01 min.

My father was an accomplished physiologist, a purist who said we were reducible to carbon dioxide and water vapor. In his scientific research he was also an excellent jury-rigger, which facilitated a number of his discoveries, a trait I have employed fruitfully in making art, particularly with the computer. During WWII, he joined many scientists assisting in the war effort, in his case, high altitude respiratory physiology for planes. After the war he became one of the first scientists to receive funded research outside of the academy. I grew up in a supreme scientific worldview combined with a rather severe parenting style. Science came to represent for me a form of the tyranny of reason. The time was also the 60s, a period of critiquing culture and politics, civil rights and Vietnam war protests, the expanded mind through psychotropic drugs, and Eastern spiritual practices. During this period, I remember that the computer was associated with governmental or post-war anonymity and surveillance.

Sometime around 1990 my father gifted me his outdated Mac Plus, which was completely unaffordable to me then as a barely self-supported artist. For him, as a still active retired scientist, its data processing capabilities and international connectivity were game-changing. The "personal computer" was described as completely customizable to the user and hence seemed to have a new kind of reflective humanity. My initial interests were more as a curiosity. I found it easy to learn and became interested in the peculiarities of its aesthetics, early painting programs, and ability to combine image with text.

In 1998 I started my first university teaching job as the Area Coordinator of Electronic Intermedia at the University of Florida, Gainesville, a small area started previously by the new media artist and critic, Simon Penny in 1989. There were vibrant interdisciplinary discussions among faculty exploring the sociology and psychology of the internet in conjunction with site-specific geographic space led by media theorist Gregory Ulmer. I found myself increasingly interested in the live internet webcams as sites for new forms of video and performance. I embarked on a series of works materializing emerging forms of global self-surveillance into installations combining sculpture and webcam feeds. I saw them as a new set of social and spatial relations. I moved toward computer-based media with a profound sense that this was a future that needed to be addressed.

Will Pappenheimer

Will Pappenheimer, postcard design for Manifest.AR collective show at Institute of Contemporary Art, Boston, during the 2011 Boston Cyberarts Festival, 2011.

In 2010, I started a new phase when I was invited by artists Mark Skwarek and Sander Veenhof to create a 3D work for an unannounced augmented reality (AR) intervention into the Museum of Modern Art. They would create a virtual exhibition of AR works to be placed on the floors of the museum and invite their audience and the institution to come to the exhibition on short notice. Although the AR medium was primitive visually and limited to the size of the cell phone screen, conceptually this seemed large-scale and important. In the early 2000s, I was working with another artist, John Craig Freeman, on an intervention into the online 3D world building site, Second Life. Virta-Flaneurazine was a mock virtual pharmaceutical start-up that would develop a potent programmable mood-changing drug and clinic for online virtual worlds and other social networks. We posited it as a psychotropic "Wanderment" drug, causing the user to aimlessly roam the distant lands of the internet, and the project offered both a virtual and physical installation clinic to treat Wanderlust Deficit Disorder (WDD), or internet addiction.

After the MoMA event, a few of us founded an international collective of artists and AR-oriented projects known as Manifest.AR. I began to focus on site-specific works. In many cases this led to what we might call virtual public or land art. These works emerge through a relationship to the histories or functions of an external site, institution, or a symbiotic relationship to specific objects in an installation. My practices are spread across computer-based activities to the physicality of site visits, site research and sculptural construction. This double vision allows for additive and interventionist works, which can have both resonant and dissonant qualities. In search of a more embodied experience, I have also recently reintroduced virtual performance and narrative by including avatars as interlocutors to cultural and social currents. Intersections of virtuality in its widest sense, as a reflection of the "real," continue to be a driving force in my work, now more than ever, as we have all witnessed the profound effects that digital media have on social space and ideas about human embodiment.

Wolfang Staehle

Wolfang Staehle, Promotion for <aliens@thing.nyc.ny.us> Mailing List , 1993
Collage distributed on the THE THING BBS.

The Thing started in Danny Newberg's basement on White Street in the fall of 1991.

Around 1990, there was a slight economic downturn. Some galleries closed and people didn't go out much anymore. I had an Amiga 2000 and played around with paid programs, video cameras, and digitizing photographs. One day, I saw a modem at the store and bought it out of curiosity. I had no idea what to do with it, but then I found a lot of local BBS systems where nerds were exchanging little programs, ASCII graphics, and games. I had no idea about the whole technical aspect or programming, so I always had a lot of questions, and I always asked these guys. I liked that kind of openness, while in the art world, things became more closed down. I thought maybe I could get people together this way to talk about art in a kind of virtual round table.

I asked Danny if I could use his basement to set up a BBS. I found a few friends who were also a bit tech savvy. We built our own private network and started posting artworks. Joining the big feed was too technical, and I was afraid of getting too much interference from people who have no idea about art. The group consisted of Benjamin Weil, Franz von Stauffenberg, Blackhawk, Jordan Crandall, Josh Decter, and Julia Scher, one of the few women. We started the network with some Europeans in Cologne, Dusseldorf, and Berlin, where I also had friends. Some already had groups, like one in Berlin called Der Friseur, that published little art magazines and fanzines. Artist photographer Jörg Sasse in Düsseldorf collected all the data once a day from all the other nodes. Then at night, from New York, I made a call into his server and picked up the data and sent him what happened here. We tried to synchronize certain message boards and topics so people could participate with one day's delay in the discourse. For the time it was a pretty fast information exchange.

When the World Wide Web came, that phase of the project had run its course. Some got tired of it and dropped out. In 1997, we moved to a place in Chelsea and made The Thing bigger. We made a website, basically replicating this BBS experience, so you could see who was online and you could chat them up. We added a reviews section of current shows and a video and audio section for people to post content.

Wolfang Staehle

Wolfang Staehle, "09/10/01 20:1 6;16 EST", 2001
Still from *Empire 24/7*

We had a camera in the office recording us all day long. People could check in online and see who was there. Then at one point, I took a camera and put it facing out the window. This is how Empire 24/7

started. The whole idea with the BBS was about interactivity and getting past presenting something to be consumed. I wanted everybody to do both. There was a woman who I had never met who collected a

screenshot almost every day from that streaming video of the Empire State Building and made a beautiful lyrical piece out of it. At first I was like, wow, somebody took my pictures. And then I thought, Oh, beautiful. She really enjoyed it. I did this kind of thing myself in the 80s. I grabbed screenshots with subtitles and made stuff from other films. I didn't care about copyright or anything.

Empire 24/7 was shown in San Francisco with the curator Peter Fleissig. Later, back in New York, he saw me on the street and said, Ever since I saw this work of yours in San Francisco on the screen, now when I go out and see the real thing, it's like I've never seen it before. That is exactly what I was going after, this kind of awareness of being there with something else. I was so happy that finally the coin dropped. He got it.

We had fun doing The Thing because it was new territory for everybody. We were checking in often to see if somebody posted something new. I don't have this excitement anymore with social media. I'm not doing social media at all. I'm mostly annoyed when I get stupid emails. I know I should reach out to people and tell them what I'm doing and see what other people are doing. Sometimes I miss something, but maybe it wasn't so important.

In the Beginning, There Was the End

Natasha Chuk

Art history is not a neutral ledger. It reflects a selective memory shaped by power, privilege, and the convenience of tidy narratives. The origin story of digital art, like all cultural myths, has been streamlined into a canonical arc—one that privileges formalist abstraction, generative logic, and systemic precision. The clean geometry of early algorithmic works from the 1960s and 70s was often male-dominated, computation-driven, aesthetically minimal, and disavowed embodied presence. In privileging formal minimalism, it laid the groundwork for a visual regime that resurfaced in contemporary art practices, placing a firm grip on the ideologies and aesthetics of today's digital culture. But artists born in the post-WWII years following this first wave of creative experimentation with computers, a group identified here as The First Circle, fall outside of this primary lineage. Intermedia artists, women-identifying artists, people of color, and hybrid practitioners made work that, in contrast to their predecessors, was often deemed too messy, too imprecise, and too difficult to categorize. Without a script to follow, they dismantled the Greenbergian formalism ideal, staging unruly experiments infused with the same radical vitality and humanist attentiveness that has animated their work and practice from the beginning.

This archive and the text you hold in your hands are thus a quiet act of refusal. They deny a singular history, refuse to fall for aesthetic sterilization, and spurn the idea that art made with computers should be neat, optimized, rational, or abstract. They gesture toward the mourning of lost time and the artists, works, and philosophies that were excluded in pursuit of a streamlined, technocratic futurism. They signal that in the beginning, there was the end. Their beginning was their end, marked by the acceleration of technological development and the exhausted creative efforts buried under the weight of their own collapse. These pages function not just as documentation, but as an invocation: a gathering of names and practices, a constellation of resistance, and a record of feeling. Real, untidy human emotions.

If the mainstream history of digital art has been fashioned around the ideology of control—over code, meaning, and machine—then the works collected here offer an alternative. They operate in a field of radical indeterminacy, lacking control and rejecting explanation. They forego the aspirations of seamless interaction or algorithmic spectacle. Instead, they dither in the unstable territory between thought and sensation,

technology and mysticism, and even between reason and a complete undoing. They sometimes wound or haunt. They function as fragile systems designed around the complexity of human feeling in a realm that claims to be free from it.

The artists presented here operate within a rubric, its own kind of algorithm that reads like a manifesto in reverse. This playful script, created by Claudia Hart, leads to a gathering of foundational figures. They are the conceptual cartographers of the proto-digital whose radical interventions in code, perception, and interface enacted a poetics of computation and visual representation long before the language of so-called new media was formalized. Some of the artists in the archive are working at the margins of computing and its ethos. The collaborative duo Wenyon & Gamble (Michael Wenyon and Susan Gamble) are renowned for their pioneering work with analog holography. Their haunting installations deftly navigate the perceptual edges between virtual illusion and spatial dimensionality to foreground the epistemological instability of vision itself. Though this form does not incorporate the digital, it engages similar concerns of material presence and simulation in digital and post-digital art, such as immateriality, data embodiment, and the ontology of the image. Through their work, they, along with the others in this archive, inscribed the speculative architectures into the nascent imaginaries of digital and networked cultures. However, against the backdrop of today's red-chip aesthetics of brash, shallow, monetized iterations of screen-friendly art designed for blockchain-fueled speculation, their work employs the tactics of computing but does not scream for attention. Instead, it murmurs, enchants, and tells stories. Where today's red-chip marketplace celebrates immediacy, scarcity, and simulated value, these works draw us into an alternate temporality and texture. They offer no quick payoff, no instant thrill. They invite a kind of contemplative looking, listening, and being that is increasingly rare. They invite us to dwell in discomfort, vulnerability, and our own imperfect presence, including our own immortality.

This gathering of names and artworks is not an attempt to reject the dominant history outright, but to complicate it. It is a reminder that multiple truths can and must coexist in a field of struggle. It warns against accepting the idea that the digital is a singular aesthetic or a coherent ideology. Hart's own work, and the broader lineage she gestures toward, insists on the digital as a liminal space of affect, contradiction, and transcendence. Rather than seek resolution, we are invited to linger in the space between decay and renewal, between sensation and interpretation, and self and system. In all these ways, this gathering

performs a kind of philosophical labor. It resists the instrumentalization of feeling and the automation of experience. It reminds us that the most important truths cannot be optimized: they can only be felt. It is a strategy of radical humanism. It is not the naïve optimism of universal progress, but an embrace of the fragile and indeterminate. Here computers and new media are neither celebratory nor dystopian. They are relational and tactile. They are transcendent in their abilities to distort perception and reveal the unconscious rhythms of the body and mind. Through these works, we get an encounter that is not always comfortable. Yet this is precisely the point. In a culture that rewards certainty, these works insist on ambivalence. In a world obsessed with productivity and progress, they give us decay and disappearance, and sometimes indifference. In all ways of life governed by speed, we are offered duration and nuance. These works do not ask to be understood. Instead, they offer opportunities to feel. And in that feeling, we are transformed.

As a media theorist of a different generation, my interest lies not in the techno-formalist ambitions of early computational art, but in the emotional, affective, and existential (read: messy) undercurrents that this aesthetic often effaces. I am drawn to the ways perception is mediated and extended and lead with an understanding that media are not a neutral conduit of information. They are a charged site where aspects of our humanness are tested, dissolved, and reconfigured. In this way, I contemplate the stakes of embodiment, loss, and perceptual intensity within a digital landscape increasingly dominated by abstraction, automation, and disembodied logics. My engagement is rooted in history and speculation, considering what histories are foregrounded, what sensibilities are sidelined, and what kinds of feelings survive—or are even possible—within algorithmic regimes.

From the beginning, a group of artists worked with machines not to replicate the alienation of capitalist efficiency, but to subvert it. They imagined digital and virtual space as a site of ritual, resistance, and becoming. It is this lineage, which is often erased by the myth of the clean computational origin, that this archive reclaims. This, then, is art after the end; or one might say at the very beginning of the end. Art that does not promise utopia, but carves out a space for sensation and shared refusal. It does not offer the comfort of narrative resolution. Instead, it offers a place to stand in the wreckage, to grieve, and to begin again.

About the Authors

Natasha Chuk

Natasha Chuk, PhD is a media theorist, writer, educator, and independent curator whose work explores the historical, philosophical, and creative dimensions of media and technology. Her research focuses on how media systems shape perception, embodiment, and cultural imagination. Bridging critical theory, media history, and artistic practice, she investigates the recursive logics and material residues that inform contemporary visual and technological culture. Her writing has appeared in *Millennium Film Journal, The Brooklyn Rail, Chronogram, IMPULSE Magazine, FLAT Journal,* and other periodicals and edited volumes. She is the author of *Vanishing Points: Articulations of Death, Fragmentation, and the Unexperienced Experience of Created Objects* (Intellect, 2015) and *Photo Obscura: The Photographic in Post-Photography* (Intellect, 2025). She teaches courses in the areas of film, photography, video game studies, new media art, and media theory at the School of Visual Arts and Parsons in New York City.

Claudia Hart

Claudia Hart emerged as part of that generation of 90s intermedia artists producing what was known then as Identity Art, that she later interpreted in relation to developing simulations technologies. Hart's work is about issues of the body, perception and nature, charting the natural as it collapses into technology. Her work mixes realities. She also thinks of her intermedia installations as sites of contemplation and transformation.

Hart is a pioneer of 3D animation and, as they were invented, other forms of VR, AR, along with tangible objects made by computer-driven production machines, created using related computer models. She took a feminist position in a world that was then without women, 30 years ago, and was inspired by the French media artists of the 1960s.

Hart calls her work, "post photography," and has also created a body of theoretical writings and exhibitions based on this concept. Her 3D worlds are generated by mathematical models rather than captured by a camera on film. In 2007, at the School of the Art Institute of Chicago, she developed a pedagogic program based on this concept. *Experimental 3D*

was the first art-school curriculum wholly devoted to teaching simulations technologies. Hart was a professor at SAIC for 16 years

Claudia lives in a ramshackle Victorian house on the North Shore of Staten Island, New York City, and is married to the Austrian media artist Kurt Hentschläger.

Artists' Biographies

Adrianne Wortzel is a new media artist based in New York City. She has exhibited her work for over six decades at various venues, including the Asheville Art Museum, Whitney Museum of American Art, Ars Electronica (Austria), and Moderna Museet (Stockholm), amongst others. Since the 1990s her work has integrated robotics into performance art, installations, and electronic literature in order to examine technology's impact on both quotidian experiences and broader society. Wortzel's digital text Solace and Perpetuity, a life story was awarded a 2015 New York Foundation on the Arts Award for Fiction. Her digital and electronic literature are in collections such as the Morgan Library and Museum, Duke University David M. Rubenstein Rare Book & Manuscript Library, and the Pratt Institute Artist's Books Collection, amongst others. Wortzel received a B.A. in Fine Arts from Brooklyn College, where she studied with Ad Reinhardt, Burgoyne Diller, Jimmy Ernst, and Louise Bourgeois. She also has an MFA in Computer Arts from The School of Visual Arts. She is presently a professor emeritus in the Departments of Entertainment Technology and Emerging Media Technologies at the New York City College of Technology.

Annette Weintraub is a media artist whose work explores architecture as visual language and the symbolic and social dimensions of space. Her projects integrate narrative and conceptual representations to examine the boundaries between personal and public environments. Her work has been exhibited internationally at venues such as the Whitney Biennial, ICP, FILE (Brazil), ISEA, SIGGRAPH, and the International Film Festival Rotterdam, among others. She has received commissions from Turbulence and CEPA, and awards including I.D. Magazine's Silver Award. Her work has been featured in *Artforum*, *Art in America*, *Aperture*, *The New Yorker*, *Newsweek*, and *The New York Times* online.

Chico MacMurtrie is internationally recognized for his large-scale, performative, kinetic installations, and interactive public sculpture exploring the intersection of robotic sculpture, new media installation, and performance. His work investigates organic life from deep within, finding geometry in all living systems. MacMurtrie and his interdisciplinary collective Amorphic Robot Works/ARW have received numerous awards for their experimental new media artworks, including five grants from the National Endowment for the Arts, the Andy Warhol Foundation Grant, the Rockefeller Foundation Fellowship, VIDA Life 11.0, and Prix Ars Electronica.

MacMurtrie was awarded the Guggenheim Fellowship in Fine Arts in 2016 and the Map Fund Grant in 2019.

Claudia Hart emerged as part of that generation of 90s intermedia artists producing what was known then as Identity Art, that she later interpreted in relation to developing simulations technologies. Hart's work is about issues of the body, perception and nature, charting the natural as it collapses into technology. Her work mixes realities. She also thinks of her intermedia installations as sites of contemplation and transformation. Hart is a pioneer of 3D animation and, as they were invented, other forms of VR, AR, along with tangible objects made by computer-driven production machines, created using related computer models. She took a feminist position in a world that was then without women, 30 years ago, and was inspired by the French media artists of the 1960s. Hart calls her work, "post photography," and has also created a body of theoretical writings and exhibitions based on this concept. Her 3D worlds are generated by mathematical models rather than captured by a camera on film. In 2007, at the School of the Art Institute of Chicago, she developed a pedagogic program based on this concept. Experimental 3D was the first art-school curriculum wholly devoted to teaching simulations technologies. Hart was a professor at SAIC for 16 years.

Copper Frances Giloth is an award-winning digital media artist whose work has been featured in international festivals, galleries, and museums, including the Los Angeles County Museum of Art (LACMA); the Museum of Modern Art in New York (MoMA); the National Academy of Sciences in Washington, D.C.; the Museum of Contemporary Art Chicago (MCA); and ACM SIGGRAPH. In 1980, Giloth became the first master of fine arts candidate and woman to graduate from the Electronic Visualization Laboratory at the University of Illinois at Chicago. In 1982, Giloth chaired the first ACM SIGGRAPH juried public exhibition of experimental two-dimensional, three-dimensional interactive, and time-based works by artists and scientists. In 1985, Giloth and Jane Veeder co-authored "The Paint Problem," an influential essay on issues around the future of artists' digital tools. Giloth is Professor Emeritus of Art at the University of Massachusetts Amherst, where she also served as Director of Academic Computing in the Office of Information Technologies for 21 years.

David Rokeby is an installation artist, considered one of the pioneers of interactive art. Born in Tillsonburg, Ontario, he is based in Toronto, where he studied at the Ontario College of Art. Since 1982, Rokeby's works have been exhibited internationally, including at the Venice Biennale in 1986,

where he presented one of his emblematic works, Very Nervous System.

George Legrady is a pioneering digital media artist whose work merges cultural narratives with computational processes to create new aesthetic forms. He studied at Goddard College (1972), then completed an MFA in photography at the San Francisco Art Institute. In 1981, he acquired computing skills in the studio of the AI artist Harold Cohen, the only invited artist to use his PDP-11 system. Legrady introduced digital imaging at USC (1984–88) and has taught across leading institutions such as Cal Arts and SFSU's Conceptual Design / Information Arts. His internationally exhibited work spans interactive installations and data visualization. A Guggenheim Fellow and Ars Electronica honoree, he is Distinguished Professor and directs the Experimental Visualization Lab at UC Santa Barbara.

Grahame Weinbren's installations, documentaries and experimental films have been screened and installed internationally since 1975, including the Whitney Museum, MoMA, ICA (London), Guggenheim Museum, Bonn Kunsthalle, the Centre Georges Pompidou, and numerous others. Commissions include the National Gallery of Art, the City of Dortmund, the Guggenheim Museum, and NTT/ICC Tokyo. His writings on cinema, media art and philosophy-related topics are widely published. He is the senior editor of the *Millennium Film Journal* and until recently a member of the graduate faculty of the School of Visual Arts.

Guillermo Bert is a Los Angeles-based multimedia artist born in Santiago, Chile. His work explores themes of displacement, identity, and technology, often through collaborations with Indigenous communities. His *Encoded Textiles* series integrates QR codes into traditional weavings, linking to stories by Mapuche, Maya, Zapotec and others. Bert's work spans video, sculpture, and installation, and has been exhibited in numerous museums across the U.S. and internationally, including LACMA, the Smithsonian, and the Nevada Museum of Art. His work is held in many museum collections nationwide. Bert has received major grants and served as Art Director at the *Los Angeles Times*.

Jennifer Steinkamp is an installation artist who works with video and new media to explore ideas about architectural space, motion, and perception. Steinkamp employs advanced technologies to animate organic and abstract forms, offering a poetic lens into the often-invisible complexities of the natural world. Her large-scale, immersive installations respond directly to the architectural interiors they inhabit, transforming the viewer's spatial perception and disrupting conventional modes of

encounter within the gallery.

Jim Campbell started making interactive video artworks in 1988, incorporating his own custom designed electronics, before computers were fast enough to process video. Around 2000 his work started focusing more on perception in the form of custom low-resolution image displays. His work is in numerous museum collections including the MoMA, Smithsonian American Art Museum, Whitney Museum, Metropolitan Museum of Art, San Francisco MOMA, and Los Angeles County Museum of Art. He has degrees in both Mathematics and Engineering from MIT and, as an engineer working in Silicon Valley for many years, he received nearly 20 patents.

Joan Truckenbrod's coded algorithmic drawings and textiles were included in group exhibitions at Kunsthalle Wien, the Museum of Contemporary Art in Luxembourg, and the AKG Buffalo Art Museum. Two major US exhibits of artwork created by programming computers, included her digital artwork: LACMA in 2023, and the Whitney in 2018. Ms. Truckenbrod's artwork is in collections at the Whitney NYC, The Art Institute of Chicago, the AKG Buffalo Art Museum and the Victorian and Albert Museum in London. She is Professor Emerita at The School of the Art Institute of Chicago. Her artwork is represented by RCM Galerie in Paris. (www.joantruckenbrod.com)

Jordan Crandall is an artist, writer, and performer. His artwork has been exhibited at many institutions including Documenta in Kassel, the Whitney Museum in New York, the Tate Modern in London, the San Francisco Museum of Modern Art, and the ZKM Center for Art and Media in Karlsruhe. He has won several awards including the Vilém Flusser Theory Award given by the Transmediale in Berlin. He is the author of five books, including *Drive*, an anthology of his artworks, installations, and writings published by Hatje Cantz Verlag, and most recently, *Autodrive*, published by Goldsmiths Press in 2023. He is Professor of Visual Arts at UC San Diego.

Joseph Nechvatal is an American post-conceptual artist and writer who creates virus-modeled artificial life computer-assisted paintings, sound art and digital animations. In 2020, Pentiments Records released a limited-edition cassette of his *Selected Sound Works (1981-2021)* and in 2020 the double LP *Viral Tempest*. In 2023, his farcical cybersex novella *~~~~~~~~~~~~~~~~~venus©~Ñ~vibrator, even* was published by Orbis Tertius Press and the sequel, *Venus Voluptuous in the Loins of the Last God*, in 2025. In 2025 *Ex Stasis 69*, a cassette of recent audio art, was released by

Pentiments, and Nechvatal joined avant-garde music label Table of the Elements and Magenta Plains Gallery.

Julia Heyward's work centers around the orchestration of music, image, and language in the areas of multimedia performance, new media and visual art. After a decade of solo performance, Heyward staged No Local Stops which won a BESSIE for 'Outstanding Performance of the Year for 1984', presented by DTW New York Dance and Theater. Heyward has written, produced and performed three other large scale multimedia performances: Mood Music (premiered May 1988, The Kitchen, NY), Miracles in Reverse (premiered 1996, Potsdam, Germany), and 29 SpaceTime/The Gabriel Frequency (premiered 2017, Roulette, NY). In addition to writing, directing, and creating the visuals for each of these works, Heyward also co-composed the music.

Keith Sanborn is a media artist, theorist, curator and translator. Sanborn's moving image work stands out for its sharp blend of philosophical inquiry, formal innovation, and use of a wide range of found footage that gets reworked through layered sound and text. He has had numerous one-person shows and been included in major surveys: The American Century, the Whitney Biennial, Monter/Sampler and festivals: OVNI, Video Vortex, Rotterdam, EMAF, Oberhausen, and Hong Kong Videotage. His theoretical work has appeared in Artforum, Kunst nach Ground Zero and catalogues of MoMA, Exit Art, and the San Francisco Cinematheque. He has translated Debord, Viénet, Wolman, Bataille, Napoleon, Bouhours, Shub and Gioli, among others. He has curated for Oberhausen, Exit Art, Artists Space, Pacific Film Archive, and CinemaTexas. He has taught at various colleges and universities.

Kurt Hentschläger is a New York-based Austrian artist who creates media installations and performances for both physical and virtual venues. His works have characteristically been visceral and immersive, as in ZEE, FEED & more recently in SOL, SUB and EKO, and are known for their perceptual effects. They challenge an audience psychologically but also offer a meditative respite from the day-to-day stress of digitally enhanced life. His representational body of work, including MEASURE and ORT, suggests a semi-synthetic form of nature that serves as a metaphor for our life in the Anthropocene. Hentschläger's work practice embraces experiment and interdisciplinary approach, most prominently displayed in his ephemeral audiovisual environments and live shows in between fine arts, music and theater. Between 1992 and 2003 he collaborated in the groundbreaking media art duo "Granular=Synthesis", known for emotionally intense works, developing amongst others what is now often referred to as immersive

art. Selected presentations include the Venice Biennial, the Venice Theater Biennial, Stedelijk Museum Amsterdam, PS1 New York, MAC - Musée d'Art Contemporain Montreal, MAK – Museum of Applied Arts Vienna, ZKM – Center for Art and Media, Karlsruhe, National Art Museum of China Beijing, National Museum for Contemporary Art Seoul, ICC Tokyo, Arte Alameda Mexico City, MONA – Museum of Old and New Art, Hobart, Tasmania, Sharjah Art, UAE, Power Station of Art, Shanghai, The Momentary, Bentonville.

Les LeVeque is an artist based in New York who works with digital and analog electronic technology. His work includes single and multi-channel videos, video/computer-based/film installations and live video synthesizer performances. LeVeque's work often utilizes algorithmic structures, statistically distributed elements, experimentation with the boundaries of interfaces, the use and misuse of current and obsolete technologies and may provide new views of existing narratives.

Leslie Thornton is an American filmmaker and artist who creates vigorously experimental film and video. All her work delves into the mystery and ongoing investigations into the production, creation, and distribution of meaning through and within media. One finds that with Leslie Thornton both form and content are critical and inform each other. Leslie Thornton's film and media works have been exhibited across the world, in venues including The Museum of Modern Art, New York; the Whitney Biennial Exhibition; Centre George Pompidou, Paris; Rotterdam International Film Festival; New York Film Festival; CAPC Musée, Bordeaux; Pacific Film Archives, Berkeley; and festivals in Oberhausen, Graz, Mannheim, Berlin, Austin, Toronto, Tokyo, and Seoul, among many others. Leslie was the only female experimental filmmaker noted in *Cahiers du Cinema's* "60 most important American Directors" publication. Leslie Thornton's project *Peggy and Fred in Hell* received numerous accolades in various annual best lists including: *The Village Voice* and *The New York Times*.

Lev Manovich is an artist, author, and influential digital culture theorist. After studying visual art, architecture, and filmmaking, Manovich began using computers to create digital art in 1984. His work has been exhibited in 14 solo and 125 international group exhibitions at many leading institutions, such as the Institute for Contemporary Art (London), Centre Pompidou, The Shanghai Biennale, and The ZKM | Center for Art and Media. His innovative art projects include "little movies" (the first film project for the World Wide Web, 1994), Soft Cinema (narrative films edited by algorithms in real-time, 2002) and Selfiecity (interactive visualization of selfies in six global cities, 2014).

Canadian artist **Lorna Mills** has exhibited her work in solo and group exhibitions since the early 1990s. Her practice has included obsessive Ilfochrome printing, obsessive painting, obsessive super 8 film & video, and obsessive online animated GIFs incorporated into restrained off-line installation work. Past exhibitions include "Dreamlands" at the Whitney Museum, NY, "Yellowwhirlaway" at the Museum of the Moving Image, NY, and "Sea Change" at the Pérez Art Museum Miami. Her GIF collages have been included in PHAIDON's "Vitamin C+ Collage in Contemporary Art", "Digital Art" (2023 edition) by Christiane Paul and Taschen's "On NFTs" edited by Robert Alice. Mills is represented by TRANSFER Data Trust in New York and DAM Gallery in Berlin.

Lynn Hughes is an artist, curator and academic based in Montreal, Quebec. She has a background in History and Philosophy of Science and Technology and has been thinking about relations between art and technology since the mid 1980s. She was instrumental in the structuring and funding of para-institutional contexts that support interdisciplinary collaboration across art, technology and games. These include the Hexagram Research-Creation Network, the Technoculture, Art and Games Research Centre and the Milieux Institute at Concordia University. For the last 20 years her practice has focused on the role of the body and sociality in experimental games.

Mark Alan Klink, born in Salt Lake City, Utah in 1951. He has been and done many things: swept floors, worked as a factory hand, been an athlete, a minor government official, a life guard, a computer programmer, and a traditional print maker. For twenty years he taught children and other educators how to use computers. Klink attended U.C. Berkeley and U.C. Davis. He exhibited drawings and prints at various galleries during the 1980s. He began programming computers and experimenting with computer art during the 1990s, switched entirely to creating with computers during the early 2000s. He is known as the grandfather of 3D glitch.

Michael Rees is an artist working in themes of figuration, language, technology, and the social to weave a sculptural mélange. He has shown his work widely including the Whitney Museum in the 1995 Biennial and again in "Bitstreams" in 2001, the MARTa Museum in Germany, Art Omi, The Pera Museum in Istanbul, The Kemper Museum of Contemporary Art, and in private galleries such as 303, bitforms, Basilico Fine Art, Pablo's Birthday, Favorite Goods and elsewhere. Current exhibitions include Grounds for Sculpture, Nerman Museum of Contemporary Art and the Aldrich Museum of Art. His works are in the collections of the Whitney Museum of American Art, the Kemper Museum of Contemporary Art, Kansas City, and numerous private collections. Rees has received grants from Creative Capital, the New Jersey State Council on the Arts, the Rockefeller Foundation, and the National Endowment for the Arts.

Nancy Burson is an acclaimed artist/photographer who combines art and innovation in a way that challenged photographic truth at the birth of digital manipulation. She is best known for her pioneering work in morphing technologies, which age enhance the human face and still enable law enforcement officials to locate missing children and adults. Her *Human Race Machine*, commissioned by Zaha Hadid for the London Millennium Dome, was used for over a decade as a diversity tool that provided viewers with the visual experience of being another race. Her work is included in museums worldwide including the MoMA, Metropolitan Museum, and the Whitney Museum in NYC, as well as the Victoria and Albert Museum in London, the Center Georges Pompidou in Paris, the LA County Museum of Art and the Getty Museum, MoMA (San Francisco), the Museum of Fine Arts in Houston, and the Smithsonian Museum in Washington DC, as well as many others. She has collaborated with Creative Time, the Lower Manhattan Cultural Council, and Deutsche Bank in completing several important public art projects in NYC.

Nina Sobell pioneered the use of video, computers, and interactivity in art, and performance on the Web since 1969, when she first used video to document participants' undirected interactions with her sculptures. She investigates how video enables her to manipulate the relation between time and space, and to create a vortex for human experience, in which the mediated event coincides with public experience, memory and relationships. As a digital artist focusing on experimental forms of interaction and performance, Sobell uses tools such as wireless EEG headbands, MIDI sound, webcasts, and closed-circuit video surveillance. She was part of the feminist video performance movement of the 1970s with works such as Chicken on Foot (1974) and Hey! Baby, Chicky!! (1978), but she is also known for her work with Emily Hartzell on ParkBench and ArTisTheater (1993). Since the early 1970s, Sobell worked with closed-circuit video to explore the relationship between artist and audience. With the series Brain Wave Drawing in collaboration with Mike Trivich 1973, Sobell set up a system Interactive Electroencephalographic Video Drawings, in which two participants could see their brainwaves changing in real time as they simultaneously watched their own images on closed-circuit video, creating an improvisational feedback loop as they silently communicated with each other.

Paul Wong is a pioneering figure, known for his innovative work in visual and media art. With a career spanning over five decades, Wong has continuously pushed the boundaries of storytelling, working outside mainstream conventions making art for site-specific spaces and screens of all sizes. He is an award-winning artist and curator and founder of several artist-run groups, and organizing events, festivals, conferences and public interventions since the 1970s. Wong has produced projects throughout North America, Europe, and Asia.

Peggy Ahwesh is an American experimental filmmaker and video artist. She received her B.F.A. at Antioch College. A true bricoleur, her tools include narrative and documentary styles, improvised performance and scripted dialogue, synch-sound film, found footage, digital animation, and crude Pixelvision video. Her work is primarily an investigation of cultural identity and the role of the subject across various genres. Her works have been shown around the world in San Francisco, New York, Barcelona, London, Toronto, Rotterdam, and Creteil, France.

Penelope Umbrico's installations, video, and digital media works utilize photo-sharing and consumer-to-consumer websites as an expansive archive to explore the production and consumption of images. Her work navigates between producer and consumer, local and global, the individual and the collective, with attention to the technologies that are produced by (and produce) these forces. Umbrico's work has been exhibited at MoMA PS1, NY; Museum of Modern Art, NY; MassMoCA, MA; San Francisco Museum of Modern Art, CA; Milwaukee Art Museum, WI; Art Museum Gosta, Finland; Foto Colectania, Barcelona, Spain; The Photographers' Gallery, London; Daegu Photography Biennale, Korea; Pingyao International Photography Festival, China; Kunstverein Ludwigshafen, Germany; Rencontres d'Arles, France; Gallery of Modern Art, Brisbane Australia; among many others, and is represented in museum collections around the world. She has received numerous awards, including a Guggenheim Fellowship; Sharpe-Walentas Studio Grant; Smithsonian Artist Research Fellowship; New York Foundation of the Arts Fellowship; Anonymous Was a Woman Award. Her monographs have been published by Aperture NYC and RVB Books Paris.

Perry Hoberman is a pioneering installation and performance artist whose work has been exhibited extensively across the United States and Europe. Known for his inventive use of both emerging technologies and obsolete media forms, Hoberman explores the shifting relationships between humans and machines with wit and insight. His contributions to the field have been recognized with prestigious fellowships from the

Guggenheim and Rockefeller Foundations. He also served as Associate Research Professor in the Interactive Media Division at the USC School of Cinematic Arts, where he leads the development of a school-wide Center for Stereoscopic Imaging, advancing research at the intersection of art and immersive media.

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Ricardo Dominguez is a co-founding member of Critical Art Ensemble (http://critical-art.net/) and of Electronic Disturbance Theater 1.0 (EDT), a group who developed virtual sit-in technologies in solidarity with the Zapatistas communities in Chiapas, Mexico, in 1998 (https://anthology. rhizome.org/floodnet). With Electronic Disturbance Theater 2.0 project with Brett Stalbaum, micha cardens, Amy Sara Carroll, and Elle Mehrmand created in 2007 the "Transborder Immigrant Tool" - https://tbt.tome. press/ EDT 2.0 was the UCLA Luskin Institute on Inequality and Democracy Fellow (2021). EDT 3.0 was in the MexiCali Biennial's "Border Activations" in 2023. His articles and essays can be found at: https://ucsd.academia.edu/ RicardoDominguez

Tishan Hsu lives and works in New York. Hsu has held solo exhibitions at institutions including Secession, Vienna, Austria (2023/2024); MAMCO Geneve, Geneva, Switzerland (2024); Hammer Museum, Los Angeles, California (2021); Sculpture Center, New York, New York (2020/2021); MIT. List Visual Arts Center, Cambridge, Massachusetts (1988); and Carnegie University Art Gallery, Pittsburgh, Pennsylvania (1987). His work has been included in numerous group exhibitions, including *Together in Time: Selections from the Hammer Contemporary Collection*, Hammer Museum, Los Angeles, California (2023); *Day Jobs*, Blanton Museum of Art, Austin, Texas (2023) and Cantor Arts Center, Stanford University, Palo Alto, California (2024); *Human Is*, Schinkel Pavillon, Berlin, Germany (2023); *In the Balance: Between Painting and Sculpture*, 1965–1985, Whitney Museum of American Art, New York, New York (2022); *Cloud Walkers*, Leeum Museum

of Art, Seoul, South Korea (2022); *A Gateway to Possible Worlds: Art & Science-Fiction*, Centre Pompidou-Metz, Metz, France (2022); and *Zeros + Ones*, KW Institute for Contemporary Art, Berlin, Germany (2021).

Toni Dove is an instrument builder. She creates human operated machines that tell stories. An early innovator of responsive narrative, she is known for genre mashing stories that use interactivity as metaphor to create visceral experience and examine the implications of technological change. Her disruptive practice, developed over years, has created media machines that blur the boundaries between performance and installation and fuse film, game, experimental theater and artificial intelligence-based interaction. Her work has been presented in the US, Europe and Canada, including the Banff Center for the Arts, The Rotterdam Film festival, The Wexner Center, Redcat, The Kitchen, and ZKM. Dove received the Eugene McDermott Award in the Arts from M.I.T. and a lifetime achievement award from I.D.M.A.a. The Ringling Museum, Fla., presented a retrospective of Dove's interactive work "Embodied Machines", 2018. A current project "Sunjammer 6: A Tale Blown by a Solar Breeze" supported by NYSCA, NEA, The Doris Duke Foundation, residencies with Bell Labs E.A.T., and Pioneer Works, premiers Jan. 2026, The Schwarzman Center for the Arts at Yale. Dove is a fellow at C.C.A.M., Yale University.
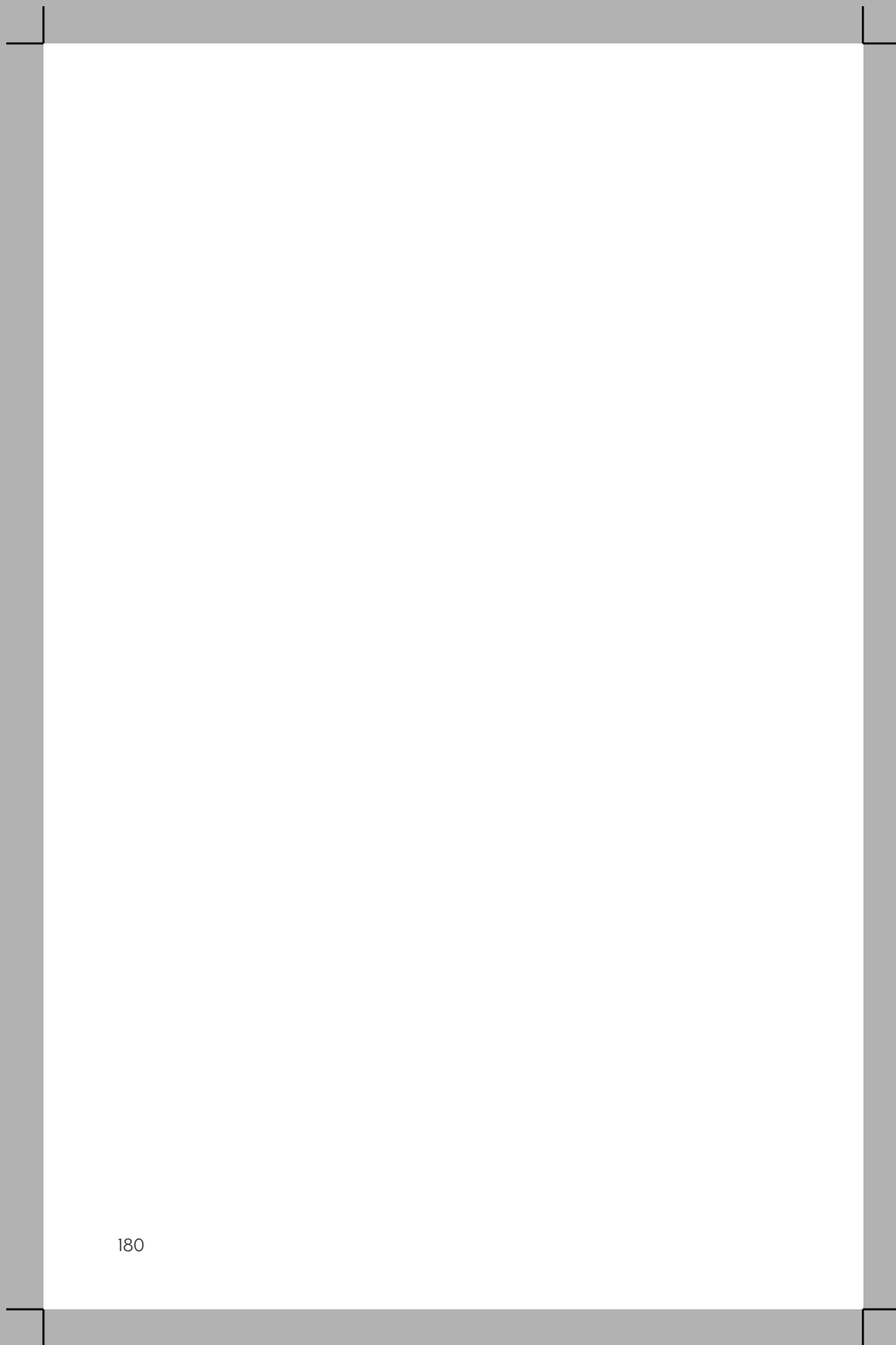
Ulysses Jenkins is a pioneering figure in video art since the late 1970s, known for his innovative blending of visual and sonic forms to explore the politics of representation. His work deftly weaves together archival materials, processed imagery, photographs, and evocative soundscapes to construct layered narratives that challenge dominant histories. Engaging deeply with questions of race, gender, ritual, and power, Jenkins crafts an alternative visual language that reimagines collective memory and insists on the presence of the "other" within media culture.

Wenyon & Gamble: Susan Gamble and Michael Wenyon are a collaborative duo of visual artists known for their pioneering work using holography and exploring the intersection of art and science. They are recognized for artworks stemming from residencies in observatories and other scientific institutions and have worked with photographic technology since the 1980s. They combine backgrounds in art and science, with Gamble holding a PhD in the History of Science from Cambridge University and Wenyon holding an MSc in Optics from Imperial College London.

Will Pappenheimer is a Brooklyn-based artist working in new media, performance, and installation with an interest in spatial intervention and the altered experiences of the artwork as site. His current work explores the collage of the virtual and physical worlds in the recent medium of augmented reality (AR) and "mixed reality." He is a pioneer of AR medium and a founding member of the AR collective, Manifest.AR, formed in 2011. His projects and performances have been shown internationally at Whitney Museum of American Art, LACMA, Los Angeles; SFMOMA and bitforms in San Francisco; the Stedelijk Museum in Amsterdam; FACT, Liverpool, UK; Contemporary Istanbul Art Fair, Istanbul; Fringe Exhibitions in Los Angeles; the ICA, CyberArts Gallery and the Museum of Fine Arts in Boston; the Corcoran Gallery of Art in Washington; Xi'an Academy of Art Gallery in China; the New Museum and the 2017 Moving Image Art Fair in New York. He recently debuted a solo show of new mixed reality sculptural works at the Alpha Gallery in Boston. The artist's works have been reviewed in the Whitney Museum curator, Christiane Paul's recent historical editions of "Digital Art," a chapter of Gregory Ulmer's theoretical book "Electronic Monuments," Art in America, New York Times, Hyperallergic. org, WIRED, Modern Painters, the Boston Globe, EL PAIS, Madrid, Liberation, Paris, and Art US. A documentary on his work is part of Bloomberg TV's Art + Technology series.

Wolfgang Staehle is a German-born New York-based artist widely regarded as a key pioneer of internet art. In 1991, he launched THE THING, an independent media platform that began as a bulletin board system (BBS) and quickly evolved into a foundational space for early net.art, bridging online experimentation with offline artistic discourse. His work has been exhibited internationally at institutions including the Fondation Cartier in Paris, Gagosian Gallery in New York, Transmediale in Berlin, Wood Street Galleries in Pittsburgh, Centro Cultural Banco do Brasil in Rio de Janeiro, Tate Modern in London, and the Hirshhorn Museum in Washington, DC.

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