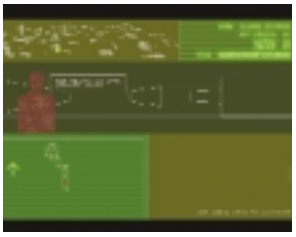
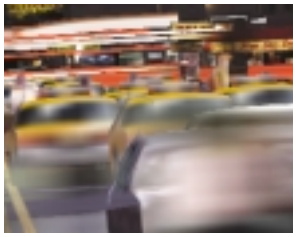
ART GALLERY

Chair | **Karen Sullivan** | Ringling School of Art and Design





SIGGRAPH 2002 ART GALLERY CHAIR

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Special thanks are extended to Tom Appolloni, SIGGRAPH 2002 Conference Chair, the SIGGRAPH 2002 Conference Committee, Capstone Solutions, Inc., AVW-TELAV Audio Visual Solutions, Freeman Decorating Company Rentsys, Smith-Bucklin and Associates, Inc., Hall-Erickson, Inc., Q LTD. Thank you to Dan Collins, Studio Chair, who made the Working Artist collaboration possible. I would also like to recognize Ringling School of Art and Design: Department Chair, Jim McCampbell; Dean, Melody Weiler; and Vice President, Johnette Isham, for providing me with the support and time needed to produce this exhibition. Thank you to Lynn Pocock, SIGGRAPH 2001 conference chair for her encouragement, persistence, and support. Very special thanks to my husband, Larry, and my son, Mack. Finally, thank you to the SIGGRAPH 2002 artists. The work is the show.

SIGGRAPH 2002 Art Gallery: Celebrating the Creative Spirit

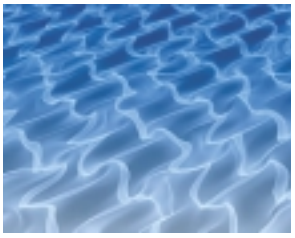
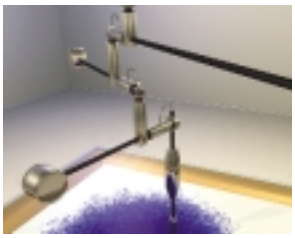
The SIGGRAPH 2002 Art Gallery celebrates the creative spirit by taking a look "behind the scenes" at the process of creating digital and electronic fine art. This year, the gallery highlights the process that generates the work, demonstrating how the digital artist creates.

Attendees experience the innovative examples of two-dimensional, three-dimensional, interactive, and installation work submitted by the international computer graphics community. Some works represent traditional forms such as print or sculpture while others push the boundaries of Web communication and interactive spaces.

Through sketches, diagrams, video documentation, Web documentation, and discussions, more than 70 artists reveal the magic behind their work. The artworks show excellence in innovation and artistic talent, document creative thought, illustrate working process, and explain the use of the computer or electronics in the piece.

Six papers presentations place process in a theoretical and cultural context. These papers, published here, will also appear in the *Leonardo.*

In a new collaboration, the Art Gallery and the Studio feature seven artists in a working studio, where they create art using Studio facilities. The goal is to make the creative process visible. Attendees watch the work develop, talk with the artists, and (perhaps) make art themselves.


Karen Sullivan
SIGGRAPH 2002 ART GALLERY CHAIR
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ART GALLERY

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Bart Woodstrup

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(above) Pixave: Denominator
DelRay

(below) DelRay: Elbo Room

ARTIST BIOGRAPHIES

Since 1996, artist Matthew Biederman has exhibited and performed video projection installations and screened works in plays, musical performances, film festivals, and exhibition installations that explore themes of "cut-up" electronic image delivery, media saturation, and data systems, as well as the video signal as medium. Biederman has also served as artist-in-residence at the Experimental Television Center.

Biederman is based in San Francisco where he frequently performs at regularly scheduled audio/visual venues that he also curates. He also presents live "one-time" video improvisations conducted digitally via software that he writes and continually modifies and updates. Recent performances have included shows at the Montreal International Jazz Festival, Betalounge, New Langton Arts, and the San Jose Museum of Art.

Bart Bridger Woodstrup received a Masters of Music in Computer Music and New Media Technology at Northern Illinois University. His work, however, extends beyond the boundaries of music and sound art. He has produced video work, which is shown frequently in the U.S. and abroad. He also enjoys working with a variety of media (i.e. photography, performance art, net.art, etc.) often incorporating these into an intermedia piece. Recently he served as a Visiting Assistant Professor at Northern Illinois University where he taught classes in video, performance art, sound art, digital imaging, and critical thinking for art and time. Bart is an instructor at the Illinois Institute of Art at Schaumburg where he teaches audio for animation.

PROJECT PROPOSAL

The DelRay laboratory is a site specific, and time specific, artistic installation. This laboratory facilitates experimentation with different procedures for exploring the fusion of sound and image. Through computer programming, sensors, and audience interaction, various image and sound synthesis techniques will reveal the complexities of the grammar of vision and auditory perception. Line, color, form, depth, motion, acceleration, and texture will interact as the visual counterpoint to similar properties of sound. The experiments will take place as both artistic and scientific explorations within themselves as well as evolving into a formal composition. On display are both the composition and the artistic process of the composition.

DelRay experiments will be conducted using the QuickTime-based architecture of Nato 0+55 and the MAX/MSP object-oriented programming language. Two systems, one for each of the composers, will be set up in the laboratory whereby external, environmental information will become the data "steering" each aspect of synthesis and playback.

The two members of DelRay will work separately on their own workstations. Biederman will construct the visual synthesis using Nato; Woodstrup will use MSP to generate and manipulate sound. Video cameras will be used to gather imagery and also as a control mechanism that will feed into both visual and audio synthesis. Sensors gathering information on temperature, light, motion, and depth perception will be incorporated. The two workstations will be networked sending sensor, sound, and image information to create a dialogue between the two computers.

Image and sound will be systematically introduced to one another, colliding with each other, creating entirely new relationships between one another. The sound of this collision will produce disagreeable vibrations of such magnitude that new harmonies will be produced. These harmonies will be created along the pathways from sensory experience to perception, nostalgia, and knowledge. This process is wrought from the scientific (the need to know) and the intuitive (the need to create).

ARTIST STATEMENT

The concept of DelRay is examined in the light of the Del itself, particularly in its resistance to various forms of abstraction and disembodiment. This act of participation is never final. By enduring enough data to gauge the resulting Ray, it will amount to pulling out the rug underneath the list of suspect words. This representation of data-space does not necessarily have to reflect real experiences, yet we find that we are gradually getting closer and closer to the Ray.

Interrogation of our condition is of high cultural importance. This is a kind of perversion of technology. In this time all sorts of distortions and misunderstandings will appear, where the complexity of digital systems causes mutations as well as innovation.

We are beginning to see how machines actually work. This is a neutral presentation disguised in the condition of its representation. We were sitting on the porch and we said, "what if?" DelRay will customize your experience to make you easier.

With the understanding that some of the greatest technological achievements were created through accidental occurrence, sanitary working (working in a vacuum) is ill-advised.

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Brit Bunkley

Hand Machine 2
500 x 500 x 300 mm

ARTIST BIOGRAPHY

Brit Bunkley is currently the head of sculpture and a lecturer in digital media at the Quay School of the Arts, Wanganui UCOL in Wanganui, New Zealand. He immigrated to New Zealand from New York City with his family in 1995. Bunkley's previous 16 years in New York as a working sculptor and photographer included building numerous commissions while also receiving several grants and fellowships such as the National Endowment of the Arts Fellowship and the Rome Prize Fellowship.

Bunkley originally used computers as a design tool for public sculpture. His use of digital media soon evolved beyond creating designs for actual projects to creating virtual environments, sculptures, and installations that were made physical as large prints, videos, and rapid prototypes. Since moving to New Zealand, he has participated in numerous group exhibitions and has had three solo shows in public galleries including the recent "3D Work: Signs (and 'Other Similar Entities')" at Te Tuhi - The Mark (formerly the Fisher Gallery) in Auckland in 2001.

ARTIST STATEMENT

Although I originally used digital imaging as an element of the design process for public sculpture and installations in the early 1990s, I now use the computer primarily for creation of virtual sculpture and installation. With the recent introduction of 3D prints (rapid prototyping and CNC technology, as pioneered by a number of artists in the late 1990s), the "virtual" has returned to the "actual" by creating physical models from digital files. It is my intention to locate a common ground between the virtual 3D still and moving images, and 3D physical prototypes.

I find 3D digital media especially conducive to illustrating disturbing social/political perspectives of neoliberal "globalised" modern life. The vicissitudes of neoliberal globalism is one of several reoccurring themes in recent years, represented by (clenched and outstretched) hand symbols, speakers, the abstract schematic letters of logic and math (e.g. "x","y", "z"), the globe, television, diffused transnational corporate symbols, cartoon characters as corporate metaphors, and other iconic symbols of the modern world.

My computer currently functions not only as an aid in visualizing and designing large-scale sculptures or installations, but now it essentially functions as a tool to depict objects that would not or could not be built: impossible images. With an affinity to staged photography, these images attempt through ambiguity of scale, material, reflection, and perspective to blur the line between images of virtual and actual objects. The computer prints and videos often capture a virtual image in a believable but slightly skewed setting that is both convincing and unsettling. In this context, the virtual sculptures and monuments are props in a virtual "installation" that are separated from the real by the edge of the print or video field.

Most recently, I have begun creating sculptures directly from virtual 3D files using new rapid-prototyping (RP) techniques from digital files sent via email, often to remote sites (in the tradition of the various electronic "art correspondence production" by Moholy-Nagy and Donald Judd). The RP techniques have been LOM and Z-Corp. 402 printer processes.

PROJECT PROPOSAL

I propose to build one or more large-scale digital rapid prototype sculptures at SIGGRAPH 2002 by "printing" sections of the sculpture, then joining together the sections, producing sculpture(s) at a scale significantly larger than the allowable envelope of rapid-prototyping machines. "Hand Machine 2," recently completed, is to be built at a scale approximately three times the scale possible in a single build of most current rapid-prototyping machines. The new large-envelope rapid-prototyping machines or a CNC machine will allow a scale approximately six times the size of the recently completed prototype illustrated in the accompanying photograph.

The sculpture(s) will be built/printed at SIGGRAPH 2002 using the rapid-prototyping equipment available in the Studio. The printed sections, using the largest envelope possible from the rapid-prototyping machines, will be epoxied together and the seams sealed (the seals becoming part of the overall design element, indicating the process of fabrication).

In addition, to building rapid prototypes, I will also create related 2D prints as output on the large-format printer.

Containment
1250 x 1550 mm, Lamda print

Spanish Icon
1250 x 1250 mm, Lamda print

TECHNICAL STATEMENT

The primary software used for modeling and rendering the 3D objects and scenes is 3D Studio Viz 3. Some elements of the scenes were built in Mechanical Desktop in order to take advantage of its efficient Boolean capability, then exported to 3D Studio Viz 3. All work was produced on a dual Pentium computer. The bitmaps of mapped images and renderings were scanned and edited in Photoshop. The final images were printed as both Lamda photographs and high-resolution Canon ink-jet prints.

PROCESS STATEMENT

Many of the forms and mapped images I have used appear simultaneously in several works, since I interchange the same, or similar, forms and concepts from the same images and related 3D models. For example, a “TV” form was used in a rapid prototype, “Hand Machine 1,” the animation “Spanish Wall,” and the print “Spanish Icon.”

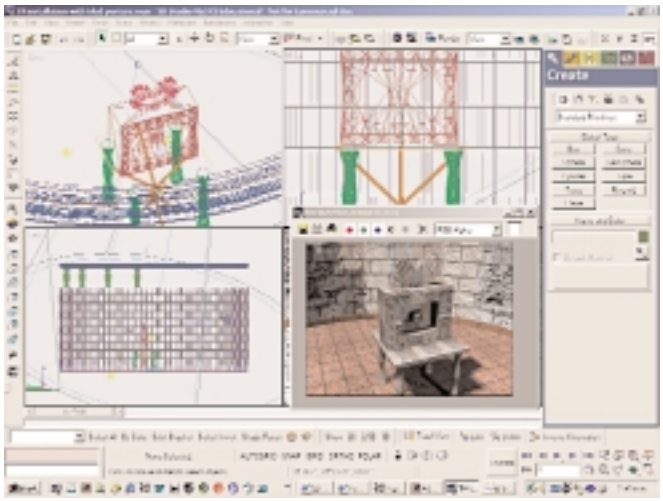
Images of Spanish Civil War posters were processed with the bas relief filter in Photoshop and then mapped onto both the walls and “TV” and walls of the “stadium” within the animation “Spanish Wall,” and they were mapped onto the print “Spanish Icon”. The “loudspeaker on a truck” and megaphone photographs included in page 3 (originally from the book “1936” by the Ex) influenced creation of the print “Containment” as well as the rapid prototype “Globe.” The other photographs on this page appear in animations and other prints, as do the Australian street signs mapped onto “Containment.”

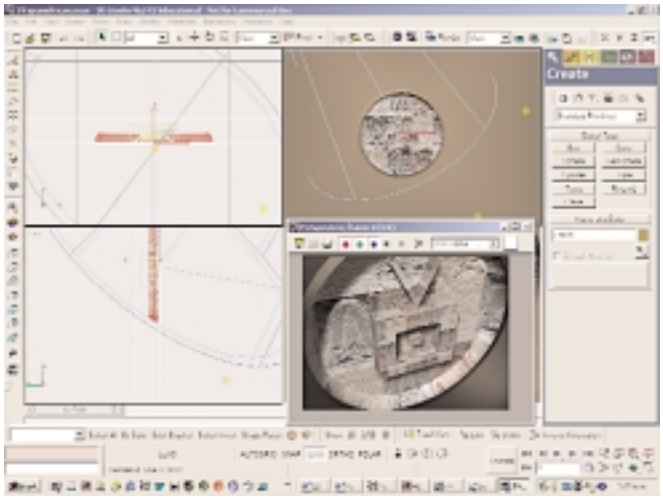
The hands used in the “Spanish Icon” print and “Spanish Wall” video reappear on several other models including the “Hand Machine” rapid prototype included in the illustrations. The inspiration for the use of the hand came from the proliferation of the hand graphic symbol in the United States as well as more traditional representations as illustrated with the tiff images of my wife’s prayer plaque and hand broach.

All these processes, and more, are adequately documented at SIGGRAPH 2002.

Brit Bunkley continued

(above)
Influences





(above)
Rapid prototype sculptures

(left)
Screen grabs

(below right)
Maps

(above)
Influences

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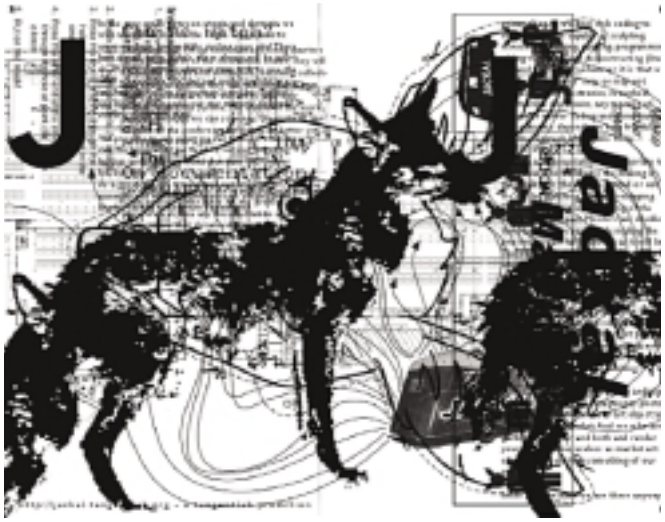

Jackal Poster

The Jackals

ARTIST BIOGRAPHIES

TangentLab is an artistic collective dedicated to creating immersive multimedia environments. Each member of the group possess different expertise in computer programming, electronics, video, graphic design, and public art, but all the members share a dedication to the exploration of innovative ways of using new media to create interactive artworks.

ARTIST STATEMENT

Appropriation is a commonly heard piece of artspeak which is used to discuss the deliberate re-working of one work into another (often unrelated) work. The Oxford English Dictionary expands this definition to include the phrase "without authority," and although this is usually true, appropriation is not synonymous with plagiarism. The key difference is that while plagiarism is outright theft by misrepresentation, appropriation is recontexulization for the purpose of the discovering of additional meaning.

Both artists and engineers who work with technology should be intimately familiar with this and other themes the Jackals are exploring. As technology artists, the "medium" of the Jackals' work is very often the end product of someone else's work. The pieces they develop, composed often as not by appropriated consumer technology, represent a recontextualization of the end product of a commercial process.

Although appropriation is not new nor limited to art—it is perhaps similar if not synonymous with "reverse engineering"—the Jackals are lending the process a fresh face by openly acknowledging it and taking it a step further: by inviting the attendees and organizers of SIGGRAPH to participate in their process.

Except in few special cases, artists who are also technologists are not privileged to start their work from scratch. Painters may have once mixed their own pigments, and may do so again, but net artists do not build their own Internet (nor do they wish to).

The artworld has long championed the individual, elevating signatures to logos and turning galleries into showrooms. Jackals reverse this "cult of the individual" by publicly recognizing their own reliance on others as artists, technologists, and humans living in our technology-laden (if not driven) society. Rather than search for the next "big idea," the Jackals recognize the collaborative necessity of human experience. "Big ideas" emerge on their own, and they could not do what they do without the help of others. Frankly, neither can we.

PROJECT PROPOSAL

In the gray space between utopia and dystopia we who are jackals live on the edges. Opportunistic omnivores who are, unavoidably, circling your city! There have always been jackals, there always will be jackals. We are the ones who put your tech to use, the ones who recycle the glut and make it useful in aesthetic glory. The technology is neither servant nor master, but merely our raw material, to gnaw, rework, shape and build.

Stealing as appropriation is appropriate to this venue. The building is the making is the thinking is the reason. Invited or not, we will be watching, thinking, reshaping. The making of art is the making of the future from the past. Moore's law yearly doubles the power of the past, making the present at least half as strong as it will be. The building of our work is the process by which we internalize your world and construct our own. Web sites, plasma displays, high modernism, biotech, abstract expressionism, history, postmodernism, mechanical engineering, physics, philosophy, IP protocols, circuit boards, and solder are all dropped into a blender with a bit of irony. The resulting concoction we call art and technology, the horrible crossbreeding of the best and worst of our thinking.

Scientists have combined spinach and pigs, painters have reworked painting as photo as handmaiden of science as art object as commodity into market. And we who are neither, do neither and both, and render your commodities useless as market art objects, even evolving something of our own.

The Jackals will live on the outskirts of the metropolis, watching, collecting, repurposing what they can to construct a new reality of techno-art. We will arrive with only enough supplies to survive. The nature of the work depends on what we can scavenge. We invite all participants of the conference to watch, or better yet, participate in our work.

Kenneth A. Huff

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For the background of this image, a number of surfaces were stacked on top of each other and then processed using the "surfacePlater" tool.

2001.4b
34 x 34 inches, digital image on photographic paper

ARTIST BIOGRAPHY

Kenneth A. Huff has been creating images with his current digital techniques for almost 10 years. His work is displayed on his Web site (www.itgoesboing.com) and is held in public, private, and corporate collections around the world. He uses software tools currently provided under a grant from Alias|Wavefront and has received significant amounts of computer time for rendering from WAM!NET Inc.

Born in Bismarck, North Dakota in 1969, Huff lives in Orlando, Florida and is an independent artist. He is self-taught and began publicly exhibiting his work in October 1997.

TECHNICAL STATEMENT

In general terms, the final images of my work are created entirely using digital tools. The images are high-resolution, 3D renderings, typically 6,000 by 6,000 pixels. All of the 3D modeling, texturing, lighting, and rendering is done using Alias|Wavefront Maya running on SGI and Apple Macintosh computers.

There is no photography involved in my process, nor are physical objects or source materials used in the pieces. They are entirely virtual constructions.

The patterns of color and texture on the surfaces within my work are developed almost exclusively using procedural, 3D textures that simulate solid materials. These textures produce unique values over the entire surface while maintaining an overall consistency. By modifying the attributes of these materials or having the attribute values determined by other materials, I build up the complex patterns of color and texture.

The final renderings are always ray-traced. While the rendering may be broken into sections for efficiency, all renderings are completed in a single pass. The only compositing I do involves assembling the sections. I use MEL, Maya's integrated programming language, extensively to automate repetitive tasks. An example of this would be an image that contains numerous objects, all of which are similar, but each of which is unique in its structural and textural details. I use MEL to create a tool which could produce the multitude of objects while including the variations which make each object unique. Those variations are often based on random values within a specified range.

For the images included in the Art Gallery, I created a tool called "surfacePlater" which, given a 3D surface, will create a number of objects that conform to the contours of the surface. The general characteristics of the objects, such as the width, thickness, and density, are controlled by setting ranges or desired values in a graphical user interface. The exact placement of the objects on the surface is random and done in such a way that the objects do not overlap.

Sketching on paper is a critical first step in my creative process. The sketches may include technical notes and comments on material, color, texture, and lighting. While some sketches are more fully formed and include the general composition of an image, others contain only elements that may be combined with elements from earlier sketches.

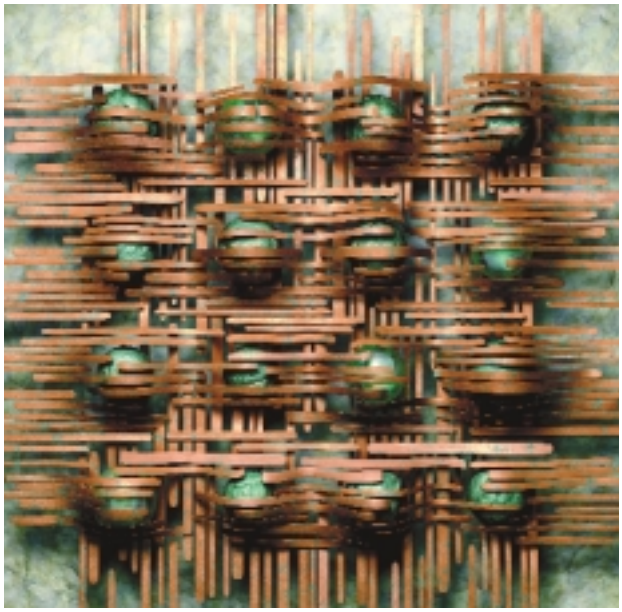
Final prints of my images are produced on a Cymbolic Sciences LightJet 5000. The LightJet directly exposes the emulsion of a color photographic print paper using a combination of red, green, and blue laser light. Once exposed, the paper is developed in chemistry just as a photograph would be.

PROJECT PROPOSAL

I will be completing new images that will incorporate one or more of the active themes currently flowing through my work. Many of those themes are implemented using software tools I develop specifically for my work. The tool development process often takes place concurrently with the creation of a new image, driven by the specific technical requirements of the image.

The new work will be documented on an interactive kiosk that will display the work in progress, sources of inspiration, original concept sketches, previously created work, and any new images created. All of these will be annotated and connected in an interactive environment highlighting the themes and patterns that flow throughout my body of work.

In addition to completing new work and discussing my overall and specific creative and technical processes, I also will address what it is like to be an independent fine artist using digital tools. Being an independent artist in any medium can be difficult, but doing so in a medium that is generally misunderstood and constantly evolving presents significant additional challenges.



2001.4c
34 x 34 inches, digital image on photographic paper

Two surfaces were used on either side of the spheres as the basis for the plating process. The length-to-width ratios were adjusted on each surface to create the horizontal orientation of the foreground plates and the vertical orientation of the background plates.

2001.4e
34 x 34 inches, digital image on photographic paper

The configuration of the spheres in this image is different from that in the other two images. This was the last of five images created. I intended for the spheres to be exactly the same in all five images but discovered that the configuration I had used in the other four images caused the rings of plates to intersect in this image. In all of the images, the grid of spheres has one glass sphere in each row, column, and quadrant.

ARTIST AND PROCESS STATEMENT

The iridescence of a beetle; the twisting surfaces of a wilting leaf; the spiral forms and sutures of a fossilized mollusk shell; fissures growing in drying mud; the arches, loops, and whorls of a fingerprint: all are examples of the natural forms and patterns that inspire my images. While I draw on these natural sources for inspiration, I do not create literal translations of their patterns and forms. I am intrigued with combining ideas from a number of sources and the contrast and ambiguity that arise from those combinations.

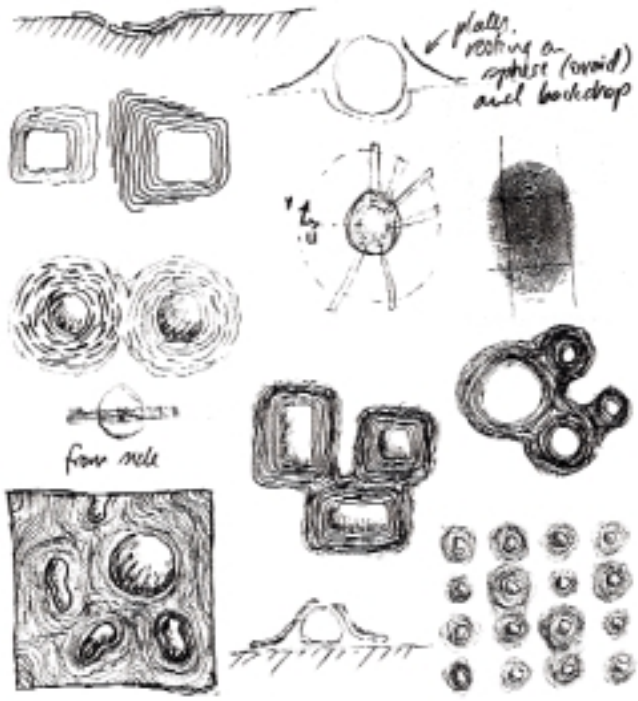
Even though I embrace technology in my process, I do not create the mechanical perfection of many human-made patterns made up of perfectly repeating identical elements. More intriguing are patterns found in the natural world in which elements repeat, but not necessarily with perfect symmetry and in which elements are similar, but not necessarily identical. Many of the patterns I create have both periodic and aperiodic aspects.

Inspired by the random, yet structured beauty and minute details of nature (flora, fauna, and mineral), I often include many objects in my images—all similar in form, yet each unique in its details. Those details of color and texture mimic the level of physical detail found in the natural world and create an illusion of reality even as the viewer is confronted with the practical knowledge that the illustrated objects do not exist.

One of the great joys of my process is that I can create an image with physical levels of detail and realism without the constraints of physical materials. The path from inspiration and idea to implementation and image is direct and unencumbered.

I recently met a scientist who investigates the microstructures formed by the controlled sintering of ceramic powders. Sintering involves heating, but not melting, materials to form a coherent mass. Electronmicrographs of his research served as the initial inspiration for a series that incorporates numerous small plates, either entirely representing a surface or coating portions of a surface. The structured placement of the 16 spheres in each image is contrasted with the irregularities of the plates.

Kenneth A. Huff continued



(above)
Original concept sketches in pencil.

(at left)
A surface is covered with test outlines and then final plates are constructed. Attributes such as density of placement, thickness and proportions of width to length are controlled through a graphical user interface.

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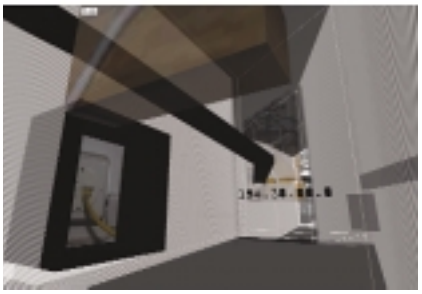

(left) *fabric | ch vs lab[au] //in electroscape//*

ARTIST BIOGRAPHIES

fabric | ch, founded in 1997 by two architects (Patrick Keller and Christophe Guignard), a telecom engineer (Stéphane Carion), and a computer engineer (Christian Babski), is now a workshop for architectural, aesthetics, and technological research as well as an art-science oriented structure of experimentations and productions.

Our areas of interests cover the design and implementation of what we call electronic architecture and microarchitecture: the development of (wire and wireless) net projects and net communities that combine the virtual and the real, shared environments and information architecture, Internet projects, distributed architecture, and downloadable spaces. We are particularly active in the fields of digital art, the creation of electronic spaces, the architecture of the new information territories, and the construction of cognitive digital spaces.

The members of our team come from various backgrounds: architects, engineers, and graphic designers from the research laboratories of the Swiss Federal Institute of Technology (EPFL), the University of Geneva (UNIGE) and the Art School of Lausanne (ECAL). They constitute a network of interdisciplinary and transcultural know-how. In addition, a number of workers on individual projects take part in the thinking and work relating to the central core of the project in question.

ARTIST STATEMENT

The idea behind the project *fabric | ch vs lab[au] //in electroscape//* is to generate a digital content installation and exhibition within an electroscape virtual environment. The process should be finished by the end of the week in San Antonio. Electroscape is a digital experimentation and exhibition structure previously known under the name *La_Fabrique* (www.fabric.ch/La_Fabrique). As so, it can also be considered as an anticipative design structure where radical design questions can be asked.

Two teams of electronic and information architects (fabric | ch and lab[au]) will produce a collaborative and/or antagonist design and thinking around the generic theme of electroscape: digital and mutated landscape, mixed or enhanced reality, information architecture, electrosmog and electromagnetic territories, etc. What are the new memes? The new schemes? What are the new possibilities? And how can technology modify our daily environment? The purpose of this project is to investigate those questions while transforming a pre-existing structure that will be developed as a base for the week in San Antonio: www.electroscape.org will become an open source of ideas, designs and technologies.

TECHNICAL STATEMENT

Christian Babski and Patrick Keller from fabric | ch will both be in San Antonio to produce *Electroscape_B*. While the work will be partially prepared in advance, the main idea is to fully produce the project within a week thanks to the long-distance collaboration of fabric | ch (in San Antonio), fabric | ch (in Lausanne) and Lab[au] (in Brussels). A Web site will also display Web cam images of the three locations/teams as well as the program, day by day, of what will take place in San Antonio.

The different time zones between the three locations will allow the group to have a 16-hour work day! People in Europe will work in their morning and beginning of afternoon, while the group in San Antonio will take over in their morning, perform online tests and have discussions with people in Europe about the night designs, and then work on their own.

The fact that the final application environment will be a multi-user world will make us try some crash tests of the work in progress and use those crash-test sessions as online meetings between the three teams as well. This will be part of the animation in San Antonio. People can witness the creation and setting up of a real exhibition, including the creation of the content. The difference is that it will be 100 percent digital and distributed.

TECHNICAL THINGS

Electroscape is a multi-user 3D environment built with VRML and forthcoming X3D language. In San Antonio, we will work with three laptops. Two of them will be reserved for the project, while a third will serve to catch and display Web cam images of our team working. This third machine will also display the Web site dedicated to the work in progress. A switch will let us choose which of the three screens will be displayed on the large one behind us.

The *Electroscape_B* project will utilize both 3D design and programmation design. Both approachs will serve the same project, *Electroscape_B*, which includes a 3D real-time world, programmation for this 3D world, as well as programmation and modifications of our Rhizoreality.mu server. In this sense, *Electroscape_B* will also demonstrate live the collaboration between designers and programmers in order to produce a piece of cultural and technological content based on electronic media.

W. Bradford Paley

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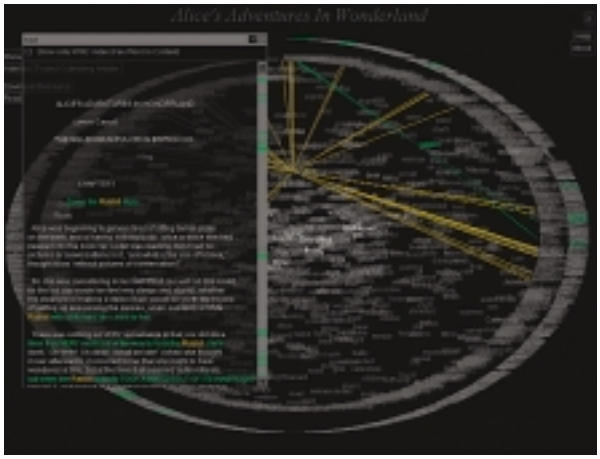

TextArc

ARTIST BIOGRAPHY

W. Bradford Paley is a recognized innovator in the fields of interface design, scientific visualization, and information presentation. After graduating with Phi Beta Kappa honors from U.C. Berkeley in 1981, Mr. Paley did computer animation for advertising. Finding production tools almost non-existent he began writing his own, soon realizing that building a comfortable tool was more challenging and interesting than doing the animation itself. Building computer interfaces became his career. He founded Digital Image Design Incorporated in 1982, a company devoted to the task of creating comfortable, clear user interfaces and visual interpretations of data.

His interests include art history, experimental (structuralist) film, hiking and camping, canoeing, in-line skating, perceptual psychophysics, cognitive psychology, jazz, and modern classical music.

Paley's installations such as *Worms,* an installation of behavioral animation on Atari computer (1985); *Ripples and Sparks*, two flat panel interactive "toys"; *Mind'Space*, all interactive information design; and *Unforgiving Memory Summit,* first presentation of *TextMap* (now *TextArc*), have been displayed at such prestigious venues as the New York Stock Exchange, Columbia University, MoMo, and the Banff Centre for the Arts.

ARTIST STATEMENT

Whether I'm working as a designer or an artist, the essence of my work is interpretation. My goal as an interaction designer is to give visual form to the ideas of my clients. As an artist I try to do the same for beautiful hidden phenomena, in the hope that once seen they'll be remembered even when my work is gone.

Seeing things through the eyes of experts—people who have studied the intricacies of some process for years—has always fascinated me. I interview experts and make little sketches to keep the new ideas clear in my mind, and to check that what I hear is what they're saying. When they begin to recognize their own ideas in my sketches, my next step is clear: animate my sketches to replace the cumbersome, standard, table-field-toolbar-menu-button interfaces they typically use. The resulting "illustrative interfaces" take their shape from the minds of the people who use them.

As an artist I'm still building interpretations. We need an interpretative filter to see some of the most beautiful phenomena: think of the fluid arabesques created in the air by any simple gesture—invisible until we add tiny particles of smoke. I choose colors, shapes, and motions to reveal my subjects, to let them express themselves as clearly as possible. But the colors are not the subject, so I try to let the viewer know they exist while keeping them as simple as possible. I want my work to say "look how plain the filter is; the beauty must be in the subject."

PROJECT DESCRIPTION

A text arc is a visual index/concordance/summary, a way to spatially reveal any text by letting its key concepts float to the surface. *TextArc* represents an entire text as two concentric ellipses. Every line from the text is drawn in a tiny font around a page almost touching the edges, then every word is drawn (in a readable size) just inside the first ellipse. Frequently used words get lighter, so in a story like *Alice's Adventures in Wonderland* key characters like Alice, Hatter, Queen, and Gryphon stand out, as do other words evocative of the story, e.g. poor, dear, door, and little.

Some words scatter inside the ellipses. This is the key organizing structure of *TextArc:* words that appear more than once are drawn at their average position. Imagine that each word is drawn on a tile and attached to each place it belongs in the story by a tiny rubber band. The net result of this rubber band tug-of-war is that words pull closer to where they're used most often. Hence Gryphon appears close to its chapter near the end while Rabbit stays more central. The structure of *TextArc* space lets each viewer's mind find its own path through the ideas in the text, pulled along by the brightness of the words and the meanings the viewer is primed to read.

Brad Paley gratefully acknowledges the invaluable input he received from people at and near Digital Image Design Incorporated (didi.com), including Cliff Beshers, JueyChong Ong, Greta Peterman, and Hai Ng. A more complete list of people involved is at TextArc.org.

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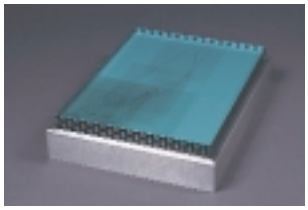
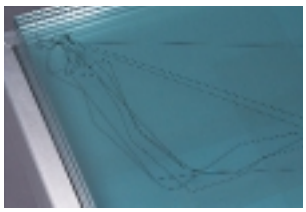
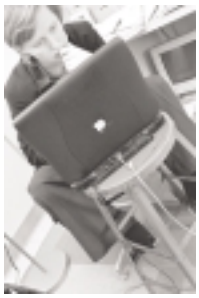
Teri Rueb





The Choreography of Everyday Movement (drawing stack)
Global positioning satellite trackings of urban travelers;
21 x 26 x 9 inches, glass, aluminum, ink jet prints on acetate



ARTIST BIOGRAPHY

Teri Rueb is an artist whose practice blends traditional and new media in large-scale interactive installations. Her work explores the relationship between technology and culture with an emphasis on issues of time, memory, and the body. She lectures, exhibits and publishes widely in international venues including CAiiA Consciousness Reframed (Australia, 2002), ISEA (Paris, 2000), The Banff Centre for the Arts, The New Museum of Contemporary Art, Bell Laboratories, Interval Research, and the German National Institute for Research on Information Technology. In 1999 she launched *Trace* along a network of hiking trails in British Columbia, Canada with the support of the Banff Centre for the Arts.

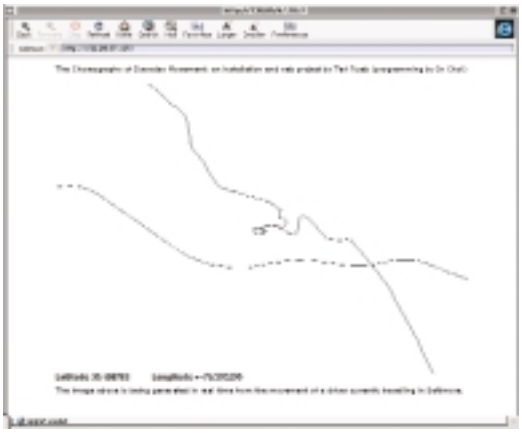
Her work has been reviewed and written about in a variety of publications including *I.D. Magazine*, *Interactivity Magazine*, and *Information Arts: Intersections of Art, Science, and Technology,* edited by Stephen Wilson (MIT Press 2001). She is a recipient of numerous grants and fellowships for research in art and technology. Rueb is Assistant Professor of Visual Art at the University of Maryland Baltimore County.

ARTIST STATEMENT

The Choreography of Everyday Movement envisions as a topographical mapping the culturally inscribed nature of our everyday travels. Using global positioning satellite (GPS) receivers, the project seeks to render visible our movement through the built environment of the city, revealing sociopolitical and poetic patterns of traffic flow through the urban body. In these drawings we see images as often as we detect the variations of a traveler's movement through the city over time. The GPS, designed for precise measurement and navigation, is subverted and recast as a kind of giant pencil or tool for making chance compositions.

The project takes process and performance as the subject of the work. Artist, studio assistant, and traveler are all equal performers in this process-based work that explores the performance of our everyday lives.

The relationship of performer/spectator is re-configured in the live Internet performance in which the performer is only visible as an ant-like dot crawling across the screen. The performer is insulated from the gaze of the spectator, creating a shifted and mediated economy of the gaze that stands in contrast to traditional live performance, film, or video.



The Choreography of Everyday Movement (live Web performance)
Real-time global positioning satellite of a driver traveling around the city;
Java applet running in Web browser

The Choreography of Everyday Movement reduces the representation of movement and physical presence to the most basic visual abstraction in an attempt to privilege the poetic over the indexical.

PROJECT PROPOSAL

Process and performance are articulated as live and archived elements in the exhibition. As a live element, a participant is tracked by GPS as she moves about the city. The trail of the participant's movement is transposed into visual terms as a dynamic drawing generated in real time over the Internet and presented as a projection in the installation space.

As an archived element, the drawings are recorded and presented for viewing in a 3D format. Recorded journeys are prepared as vector-based drawings in Adobe Illustrator that are then printed on transparency film. Each printed journey is registered against prior journeys, and sandwiched between half-inch plates of glass. The stacks of glass grow taller over time with the addition of subsequent drawings, thus creating an expanding "z-axis" through which the viewer can observe changes in the traveler's movement over time.

Artist and studio assistant maintain the installation throughout the period of the exhibition by monitoring and recording each live Internet performance, translating drawings from performances into acetate prints, and integrating the prints into the glass stacks. Process and performance are blurred as the artist, present as part of the exhibition, creates the stacks of archived drawings from the participant's movement as she travels about the city.

The piece uses GPS receivers interfaced with laptop computers. Geographical data from the GPS units is passed wirelessly via cellular modem to a Java applet running on a server on the Internet. The Java applet translates geographical data into a drawing that is generated in real time as the performer moves about the city. Java applet and wireless integration were realized by In Choi. The project is documented on the Web at www.research.umbc.edu/~rueb/trackings/

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Dan Bailey
Alan Price

Gallery visitor using the interactive touch plasma screen at the Baltimore Museum of Art. Henri Matisse's drawings of Claribel and Etta Cone appear in the background.

ARTIST STATEMENT

Etta and Claribel Cone were two sisters who over a period of 30 years amassed one of the world's most acclaimed collections of early 20th-century French art. The Cone Collection, with its incomparable holdings of work by Henri Matisse, and major examples of Picasso, Cézanne, van Gogh, and Renoir, was donated to the Baltimore Museum of Art, along with most of the sisters' possessions and furniture in 1950. During their lives, however, the Cone sisters lived with, and displayed the art in their apartments. They were passionate about collecting and their apartments were full of items.

In November of 2000, the Imaging Research Center was approached by curators at the Baltimore Museum of Art in Baltimore, Maryland, with the challenge of augmenting the exhibition of these historically important Impressionist paintings and to compliment the existing exhibition without detracting from the meaning and beauty of the original art. IRC directors Dan Bailey and Alan Price proposed that digital media be used to provide a historical context for the artworks, which would be impossible to replicate in a physical space. Using numerous historical photographs of the sisters' residence as a guide, the apartments would be virtually reconstructed so as to let museum viewers see the work as the Cone sisters did.

PROCESS STATEMENT

The impetus for this project was a series of 37 photographs of the Cone sisters' apartments from the 1930s. These photos have interested scholars by recording how the Cone sisters lived with, curated, and displayed their remarkable collection. The photographs became the prime resource and motivation for reconstructing the apartments, but more information was required to depict the apartments photo-realistically.

The apartment building was still in existence, but all evidence of how the original apartments were laid out was gone because of major renovations in the 1970s. Ultimately, blueprints from 1910 of the original building were located and these along with measurements of the building's exteriors provided a floor plan. Living relatives of the Cone sisters who had visited the apartments were interviewed and this provided more information. Fortunately, the Cone sisters bequeathed to the museum most of their possessions along with the artwork and this provided the ability to measure each piece of furniture as well as photograph it for texture maps.

Management of all this data (paintings, sculptures, rooms, windows, curtains, rugs, furniture) to allow staff and students to efficiently access it became a major effort of the project. Ultimately, a Web-based mapping system was established that located all items in a room (as determined from the photographs). This system also assured that items were correctly located and cataloged. The map provided a means for locating and accessing all the original photographs from their original vantage points.

The bulk of the work consisted of modeling the apartments and the furniture. In all, more than 500 objects were accurately modeled and textured in addition to the architecture and neighborhood. The database provided modelers with measurements, reference photos, and texture

PROCESS STATEMENT CONTINUED

maps. Each room was then arranged with all the objects and checked for accuracy by the Baltimore Museum of Art curators and project directors.

Approximately 15,000 polygons make up each room and with a total of 14 rooms, the amount of data that had to be processed by the computer to enable real-time rendering had the potential to overload the processing capabilities of the computer. To remedy this problem, a technique was employed of hiding the virtual rooms from the viewer when they were not within the viewers "line of site" and then revealing them on an as-needed basis.

Upon completion of modeling, rooms were exported to the real-time interactive animation authoring program, Virtools, which provided a robust rendering engine that could handle the size and scope of the project. This program also provided the means for interface design, interaction with objects, camera movement, navigation, and support of sound and text. Evaluation and beta testing of the first version of the project was done on-site at the Baltimore Museum of Art using museum visitors.

A second version was developed to give viewers at the museum a more complete immersive experience and was installed at the museum for two weeks in April, 2001.

Driven by a network of PCs, the apartments were presented on a 16' wide by 8' high rear projection screen using passive stereoscopic vision and polarized glasses. Gallery visitors navigated through the apartments by using a joystick.

The piece has worked successfully at the museum for over a year and has proven to be a highlight of a visitor's experience.

Original photograph of Etta's living room (circa 1930) compared to a screen grab from the virtual reconstruction.

IRC staff from left to right: Brinton Jaecks, Alan Price, Christian Valiente, Sala Wong, Ethan Berner, Dan Bailey. Photo by Mike Morgan.

Web-based floorplan for data management of the project.

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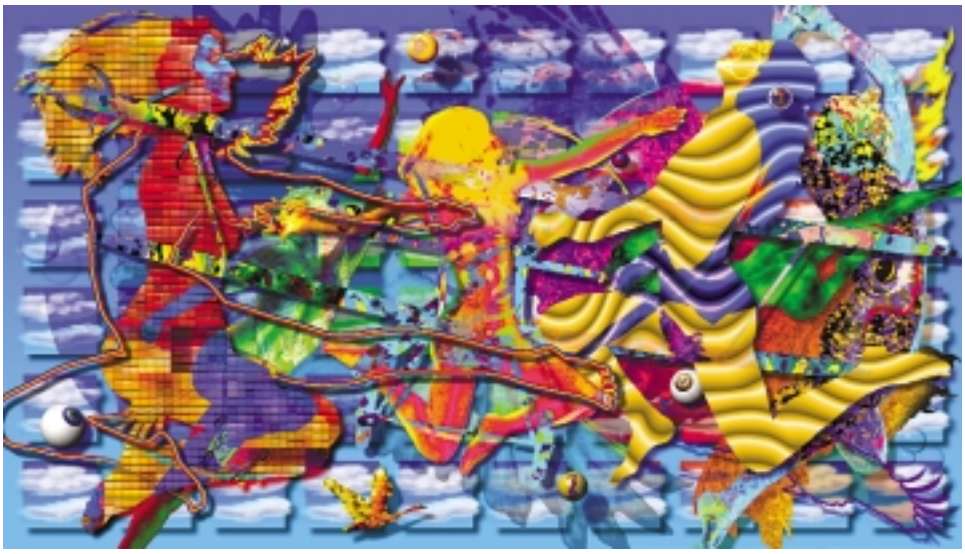


Flight
30 x 48 inches, computer art (light box)

ARTIST STATEMENT

As a young artist, I was fascinated with taking a variety of subjects out of context and using them to create new visual realities. If the handling of these disparate pieces was done well, I could make the fantastic appear possible. I learned to airbrush and used this technique to make this synthesis happen. As time went on, imagery became less important to me. I began to focus on the intricacies of the patterns and textures I could create. This seemed like the right path until, in the early 1990s, I began working on the computer.

My biggest concern with making computer art has been the final form of the finished pieces. Looking at the prints I made, I asked myself what was missing? "Light!" I had been painting with light on the computer. After some investigation, transparencies seemed to be the ticket. To properly illuminate the images, I began building light boxes that not only displayed the transparencies, but also complemented them. People ask me: "Why don't you just show your work on a monitor?" To me, getting the image out of the computer is akin to getting the vision out of my head. It's not real until it's an object.

TECHNICAL STATEMENT

My most recent effort, *Flight*, was done using Photoshop and Painter. Scanned pencil sketches are often the foundation layers for my work. After that, I rely on the tools in Photoshop to build much of the image. Sometimes, I'll have upwards of a hundred layers per finished piece. In Photoshop, it is not unusual for me to run a layer through several filters and other functions so many times, so rapidly, that days later I have no idea exactly how I got a specific result. Painter is also a very useful program. I use it for creating textures, and the image hose produces some interesting visual effects. This particular piece was limited to those two programs. However, I often use Poser or LightWave if I need 3D for an image.

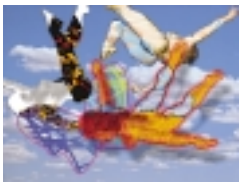
After finishing the image, I flatten the layers and save it as a TIFF file. A service bureau prints my image using the LAMBDA process, which performs direct digital imaging to Kodak continuous-tone photographic material. This material is then developed using standard photographic chemical procedures. The end result is a transparency ready to be put into a lightbox I create for it.

PROCESS STATEMENT

(above)
Big Roundup

(right)
Pheromones

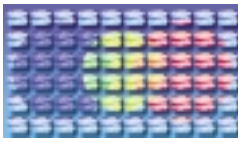
Actually the genesis for this piece began a decade ago when I was searching for new paths in abstraction. I wanted to experiment with more free-form methods of application in my painting, however, I had specific figurative imagery I wanted to explore. Along with these pursuits, I also wanted the ability to make objects appear to overlap and at the same time be transparent, so I could show all of one object even though it was covered up by another object. Using acrylic paint on canvas, I found that what went on inside the silhouettes became independent of the meaning assigned to the shapes themselves. The *Big Roundup* was an explosion of these concepts. By the time I painted *Pheromones* (toward the end of the series), my emphasis toward transparency gave way to a heightened focus on making the textures inside the shapes more bold.



Flight (prototype)

Midway through 2001, my interest in this abstract work was reawakened. I began messing around with the idea of "flying silhouettes," in this early prototype.

After my initial digital scribblings, I decided to put down a foundation for a finished piece. I began by blocking in a basic layout. I knew the final piece would be fairly busy, so I wanted to start with some simple geometric shapes to build upon. I chose three interlocking circles. Interlocking circles have become a common motif in my work. Next, I began to "hang" objects on them to see how they would interact. I was looking for positive and negative space relationships and overall flow - making the figures "dance" together.



The piece was about flight, so I decided that it needed a sky background. However, it should be a synthetic digital sky. This gave rise to the "cloud" tiles. Also, I used the circle motif to color the sky. Using the primaries for the circles and secondaries for the overlaps, I created a rainbow metaphor.

I brought in the first figure, and created two textures to use inside the silhouette. I split the figure at edge of the circle. I wasn't satisfied with one of the textures, so I ran it through several filters and inverted it.

This figure and the next two are anchors for this piece. Even though they are overlapped or underlapped, they are the prime focus of the image. Knowing this, I put special emphasis on the textures filling them. In this case, why I chose the shower floor tiles and beetles is beyond me. Creepy huh?

I especially like this silhouette because it breaks the edge of the red circle in several places. The purple pipe texture is derivative of elements in *Pheromones.* I changed the purple with the hue controls. You can see where I used the selection of a subordinate figure to underlap the yellow figure's midsection with blue.

I wanted the center figure to create a spiraling verigo effect. I used the random line texture to fill the silhouette. However, I sent the image through several filters and inverted it so many times, the texture was lost except for the color. You can also see hints of the biplane showing through.

I added two more figures. The figure on the right was fairly straightforward. The figure on the left went through many layers of changes including offsetting the left arm.

For the plane silhouette, I only used one texture. However, I duplicated this object into many layers, sandwiching them over and under the figure layers. I then modulated their hue and transparency before using the figure's inverted selections to cut them out.

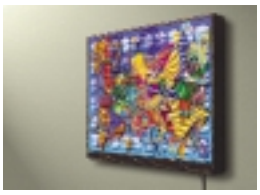
At this point I put in the eyeballs, spheres and bubbles. Their purpose is twofold. First, they occupy dead areas in the picture plane. Second, they form "triangulations of sight" that keep the viewers' eyes moving. I learned this little trick from some clever dead guys from the Renaissance.

OK, I had flying women, an airplane, balls, bubbles, birds.....hmm no birds. Gotta have birds. Also, I like hot wings. One flaming wing please.

After some reflection, I still felt that there was too much background showing. I decided to go ahead and add the two large bird shapes I had put in the original sketch. After much massaging, adding textures, clearing textures, erasing and tweaking layer transparencies, I had the piece just about finished.

One of the challenges in computer art is knowing when to quit. With conventional materials, the painting will often tell you when you're over the line. In this piece, the question arose, "Should I squeeze in one more flying naked lady." Why not? You can never have too many of them.

Remember the circles I spoke of—the ones that were the geometric bedrock of this piece? Yeah, well neither did I. So, I reinforced them with a few strategically placed arcs. Finally, layer by grueling layer I went back and tweaked the shadows...and that made all the difference.



Now it was time to take my file to a service bureau. I prefer to make large transparencies out of my images and build light boxes to show them. I have seen many computer pieces reduced to color prints. They always look kind of dead to me. What we are doing is painting with light. Every stroke we make or function we do emits a new and different quality of light on the screen. Why, after working on an image for weeks or months, would you drain the life out of it by turning it into an opaque print?

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Chiara Boeri

The Goodnight
1.67 x 2.00 m, mixed media on canvas, cotton and silk
From the collection of Paola Giacobone

ARTIST STATEMENT

The Goodnight belongs to Borges' universe, and mine. It is the object I would love to outlive me. Giving a message of orderly disorder, colors and shades, geometry and casual strokes, despair and love, darkness and light, and all which lies in between.

The piece was created for an exhibit in Italy entitled *Amate Cose (Beloved Objects).* The exhibit theme was inspired by a Borges' poem, "Las Cosas" (Things), which talks about objects around us that we perceive and feel and remember. They stare at us and at our lives. They are objects beloved and beloved moments of life. So, my object is this patchwork. I thought of it as a white cover when, very tired one night, I fell asleep, dreaming strange and colorful dreams, which all flew on it, composing *The Goodnight*.

TECHNICAL STATEMENT

A long time ago I started using computers to make many of my artworks. To me, computers can help find a different way of expression and can enrich an artist, as long as curiosity for any new media moves the artist to experiment, understand, and finally master new techniques as well as the traditional ones. They can help artists produce what they want to create.

Most of the 63 panel pieces were made directly on a Paint Box. I integrated some 3D models, made with Strata signs, that were painted and drawn on different media, and then digitized. The image resolution for each piece ranges from 2000 x 2000 up to 4000 x 4000, depending on the material used for print. For canvas or cotton, it is better to compute the images at a lower resolution. For silk, the images are computed at a higher resolution.

A first printout test was done on papers of different weights and textures, in order to get a better idea of the final work; then all images were printed on the different, final fabric materials. Some of the images were printed only once, on one type of fabric. Others were printed on two or three different types of fabric, mainly cotton and silk, to obtain different textures and reflections of light.

Finally, all the pieces were sewn together, to form a sort of quilt or patchwork, and each one was finalized with oil painting and brushes. The patchwork is hung on a bamboo stick.

Hardware: Quantel DeskTop, Graphic Paint Box, and Macintosh G4.
Software: Quantel, Strata 3D Studio, Pixels 3D, Photoshop (just to write the images in CMYK EPS format, not to retouch them), QuarkXPress.
Input of some elements: Agfa Arcus scanner.
Output: Epson Stylus Color 3000, Iris Graphics .
Print media: silk, cotton, linen, canvas. Additional painting with oil and brushes. Individual pieces mounted and sewn onto a light, very tight-knitted canvas.

PROCESS STATEMENT

I love materials: silk, cotton, canvas. I need to touch them and feel my work in a very sensual way, so that when one of my works is printed, it is never finished. I need to add brush strokes to complete it, eventually going back again to the computer to make a piece that is missing, and so on, until I am satisfied.

In this way I created *La Buonanotte (The Goodnight)*, a quilt composed of 63 pieces of artwork. The images created with the computer were printed on different kinds of fabric (silk, canvas, cotton, etc.). Then each one was repainted with oil, and all of them were sewn together to form a patchwork.

I started by making lots of sketches on paper, looking for the right colors and shapes. I finalized some of these with watercolors on different kinds of paper and tissue. Then I digitized some of the drawings and started reworking them with an "r" paint system, in this specific case, a Graphic Paint Box. This allowed me to find the look I wanted to obtain, the right textures and atmosphere, in a relatively short period of time.

Then, I decided how many pieces of artwork I would need to create the quilt. The initial estimate was approximately 50 to 60 single pieces, to be sewn together.

I worked on one or two pieces, each 40 cm x 40 cm, integrating digitized paintings I had made: signs, textures, 3D elements, and paint directly on the computer. Since the medium is very important and determines the way I work, I printed these first pieces on different materials: two types of cotton, two canvases, silk.

One of the pieces was very detailed with neutral colors. Except for some brush strokes here and there. I preferred the image as it appeared on silk. The other image, which is more geometric, and has many overlaid textures, had a better result on cotton and canvas.

I continued creating all the different pieces back at the Paint Box. Often, I went back to draw or paint on paper some elements, or make some oil or watercolor backgrounds, which is sometimes more complex to do with a computer. Other times, I would only work on a 3D system, building abstract shapes, mostly with an old iron look, which I transferred on the Paint Box. To get a precise feeling of the overall work, I simulated it on the computer.

I went on painting, assembling, overlaying for quite a long time, and in fact, I ended up with some 100 different pieces of artwork. I printed all of the images on paper and made a first collage on a big panel, correcting colors with traditional oil paint. I chose 40 pieces, and printed some of them twice, in order to have a quilt made of nine rows, seven pieces in each row.

Back at the Paint Box, I retouched and finished the ones I had chosen. I transferred all the files to a MacG4 and used Photoshop and QuarkXPress to print the images, using an Epson Stylus Color 3000 and an Iris Graphics. I printed directly on canvas, silk, and cotton.

When the 63 pieces were ready, I sewed the quilt together, then I retouched (or better) finished each piece, using oil colors, so that each one looked different, and the work looked as brilliant as I intended it to be. When the painting was dry, after many days, I lined the quilt with a dark red cloth. Hanging from a bamboo stick, *The Goodnight* was ready for the gallery after four months of work.

Stan Bowman

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Running Wild
22 x 29 inches, inkjet on paper

ARTIST STATEMENT

I am a digital artist and a painter. Since the 1980s, my work has been about peculiar juxtapositions of everyday objects into unusual and fascinating combinations. Having started my work in photographs, I now continue with digital compositions. My recent work is about separating everyday objects and grouping them into a new context. Fuses and fishing lures create a provocative contrast, and a plastic inflatable owl with zippers is an intriguing combination. A pair of jumper cables grips a pair of socks, mysteriously. All are against a black spatial background, emphasizing improbable fantasies. On one hand, it is the throw away character of our culture today that catches my eye and interest and causes me to use everyday objects that become something else when scanned and collaged into a digital image. Secondly, it is my delight to create surprising juxtapositions of objects that keep my interest and hopefully those of other viewers. Thirdly, I am interested in creating a flight of fancy, a world that is dreamlike, with commonplace objects that are pictured clearly but change meaning by being in a new and different context. Finally, I am a colorist, creating emotive worlds that establish and embellish the meanings of places and objects. My full line of current work can be seen at my Web site: www.stanbowman.com/

TECHNICAL STATEMENT

When I am working in my studio, I primarily use a computer and a flatbed scanner. My main program is Photoshop, but recently I have begun to use a new 2D/3D program called Zbrush, made by Pixologic. For a background, sometimes I scan paint on glass, and at other times I make the background in Zbrush. Objects are scanned and then imported into Photoshop. Recently, I have been using Zbrush for the complete image. Images are then printed out on a wide-format printer in my studio, matted, and framed for display in exhibitions.

PROCESS STATEMENT

All work is completed in my studio. However, I do go out to find objects for my compositions. My favorite activity is visiting yard sales and flea markets to find unusual and colorful objects for scanning. Sometimes I find organic objects in the landscape around my house (leaves, branches, rocks, etc.), which I take back to my studio for scanning. Sometimes I buy vegetables at a local supermarket or farmers market, which I scan fresh and then leave to rot and change color, and then scan again.

"RUNNING WILD" – 2001

1. Start in Photoshop with a 150 dpi image at 12 in. x 15 in., black background.
2. Dribble and smear paint on a piece of glass. Acrylic paint, several colors.
3. Scan the glass with paint on a flat bed scanner.
4. Make the area around the paint transparent in Photoshop, select the paint and cast over the black background layer, keeping layers separate
5. Scan hands holding a decayed whitened gourd on a flatbed scanner
6. Isolate out the hands and squash from background. Select the background with the Magic Wand in Photoshop, touch up with paint brush, and convert the background to solid black color.
7. Reverse select from black to select hands and gourd, paste onto background as 3rd layer
8. Scan spinich stalks, isolate from background, paste to image to make 4th layer.
9. Scan pepper core, isolate from background, paste to image as 5th layer.
10. Move layers around to organize, change object size where necessary.
11. Apply shadow effect
12. Scale to size for printing

Looking for things to scan.

Scanning Archie McFhee parts.

Painting and scanning glass.

Scanning a paint rag.

Jeff Brice

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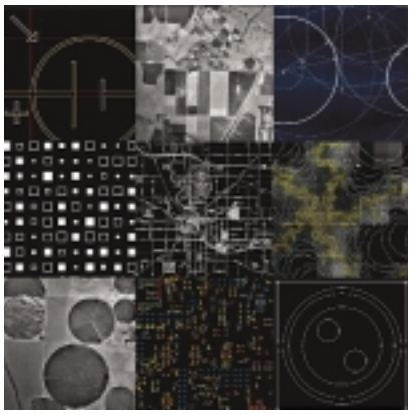
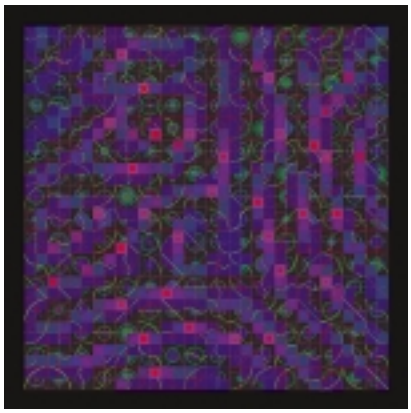
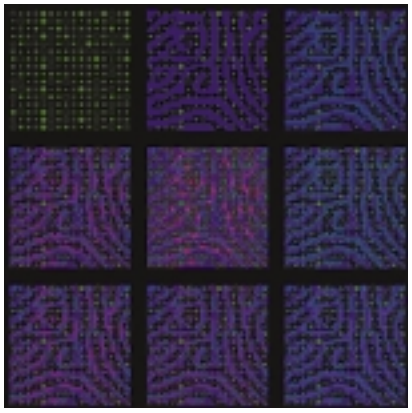


Turing Wave inspiration
33 x 33 inches, Roland print on canvas



Turing Wave
36 x 36 inches, Roland print on canvas



Turing Wave deconstruction
33 x 33 inches, Roland print on canvas

ARTIST STATEMENT

These pieces are from a body of work entitled *Emergent Codes*. They are inspired by some recent technological and scientific innovations, including cellular automata, fractal geometry, complex systems, chaos theory, connectionism, Turing waves, and remote sensing. These exciting discoveries are creating remarkable, never-before-seen images of our world and the processes that create it. The catalyst for these broad changes in our understanding is the introduction and use of the digital computer and its ability to crunch complex calculations that were never before possible. As an artist, I am communicating my own personal vocabulary inspired by the artifacts of science. So it seems appropriate to use the computer as an art tool to discuss ideas that have come into being as a result of the computer.

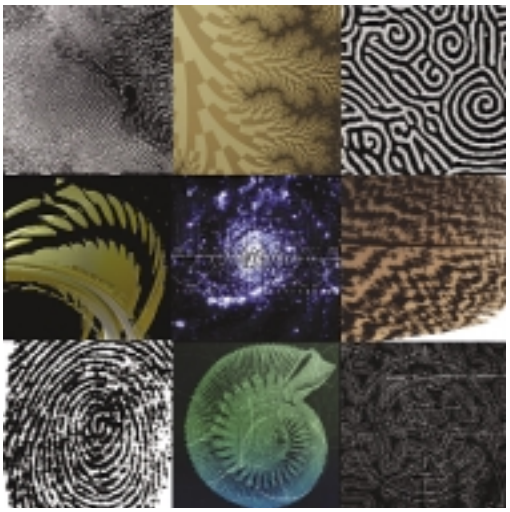
TECHNICAL STATEMENT

The computer lies at the core of this series of work. The inspiration comes from recent scientific discoveries that could be categorized as post-structuralist. The post-structuralist paradigm has come about largely due to the immense number-crunching ability of the digital computer, and it really is a philosophy born of the computer age. So it seems only fitting to use the computer as a tool to talk about these new ideas. I begin by creating a graphic vocabulary, drawing inspiration from scientific artifacts such as diagrams, satellite photos, market analysis graphs, etc. I create the simple geometric elements using the PostScript graphics program Freehand, which allows me to create elements that are very precise, so the elements line up properly when placed on a grid. Working in PostScript also allows me to import the graphics into Fontographer, a program that can create font sets. I then use Fontographer to create font sets of graphic elements. I have created half a dozen or so fonts with names such as Vector, Connectionist, Rhizo, Neural net, Crop Circle, and AI. Putting the elements into Fontographer helps automate the process of layering and reinforces the language and machine aspect of the process. I create the final pieces in Freehand, which has excellent layer control and, of course, keeps the process in PostScript.

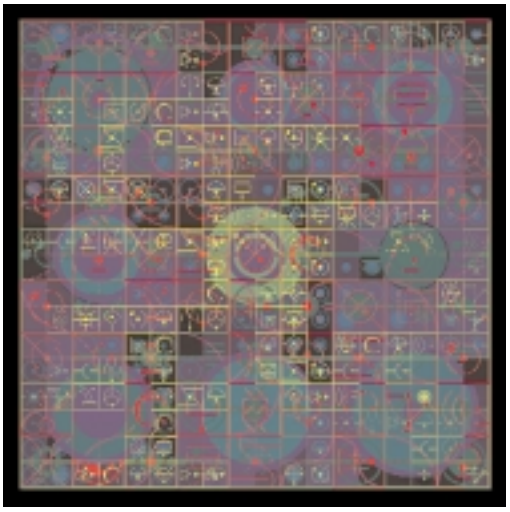
PROCESS STATEMENT

I start with a basic concept that I would like to explore. *Urban Growth* is inspired by satellite photos and fractal simulations of city morphology. Like all art activities, the layering is a non-linear process. The structure of the piece has a tendency to self-organize at some point in a way that I never can foresee. The interaction of the different layers of code begins to dictate how the final piece will evolve. Finally, color is used to enhance the depth of the piece and as a way to bring about a sense of light. The differentiation of short-wavelength color (red) and long wave-length color (blue) is used by the anaglyph 3D glasses to create depth.

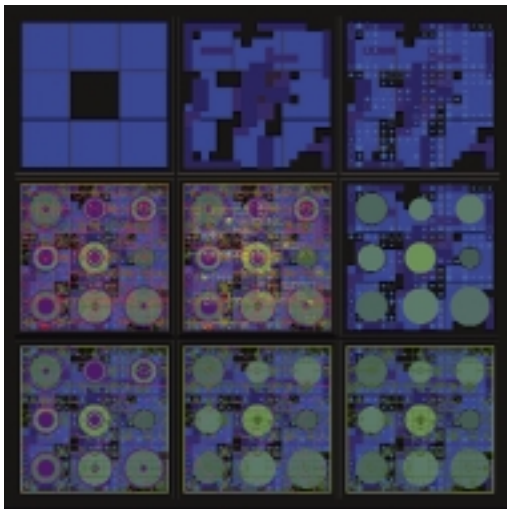
The first panel is called the inspiration panel. It consists of nine images of satellite photos and screen captures of programs that I use to create the final artwork. By juxtaposing the screen captures to photos that are implied in the artwork, I hope to create a sense of the dialogue of the different influences that goes into my work. The second panel hanging on the right side of the artwork is called the deconstruction panel. It shows in nine steps the layering of the image from back to top. This allows the viewer to see how the back layers influence the front layers.



Urban Growth inspiration
33 x 33 inches, Roland print on canvas



Urban Growth
36 x 36 inches, Roland print on canvas



Urban Growth deconstruction
33 x 33 inches, Roland print on canvas

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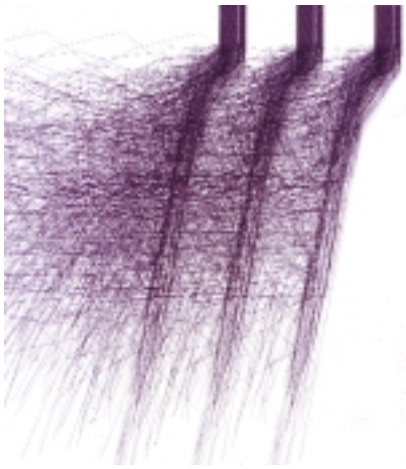


strokes_mi31
60 x 50 cm, plot on paper, Chinese ink

ARTIST STATEMENT

When walking through a landscape in snow, we observe many types of linear structures. The tree as a metaphor and as an element of landscapes is a familiar image and a poetic reminder to enjoy life. What I am trying to communicate through my work are interpretations of the mysteries and tragedies that surround us.

Computer-generated artwork, based on line drawings, is challenging for a number of reasons. It makes use of line as the characteristic element of the generative process, and the results rely entirely on the calligraphic qualities of the line. Besides the heritage of hand drawings, which we conceive as a fantastically rich universe, we may conceive an equally fantastic universe of machine drawings. Line drawings that populate this universe should exhibit qualities in their own right. For instance: they should exploit algorithmic techniques, not be reproducible by hand, show that they have been drawn by a machine, achieve a distinct and unique type of structuring, belong to an identifiable universe, exhibit strong calligraphic qualities, and make the question "how was it done?" entirely unimportant.

Lines are very simple geometric structures and at the same time inexhaustibly rich elements of artistic expression. This is one of the main reasons why I like to work with them. From the vastness of the possible structural descriptions of lines, I have chosen a personal definition, that makes these lines distinctly and identifiably my lines. For the generation of such lines, relevant feature values are: the number of starting points, the number of lines originating from a given point, the angular boundary for a polygon, the spread of a segment, and the number of segments in a polygon.

In *statu nascendi*, when a line is developing on a piece of paper, it does so from a unique starting point. It is the starting point that calls for the first decision in a drawing process, no matter whether the hand of an artist or a computer-driven device is steering the pen. The question of starting points and the question of the "character" of the line developing from those points have to be taken care of by the program. Especially interesting are two sets of algorithms: those that generate drawings in a "one-shot" generative process and those that make use of "composite" processes.

TECHNICAL STATEMENT

It all has to do with an obsession in line-oriented art. Technically, there are two main problems in generating the work I am interested in. I have to write programs or find programs into which I can cast my intentions as an artist. And I have to find output devices, onto which I can deposit the produced results (for eternity). For both problems, I have (temporary) solutions: I use both my own programs and standard programs, plotters, and printers.

Plotters (which are becoming extinct) and printers (which replace them) are very different in the way they produce output. From an artist's point of view, they both have strengths and weaknesses. The plotter relies on a drawing pen. It mimics, to a certain degree, the mechanical and sequential process of drawing by hand, and it works with "vector data." The printer is pixel-oriented, and it works line by line from the top of a sheet of paper to its lower rim.

Since my interest is focused on lines as a basic generative element for artwork, the properties and the calligraphic quality of lines (printed or plotted) are of great interest. Comparing the properties of the lines generated by the two classes of devices reveals how they can be exploited for generating processes. Some of the important properties of plotting are:

- Only lines of a limited thickness are available and they come in discrete steps
- Crossing lines generate gray-scale values and depth.
- The mechanical nature of the drawing process produces inconsistencies and slight variations in the plotted line (for example, the starting points of a line become distinctly noticeable or the pen may temporarily fail).
- Each pen can carry one color only.

The printed line also has its own characteristic properties, some of which are:

- A homogeneous and perfect line image is achievable.
- Black lines (or lines of the same color) cross each other "flat," and the illusion of depth is lost.
- There are no limitations to the width of lines, and they may be chosen from a continuum.
- A very large spectrum of colors is available for prints.

TECHICAL STATEMENT CONTINUED

There is a distinct quality to a plotted line (as opposed to a printed line), which I like a lot, and which I consider as an important feature of a plotter drawing. There are qualities in printed lines, too, which I am beginning to explore.

With line-drawings in mind, algorithms and their underlying concepts allow the artist to formulate interesting strategies for generative processes that produce artwork, I am relying on such algorithms to place large numbers of points onto the drawing area from which, in successive steps, complicated patterns of lines may emerge. Standard graphical operations like scale, move, clip, rotate, etc. are also employed. On purpose, only limited means of editing are available in the generating program, because a high value is placed on conceiving concepts that are then realized, if possible, in a "one-shot" operation.

A compositional mode of operation is supported, as well. It comes close to classical collage techniques (with all the dangers involved). Earlier versions of the program ran on a Tektronics 4052 and later on a PC. The program in its present form is written in Fortran using GKS and is operable on a Siemens WS 430 workstation. It was implemented as a partnership project between the North China University of Technology in Beijing (Qi Dongxu, Xu Yingqing) and Universität Kassel.

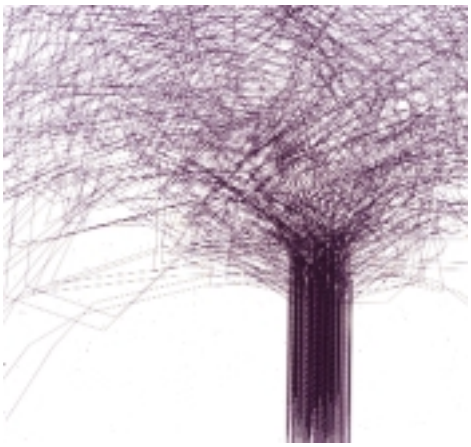
PROCESS STATEMENT

For the generative act, we can identify different approaches. One of them could be described as: "The intentional execution of a concept. Another could be described as: "The probing search along an unknown road, supported by the hope to find something." With the intentional approach, the artist tries to aim directly at the goal. It is the lucky hit which he is after. The probing search ends with a catch. Searching and finding are central concepts to this approach. "Hit" and "Catch" are two metaphors for two different generative scenarios.

In my own work, I place a high value on the "Hit." The execution of an idea by a program is a direct means to a result. To catch something requires a process, which eventually will lead to a state, which by declaration (decision) is proclaimed the result. The process of development is interrupted (ended) at an arbitrary, previously unknown point, and the last "state of the system" is singled out and raised into the position of a result. The result then suddenly stands for itself, and the generating process becomes entirely unimportant in the moment of the decision. It is (usually) not even traceable any more.

The generation of the image "baum_V14" starts with a concept for a tree ("tree11"), which is emerging as result of a "one-shot generative process." In the "tree11" image, a dense set of points is cast into a small area. From each point, one polygon emerges. As a bundle, they form "tree11," using a very simple generative rule. The strictness of this approach can (I suppose) be felt in the visual strength of the resulting image. It is this image which then is manipulated in other programs until an arbitrary decision terminates this process and delivers the final image: "baum_V14"

It can not be plotted anymore, but it can be printed. The "strokes" image is composed in a similar way. One of its three bundles of lines is generated in a "one-shot" operation, which is then replicated twice, and then plotted on a pen plotter. A number of questions arise at this point: Should a drawing that was designed to be plotted be printed at all? What significant changes occur? What features of a plotter drawing are actually changed when it is transferred to a printer, and how does this transfer affect the image, its quality, its visual evaluation?



tree11
60 x 50 cm, plot on paper, Chinese ink

Generate "tree11" as one-shot operation:
1. Define an area (width of the stem) outside the drawing area.
2. Cast a large number (several hundred) random points into this are.
3. Generate polygons by programs with the same features but different feature values from those points to produce "tree11" in one shot.
4. Cut to sheet, save as HPGL-file for plotting.

baum_V14
60 x 50 cm, computer print

Generate "baum_V14" from "tree11":
1. Translate HPGL to EPS.
2. Polygons milled through filter.
3. Play with filters and decide when to stop.
4. Mask and save for printing.

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Experiments on Intelligent Form

ARTIST STATEMENT

This work shows three pieces from an investigation into "intelligent form." For a number of years now, I have been looking at the problem of creating autonomous virtual creatures that interact, move, and learn in real time. Central to these problems are a number of conceptual difficulties in how such simple artificial intelligences represent their "bodies" and the movements that they can perform. This work takes investigations on body representations far away from typical computer graphics techniques, and very different from the now traditional and reassuringly familiar representations of triangles, meshes, skeletons, and key-frames.

In this work, we use simple forms: a square, a single curve, and a family of curves. The representations in this work encode learned knowledge about form against which other forms can be evaluated, animated, perturbed, and grown. These knowledge structures are deliberately incomplete, and the potential for mistakes in such representations is clear and important. We are not concerned here with the optimality of a result, or the robustness of an algorithm, but with the expressive power of a process, its mistakes, its adaptations.

The presented artworks collect a number of images from three of these experiments. Each panel explores a representation that connects generation and analysis, and each collection is laid out to suggest its journey or an unfolding process.

TECHNICAL STATEMENT

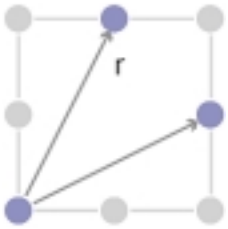
This work draws upon and expands upon research conducted in the Synthetic Characters Group and the MIT Media Lab, in particular their design of graphics and animation (or "motor") systems for synthetic characters. But its points of departure are minute details of processes that would otherwise be hidden or unnoticed and have, to date, never been shown.

The images were generated by custom-written code taken from this research effort—an effort conducted almost entirely in the Java programming language. Unlike everything else shown by this group, this work was not generated in real time but rather, giving prominence to explorative depth rather than speed, using high-resolution, off-line rendering techniques.

All source graphical material where needed (for *Angular Morphogenesis* and *Curve Dictionary*) came from scananed hand-drawn lines.

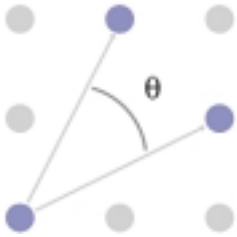
PROCESS STATEMENT

The term "process," of course, becomes immediately ambiguous in any work that in itself uses algorithmic processes. Furthermore, the term is especially muddled when its stated research goals center on the very autonomy of these processes. Such algorithmic work is perpetually unfinished, constantly changing and adapting, and particularly resistant to mediation. Any traditionally "finished" artifact that arises during this process is only a fleeting attempt to visualize, contain, or understand potentials and aspects of these processes.



The "training" procedure encodes radial relationships between the material that goes into building a form. Angular information about which point should go where is deliberately lost, leaving us with an incomplete representation.

1. *on being square*
This piece directly and exhaustively visualizes the mistakes that a particular incomplete and broken representation may make. It shows evaluations of a structure "trained" on a simple square that generates potential fields for form growth. This work comes directly from looking at the problems of creating a form representation suitable for use by an artificial intelligence, one that must be able to generate form and movement, and analyze and evaluate its own movement—combined with a playful rejection of traditional computer-graphical triangles and transforms. The enumeration of all unique images given the rotational and reflective symmetries of the square takes exactly 50 images.



In this representation, we store what relative angles material should appear, but lose the distances.

8. *Angular Morphogenesis*
This representation and sequence of images includes what *on being square* rejects; angular information and general organic growth. Here we do not limit the piece to an investigation of a square or the demonstration of process to an enumeration. Instead, in this work, we grow new material and define new movements based on our potential field representation. The sequence of images becomes a story of a circular figure created from an initial single point. The growing form almost succeeds in becoming a straight line—partly through indecision about which way to curl—before wrapping around to create a circular figure.

The core material for this process is an example-based mapping "dictionary" that maps segments of curves to larger, more complex curves. Elements that fall between the dictionary definitions are interpolated.

13. *Curve Dictionary*
In building interactive intelligences, one is often involved in creating communication between independent behaviors. For a "creature" concerned with visual form, what is an appropriate "language" and, once considered a language, what linguistic operations can be conducted within it? The final piece in this collection is concerned with a more direct exploration of "example-based" representations. These representations are populated by hand-drawn curves forming the material that is manipulated.

But there are two complementary parts to my "process." The processes created and visualized in this work fit into an ongoing research agenda, which is an ongoing investigative process in itself. The research agenda is that of the Synthetic Characters Group and the MIT Media Lab, in which I try to work on both large frameworks and small ideas. My large frameworks are the architectures that create complex graphical creatures (exhibited at previous SIGGRAPH conferences), but there are smaller pieces that fill parts of these frameworks or use elements of them as points of departure.

For small is, in many respects, an easy route for digital art, with our canvases often characterized as vast uncharted expanses that almost seem to demand a quick sketch, a playful experiment, a bold exploration. And in many respects what is presented here is small—a small study of poorly understood algorithmic processes. But such processes have been used (and hidden) inside larger works, and larger works have encouraged and nourished these small ideas. This fluidity between the design and implementation of large architectures and focused work on small ideas is important for the process behind this work and important for digital art (in particular interactive works) in general, as it moves beyond smaller, playful experimentation into larger and inherently more collaborative works.

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Flowbronze
9 x 6 x 6 inches, bronze cast from CAD/CAM prototype

ARTIST STATEMENT

I'm a digital sculptor, using metal and glass to create abstract geometries in space. This work explores order in space: tensions between inside and outside, the point at zero and the point at infinite distance, how the dimensional axes can be alike and different. I got interested in these things as an undergraduate in mathematics, wanting to cross over from formal abstractions into working with physical shapes, and sculpture gave me the way.

I'm often asked whether these pieces are based on logic or intuition. If this is a multiple-choice question, it's not an easy one: let's say that my intuition operates with mathematics at the back of its mind. The process is pure analog. I push things with my hands until they look good to my eyes, but the results show that my creative engine is inextricably fused with geometrical intuition. My work is to explore and extend the fertile region between sculpture and mathematics.

TECHNICAL STATEMENT

My designs exist first as CAD models, and they enter the physical world as wax or plastic parts built by rapid-prototyping technology. Then they're translated into metal by the ancient and effective lost-wax method, and I finish the bronzes using hand tools that Praxiteles would recognize. So the process moves, as it were, backwards in time: from virtual idea to hand-finished metal.

The sculptures are made in limited editions, but without mold-making; each instance of a piece is cast directly from a new prototyped model. It's impossible to make molds of my work. It is too involuted for even flexible tooling to work, so without prototyping there could be no editions at all.

Prototyping technology is a young, crude business as I write this, but it's the germ of an artistic sea change. It brings sculpture into the company of poetry and music, among the eternal media. Because the originals of my work are now data, they transcend location, medium, and time. Ultimately, in my lifetime I hope, art sculpture will be manufactured on demand, at the size, medium, and price point requested by the viewer. Far from threatening the value of sculptures by eroding their scarcity, I believe that this will allow them to reach their natural audience, so that they can be owned by everyone who likes them. We are standing at the Gutenberg moment for sculpture: it will soon be affordable, ubiquitous, and—like everything else that shares those properties—digital.

PROCESS STATEMENT

I begin by contemplating a shape: maybe a familiar solid such as the cube, or a more esoteric one like the snub cube or rhombic dodecahedron. I think about it with some modeling clay in hand, and perhaps some possibilities develop; eventually something emerges that might be interesting to build. Sometimes it isn't easy to visualize, but usually I can at least indicate my idea in the plasticene well enough to remember it.

Next I need a CAD design. I make this by re-modeling the piece, rather than attempting to digitize it, as no scanner can pick up all the involutions of these forms. Here I fine-tune the design, making precise what was rough in the clay, nailing down proportions and details. This is the longest and hardest part: many, many days can go into the model, and when I finally see it printed, as often as not it goes back to the drawing board.

When I have the model complete in the computer, I print it on my 3D printer, or if the piece is to be large, send it to a service bureau. In either case, a physical model is fabricated from my CAD design by building it up in layers, one layer at a time. This additive method allows very free geometry; it's not nearly so limiting as CNC methods, in which the piece is carved. During the build, support for undercuts is provided in various ingenious ways. The machine I have, a Solidscape Modelmaker II, builds support structures in a different material from the actual part, and the supports are dissolved away in a solvent bath after the build is done.

The result of the prototyping process is a strongly grained model, showing the layers it was made with, that can look a little like rough wood. The material is plastic or wax, and it may be more or less durable, but in no case is it pretty. The next step is to cast it into a material that is both aesthetic and archival: metal.

This is done by the lost-wax method, an ancient and flexible casting process that can handle almost any geometry. The disadvantage to this method is it destroys the original model (hence "lost-wax"), so a new wax is required for each casting. For most sculptors, multiple-waxes models can come from a mold, but since that isn't possible for my designs, I build a new prototype for each piece.

I finish the rough castings with hand and power tools: files, grinders, polishers, an occasional weld. The piece is darkened with a hot chemical patina. In some areas, the texture is left intact for a rich surface. In others, I abrade it lightly, and for highlights, it's polished away entirely. Finally the piece is lacquered to protect the finish, and it's done: my geometrical intuition has been realized in the physical world.

Online gallery for bronzes: bathsheba.com
Silver sculpture and jewelry: microsculpture.com
Prototyping service bureau that specializes in small-scale creative projects: protoshape.com

Alter Knot

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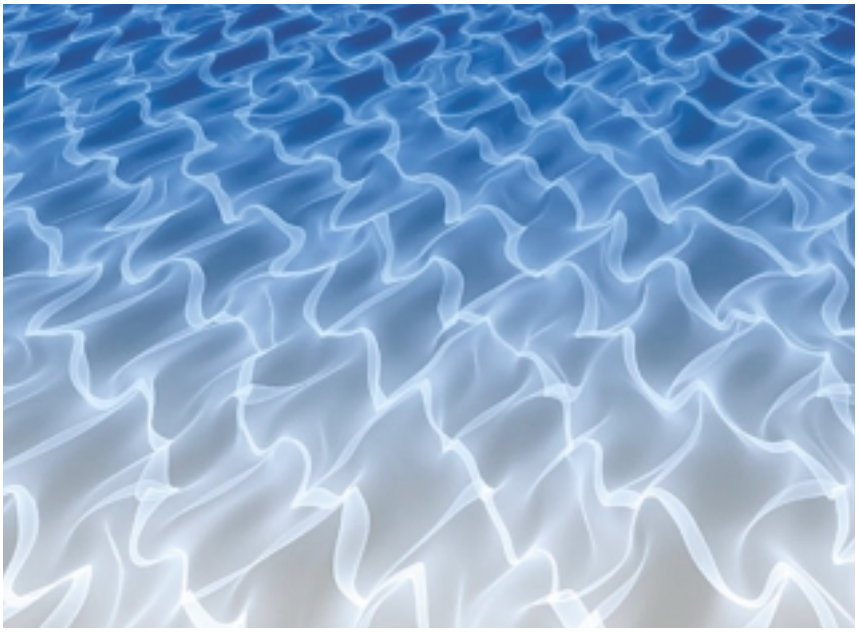


Caustic I
36 x 46 inches, lightjet print

ARTIST STATEMENT

There is no need to be an expert in celestial mechanics to marvel at a lunar eclipse. Few can look at a space telescope images with hundreds of galaxies without a passing thought about our place in the universe. Indeed, astronomy enjoys an immediate visual accessibility and appeal that most physical sciences do not. I view my role as an artist-scientist as attempting to make the mystery and beauty of other aspects of nature more apparent to non-specialists. My subjects come from what I know best—those fields where I do research: quantum mechanics, chaos theory, nanoscale physics, and chemical physics.

Science these days generates many beautiful images. But the scientific illustrations must put science first. My images do not attempt so much to teach or to convey information as to convey the emotion of discovery, of knowing nature at her deeper levels. My computer-generated images are based on science, but the scenes are created rather than found. My work uses diverse physical phenomena as a medium for painting scenes that seem somehow familiar. The familiarity banks heavily on nature's passion for repeating herself. It is key to the emotional engagement I hope to achieve.

TECHNICAL STATEMENT

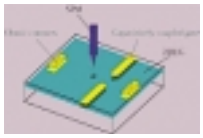
When a water colorist puts a wet brush to paper, physics rules the result: wetting and fluid flow on paper, scattering and absorption of light by pigment on fibers, evaporation and drying hold sway. These physical phenomena mimic other aspects of the natural world and with experience can be harnessed to wonderful effects. Similar statements hold for pastels, egg tempera, oils, photographs, etc. To date, digital painting tools have tried to emulate traditional media and effects. Digital artists need no longer emulate traditional media only. The computer allows us to create new media, with new rules, more naturally suited to the new tool. But such rules are best when they too follow physical phenomena, instead of arbitrary mathematical constructs.

I have learned to paint with electrons moving over a potential landscape, quantum waves trapped between walls, chaotic dynamics, and with colliding molecules. Nature often mimics herself, and so these new media, exposing the beauty and mystery of the atomic world, yield a variety of effects that recall familiar aspects of our macroscopic experience.

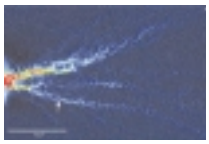
The images are mostly the result of computer code, which I have written, with output to raw RGB files which I then manipulate in Photoshop. My prints are EverColor Luminage Direct-Digital Prints produced on a CSI LightJet 5000 printer using high resolution RGB lasers to expose RA 4 photographic print materials. The process provides the highest resolution color output available.

PROCESS STATEMENT

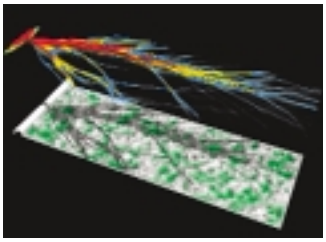
The creative process leading to *Caustic I* is typical of my artwork: a synthesis of research and artistic creation, each one enhancing the other.



Experimental setup for measuring electron transport (M. Topinka, B. LeRoy, B. Westervelt) on a micron scale in semiconductor microstructures, using a charged scanning probe microscope.

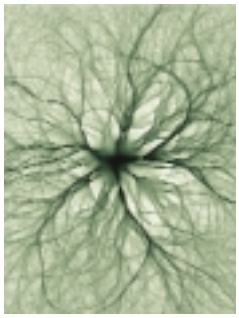


Data: Experimental discovery of branching and fringing of electron flow. The fringes are quantum wave interference effects.



Inspired by the experiments, branch formation is shown to be due to electrons riding over random hills and depressions in the potential landscape that they must negotiate. The branching is an indirect effect of this landscape: branches are not associated simply with valleys in the landscape.

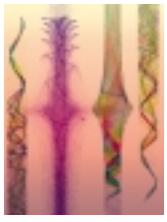
Scientific illustration (with Scot Shaw)

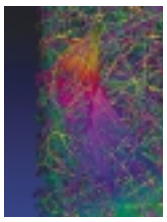


Transport II, the first of a series of large format high resolution electron flow images that use branched flow physics, revealing the caustics formed when electrons flow from center image. This image was used for the cover of *Nature,* (March 8, 2001) in connection with the publication of the new results. The electron flow patterns are remarkably flexible and organic—a new medium for artistic creation.

Transport II

Experimentation with various methods of recording individual electron tracks (overwrite, transparency, color combination) leads to a variety of effects and expands the horizons of the medium.





(far left) Wires

(middle) Nanowire

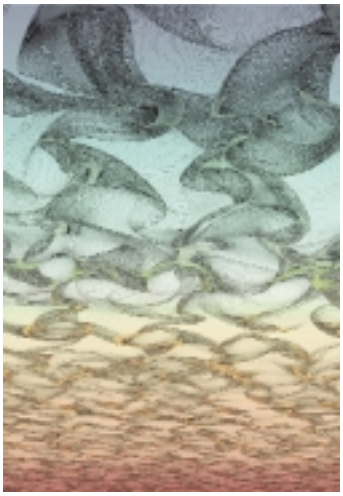
(right) Nanowire detail

Meanwhile, we begin to wonder about the effects that traveling in a narrow wire would have on the electron flow. The random, low hills and valleys are still present, but the additional confinement to narrow channels leads to new effects—both artistic and scientific. The first "wire" images are promising:

Color keyed to quantum phase (the wave nature of the electrons) adds a new dimension to the images. Nanowire is created as a synthesis of the scientific and artistic experience summarized here.

Inspired by the success of the electron transport images, which took place in a so-called 2D electron gas, the question of propagation in 3D naturally arose. I decided to look at what happens when light hits a wavy surface; this of course is becoming commonplace in 3D simulations. But I needed to know what happens when lights passes through many successive wavy surfaces. This is the analog of the electrons traveling over many hills and valleys.

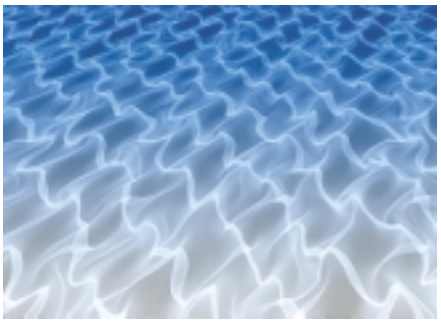
Rather than show the whole path of the light rays, I interrupted them with a plane, as in a swimming pool bottom. Using a point source of light, the caustic formation in this case is unfamiliar if there are many surfaces. In *Caustic II* there were seven successive surfaces. This gives remarkable, but perhaps unfamiliar caustic structures. I began to back off the number of wavy surfaces, for artistic reasons, mainly.



Caustic II

Caustic I shows light interrupted by the "bottom" after passing through just two surfaces. Still, the resulting pattern could not quite be seen on a pool bottom.

There is much room for creative effects (and new physical effects) in the nature of the waves used on the surface and the number of surfaces. *Caustic I* jumped out at me: here was an image almost like scenes I have seen, full of interesting caustic structures. I could not resist it!



Caustic I

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Tahir Hemphill

Living Audio
15 x 15 inches, serigraph on Arches paper

ARTIST STATEMENT

With this work, I am interested in applying a hands-on, organic approach to otherwise precise art forms. In exploring the influence of digital culture's cut-and-paste phenomena, I employ multi-layering, sampling, and repetition of images. These appropriation and re-mixing techniques are found in modern electronic music production as well as older artistic forms such as quilt making. In doing this, I hope to perpetuate these traditional cultural concepts while adapting them to a new technological terrain.

PROCESS STATEMENT

Living Audio is the print that started this whole series. I began working on a new project by designing high-contrast graphics in Photoshop, with the desire to recombine my photographs and other source material into an image that was digital with an analog aesthetic. After working for an hour, the file used up the computer's free memory and it started crashing. Each time I pushed the button on the mouse, the computer would sample part of the image and randomly move this square shape to another part of the grid. I began to see a pattern and the connection between my input and the output on the screen. I printed out each new image, scanned the printouts, and used them to design my final graphic. I distilled each piece down to four separate colors. Negatives were made of each color and plates were made from the negatives. I have produced serigraphs and etchings of the designs. Taking advantage of the pure random nature of the glitch in the computer system, I used this process as the conceptual framework for the whole series.

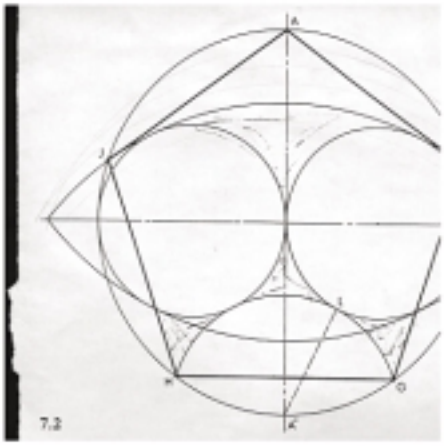
In each subsequent design, I draw from the random multi-layering and repetition employed by the first experience.


LIVING STEREO


C & S DESIGNS
CHINA SILK & HANDICRAFT CORPORATION
CITY DOG SCREEN PRINTING INCORPORATED
COURTSIDE INCORPORATED
CTC AMERICAN ASSOCIATION
CUSTOM SCREEN PRINTING
DESIGN EAST
DRESIN STUDIO INCORPORATED
Only Shirts
Standard
12 X 12
24 hours


STEREO
STEREO
stereo


LIVING STEREO




month full of spells
orange/black/white
orange/red
red/silver
red/gold
blue/silver
orange/green/red/white


LIVING STEREO

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Conscious
95 x 60 cm, iris print

ARTIST STATEMENT

I have always been interested in expressing my current emotion. My recent work expresses small emotions that I feel in everyday life and my feelings about various news and events happening around the world. Our technology-driven civilization causes many problems and distortions within society, including separations between the rich and poor, racial problems, education, and other things. People create rules and laws, but still, our society is not perfect, and there are people who are disadvantaged because of those systems.

My visual style integrates surrealism and abstract imagery. This work depicts the complexity of memory and how one memory relates to another memory. Memories are referenced to make decisions in our daily lives.

TECHNICAL STATEMENT

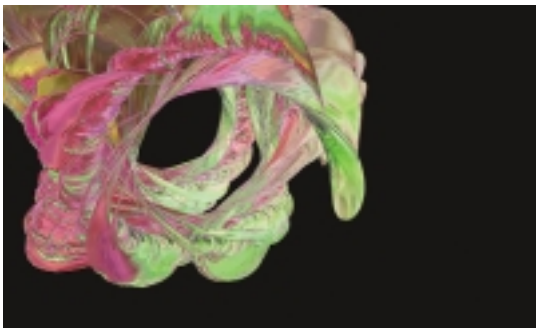
The work is produced by deforming 3D models by recursively twisting and bending. These models are placed in 3D space, with 3D StudioMax and my own proprietary software, creating an interrelationship between the objects. The images used for textures and reflection maps are rendered by ray tracing to create the metallic quality. In addition, bump maps are added to the surface to enhance the visual complexity.

PROCESS STATEMENT

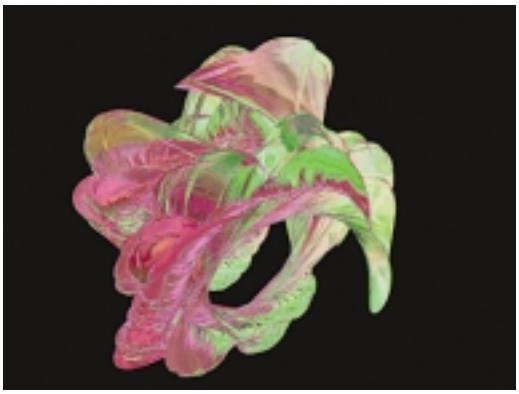
Step 1: Deforming an object. A complex object was achieved by deforming a 3D object.

Step 2: Adding textures. Textures were produced by a complex process of rendering and image-processing algorithms. The following texture is a sample of the textures used to create the artwork. Textures were used as both image maps and reflection maps to produce the image.

Step 3: Recursively twisting the object. By recursively twisting and bending the object, a visually complex and appealing object was achieved.



Step 4: Object layout. Many deformed objects were created, then translated, rotated, and scaled for layout in 3D space. The layout process was completely intuitive.



Final: Completed artwork. After many iterations of this trial-and-error process, the artwork, *Conscious*, was completed.

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Atshushi Kasao

Webcam Art: Sapporo
900 x 1940 mm, ink on paper

ARTIST STATEMENT

Webcam Art was created to visualize the result of my experience and communication through the Internet. Many interesting Web cameras are set up around the world, and some of them have controllers that allow viewers to pan and zoom from their browsers. A lot of scenery and people are viewable via Web cameras. Most of the cameras transmit small, poor-quality images, but with a stretch of the imagination, we can perceive beauty in them. This imagination motivated me to create pieces from Web cameras, which is why I might be called a net-travel painter.

If I were a "real" travel painter, people around me would stop to look at my paintings and talk about them. To know how the Web-cam owners feel about my work, I showed them my pieces and asked them to send back some comments. If a Web-cam owner wants a copy of the work, a poster-sized copy is sent.

I used original rendering software, SIC (Synergistic Image Creator), to create *Webcam Art*. SIC can enlarge the work to any scale. *Sapporo* was created from a Web camera on a northern Japanese island. One comment was: "A live camera sends just photographic pictures, so I think we never stop the time in a Web camera. However, it is a good idea to make a CG from a Web camera, because the scenery created by CG conveys a different feeling and atmosphere and makes appreciators have a desire to know real scenery." (Dosanko site Web-camera administrator.)

TECHNICAL STATEMENT

SIC is constituted of several GIMP plug-in modules, and it provides a wide variety of expressions. GIMP is an open-source photo retouch software working on Linux and Windows. The original functions of GIMP were only used to adjust color balance, so all creative tasks were processed algorithmically by SIC. Creating a large rendering image from a small Web-camera image is one of the characteristics of this software. Other important characteristics include:

- It can control color and texture separately.
- It provides numerous expressions.
- It can select and/or create color maps from excellent paintings.
- It can resist your own rendering expressions.
- It creates artwork with a history of its rendering process.

Most of these characteristics derive from SIC's vector data-handling. Though SIC is a key technology of *Webcam Art*, I can't make this type of art without the Internet and Web cameras. Controllable Web cameras have broadened my expression.

SIC's first version was created by the author, but the current version was produced by core members of the Synergistic Art Project, which was formed to revise SIC about one year ago. We are now planning to introduce SIC as open-source software. For more information: www.dsn.t-kougei.ac.jp/cp/sic/

PROCESS STATEMENT

There are many Web cameras in the world, but who do these images belong to? In the real world, we can take a photograph or draw a sketch of scenery and use these created images and works for any purpose. Can I use the images I found through Web cameras as creative material? Who has copyright on these images?

The Internet has made all of us information senders. In the next step of Internet development, the Internet should give us the ability to create. Images and documents should be open content, and many types of creative tools will increase. Also, image creation and information about how to use such tools must be shared.

Through *Webcam Art*, I ask Web camera owners about copyrights of their images, and I show the works created from Web-camera images with SIC, a creative tool that is appropriate for an open-content culture, because images created in SIC include a history of the image process. Everyone has access to the history, and they can modify the processing information and apply it to their own images. We can share the hints and know-how about creation of new image expression through this history information.

Other examples of *Webcam Art* are shown at right. Figure 1 is an image created from a Web camera of the Hudson River, and Figure 2 is a portrait of a Japanese girl.

Webcam Art: The Hudson River
900 x 1900 mm, inkjet print

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plug_in_gk_subst_color-012-001-1-100-000-027-011-10

Webcam Art: Natsuko
900 x 1200 mm, inkjet print

History (parameters of plug-ins) plug_in_gk_mean_algo-00-04-01-01-04-00-10-050-050-05
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plug_in_gk_reconst_image-003-4-8
plug_in_gk_subst_color-012-001-1-100-012-004-012-11

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Skelephron
44 x 60 inches, digital print on canvas

Pseudosphinx
44 x 60 inches, digital print on canvas

Deathwatch
44 x 60 inches, digital print on canvas

ARTIST STATEMENT

The overall concept of *Transmigrations: Cases of Corporate Reincarnation* combines theories and research on social insects, traditional and contemporary corporate structures, job descriptions, and reincarnation scriptures. A variety of conceptual layers enhances the basic idea with depth and an intricate point-of-view. While the layers require study of a substantial amount of bibliography, they provide the project with a spine, by acting as a solid point of departure. *Transmigrations* showcases 24 portraits of senior executives who return to life as insects. The characters personify symbols and weapons of their trades on a number of levels, some instantly visible and others hidden.

The term "transmigration" refers to successive embodiments, mainly in the sense of rebirth in lower life forms. This theory was first asserted by Pythagoras, the most important early Hellenic thinker and the father of controversial teachings on reincarnation of souls. He taught that those whose lives had been filled with evil deeds and destructive emotions, were unworthy to reincarnate immediately in human form. Such souls, therefore, obsessed the bodies of animals and attempted to function through these inferior vehicles until eventual re-elevation to a human host. Insect societies, strife, and competition prevail. The colony features a system of castes and labor roles featuring aggression among competitive social insects. Individuals who achieved dominance over the rest are given preference in access to food and breeding cells. The chosen ones (even within the same colony) recognize each other as rivals and display open hostility to each other. Organizational details evolve through an evolutionary optimization process, a precise replica of the methods used in the marketplace to develop successful business models. Similarly, dynamic and competitive markets dictate aggressive corporate behavior patterns and environments in which the option of moral, human, or fair conduct is almost an impossibility. The race toward market domination has underscored the need for structures that define clear, uncrossed lines of authority and communication. Thus arose a breed of business executives who have to practice cold, analytical, often impersonal tactics in order to generate maximum return on investment for their enterprises.

Transmigrations describes a cast of bureaucrats with punished souls, consigned to the lowest life form, where upward mobility is nearly impossible. These concoctions of flesh and metal do not appear to be individuals who made mistakes and wish to repent. They were willing adapters of a predatory modus operandi, and now, in their sub-human condition, their instincts apply. Here their essence is physical and exposed, just like the names, which to some degree, mirror the signature trait of the insect with which they were fused. Comfortable in their new suits, they size up their enemies. They have no friends. They never did.

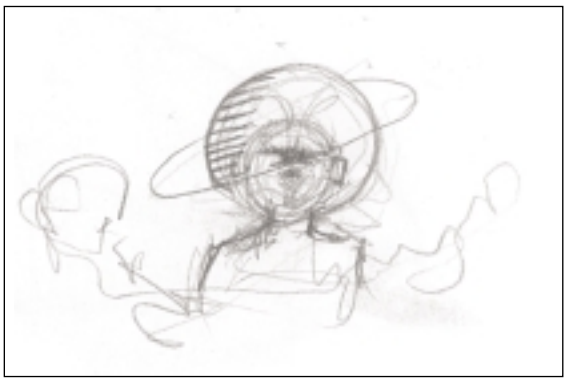
TECHNICAL STATEMENT

The digital, on-screen process of creating the images follows numerous pencil studies that determine concepts and compositions. Most of the raw photographic components originate from vintage prints, digital photography, and stock photos. The digital files are enlarged by 400 percent and printed digitally on 44 x 60 inch canvases by a six-color laser plotter printer. Adobe PhotoShop 5.5 is used to connect and manipulate old and new sources into seamless visuals. Only the basic set of software filters and effects is utilized on the multi-layered files, which are completed in grayscale before they are colored. As a traditionally trained artist, I always preferred acrylic pigments to oil because my technique required endless layering in order to get texturally and tonally dense surfaces. I painted on both sides of acetate sheets, and the result resembled experimental animation cells. I found the computer has given me the transparent-layered results that I liked and the ability to incorporate photographic materials that I believe are essential to my work, in order to create surreal, yet momentarily believable images.

PROCESS STATEMENT

Research is the preliminary stage that is crucial to the structure and cohesiveness of the series. Once research is completed, my method is simple and painful:

1. I translate studies from my sketchbook into digital collages. I chose 24 images to be finished out of set of about 35 sketches done in a relatively short period of time. Speed is important in order to retain continuity within the series.



2. I match a face to each "character" (family or corporate vintage photography provides the base from which the style and expression originate), and most of the times this is the starting point of every image.

3. The combination of body, insect, machine, tool, flesh, and bone parts composes the body and evolves to finished seamless black-and-white images. Choices are made according to the "job description" or (better) "psychological profile" discovered in the preliminary research stage. Once most of the characters are assembled, parts are swapped and even named in order to strengthen the individual concepts, so at some point the creative process is almost independent from the prior research decisions.

4. Then I add color by combining unrelated photos or parts of my own older paintings that have color or textures I like. Also, a great deal of tinting and shading is combined with various layer effects in order to get the end result. I print multiple stages of the work in progress and mark up the changes on the printout. The computer files are composed from over 20 sources and 30-40 layers that require meticulous naming and organization. Each image requires a good, solid 40-50 hours of work between initial composition and final output (not including research, photography, or sketches). The final prints were printed digitally on 44 x 60 canvases. Producing them with a high-resolution six-color laser method accurately translates their vibrant on-screen color quality.

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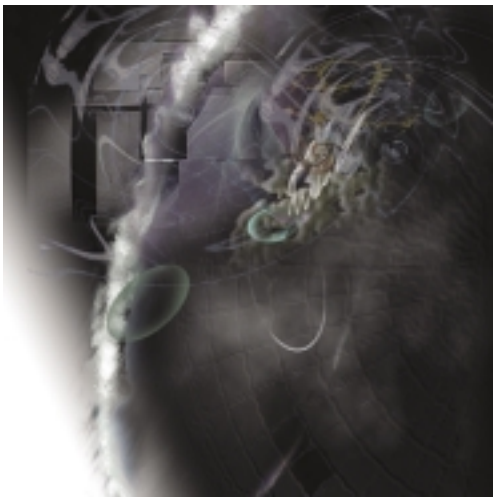
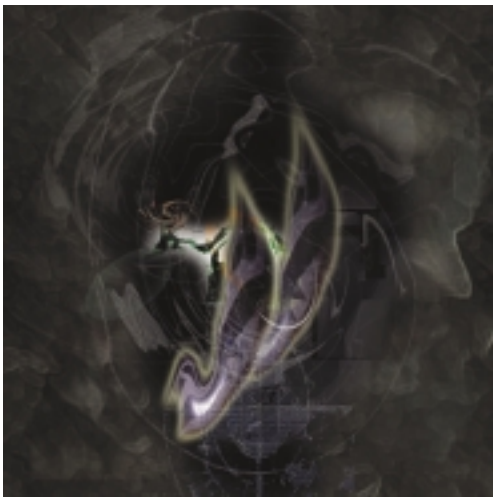
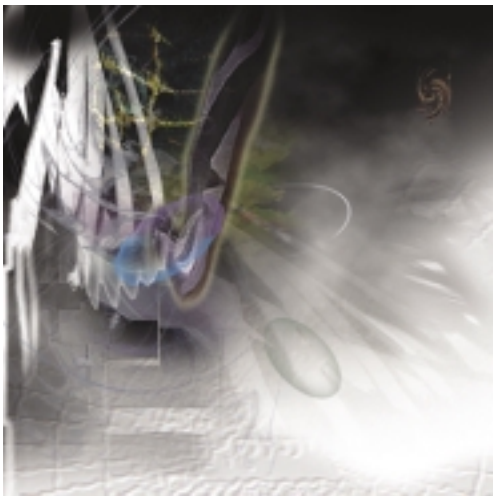


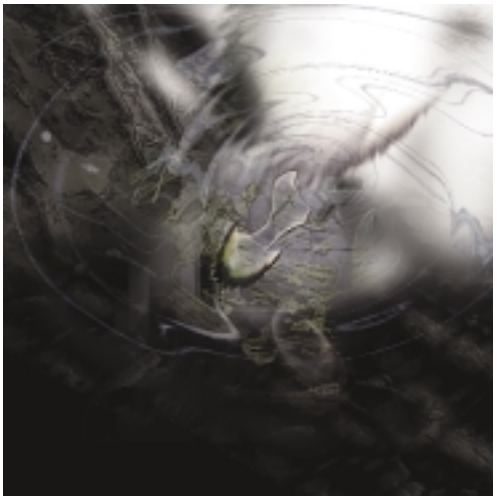
Formation I
9 x 9 inches, photographic paper



Formation II
9 x 9 inches, photographic paper



Formation III
9 x 9 inches, photographic paper



Formation IV
9 x 9 inches, photographic paper

ARTIST STATEMENT

All these works focus on expressing my understanding and feeling of nature formation. Nature forms various patterns and states. Some are orderly in space but disorderly in time; others orderly in time but disorderly in space. Some patterns exhibit self-similarity or stable structures. Others give rise to random states or oscillating ones. The dynamics seems basic, changing in relative space and time, yet still difficult to predict and comprehend.

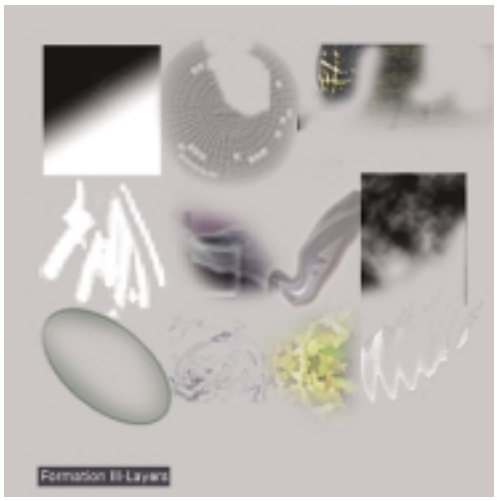
Faced with microscopic particles in everyday complexity, I sometimes have been driven through a feeling of mystery, dramatics, and unpredictability about the formation of nature. Hopefully, computer graphics may be applied to my work as a way into an unlimited thinking space.

TECHNICAL STATEMENT

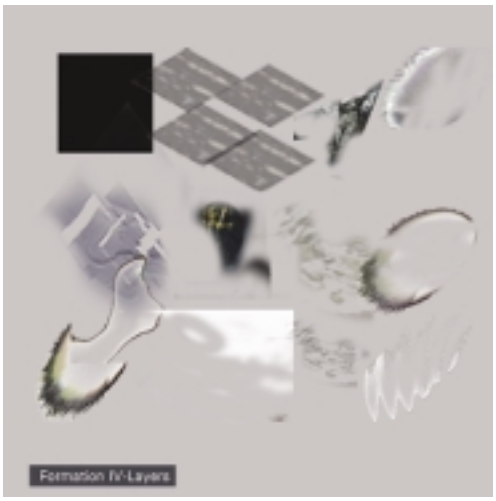
This series of digital paintings was created with Illustrator and Photoshop on a PC and printed on professional color printer.

Formation I Layers
9 x 9 inches, photographic paper

Formation II Layers
9 x 9 inches, photographic paper



Formation III Layers
9 x 9 inches, photographic paper



Formation IV Layers
9 x 9 inches, photographic paper

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Jessica Maloney

Someone, Somewhere, Sometime
32 x 18 inches, mixed media

ARTIST STATEMENT

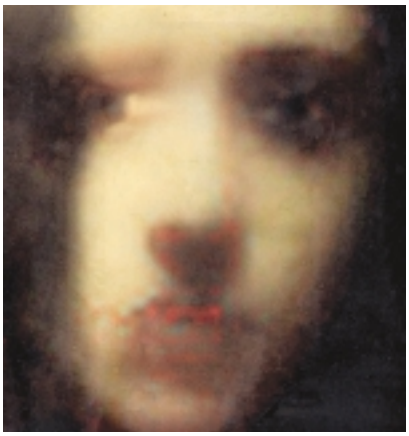
The box within a box within a box entangled with wire shows that the truth is often not obvious. It may take work to get to. This could be the truth about us or about other people. Initially, we can only see so much of a person. What is it that tempts us to want to know more? The face depicted in the box could be someone looking out as us, or it could be a reflection of ourselves. The plants made of wire are bare, which alludes to winter, coldness, and death. These plants represent restricted growth. They are moving forward while at the same time being bound by that which they are made of. Even if the restrictions we place on ourselves are protective measures used to prevent us from getting hurt, at times these restrictions also prevent personal growth. The box structure is a source of containment as well. It is safe, but it can also start to act as a constraint. Both wood and boxes are feminine symbols meant to nurture and protect. Then there is the myth of Pandora's box, which eludes to the significance of the unconscious, paying particular attention to the excessive, destructive, and unanticipated potentials. The house in the lower part of the box is meant to represent the human body and soul. The box structure that has been created can also be viewed as a home. The body acts as a container where we store our experiences, thoughts, and troubles. The home is viewed as a safe place to go, the body a private space, and the box a sturdy structure. Containment is needed at times, but too much of an inward view and our lives will cease to go on. Just as we grow and eventually leave the safety of our homes for a new life, so must we over time break free from our personal constraints and continue on to new experiences.

TECHNICAL STATEMENT

Someone, Somewhere, Sometime, is a mixed media piece, but the image was developed using ink-jet transfer on silkscreen, created with Adobe Photoshop 6.0. The dream-like face in the image was originally a photograph, but was then transformed by an overlaying texture created from a scanned drawing of a pot, a scan of saran wrap, and manipulation in the computer. After the image was finished, it was printed onto ink-jet transfer paper, which began the process of bringing the digital image into the physical realm. Once the image was on the paper, it was cut down to size and sprayed with a fixative. After drying, it was submerged in water for 60 seconds, which allowed the thin, plastic-like transfer to separate from the sturdier paper backing. The transfer was then applied to the silkscreen and patted with a towel to release any air pockets. The box, which makes up the outside structure of *Someone, Somewhere, Sometime*, was made from used silkscreen frames that were glued and then hinged together. This was then combined with wooden rods, wood stain, permanent markers, pencil, and found objects in creation of the final piece.

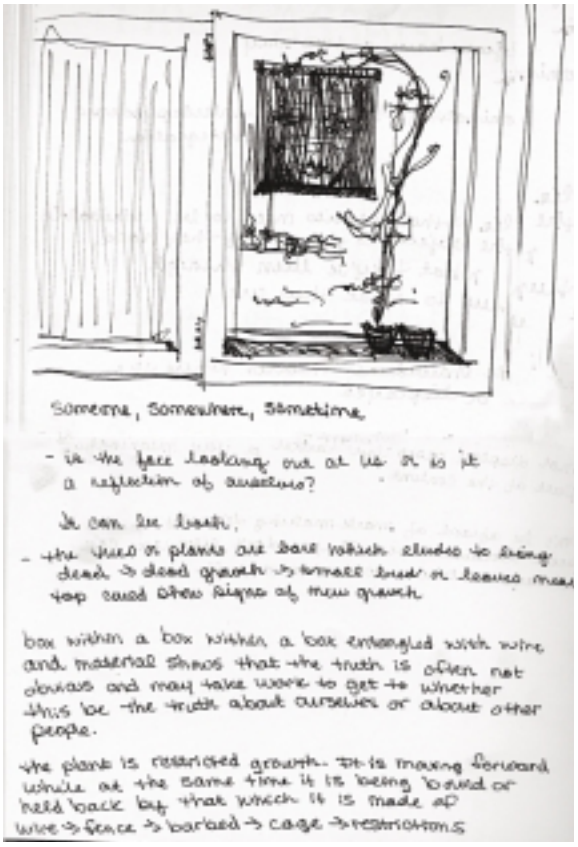
PROCESS STATEMENT

These three images represent separate layers in Photoshop. They were combined to form the image presented in the final piece. The face began as a photograph taken on 35mm film. This was scanned into the computer and put on the Web as a small JPEG file. Later, I decided to use this picture, so it was brought from the Web into Photoshop, manipulated, and printed. This print was scanned again at a higher resolution and manipulated further.



These three prints show preliminary sketches done on paper using a pencil or pen. These were used either directly or ideologically while creating *Someone, Somewhere, Sometime*.

This combination of image and text was done in a sketchbook following the completion of the project. It was my way of collecting my thoughts on the meaning of the piece as a whole.



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Unbound: The Uncertainty Principle
24 x 18.15 inches, mixed media

Schemas
20 x 16.3 inches, mixed media

ARTIST STATEMENT

Sometimes art is about the journey. While I worked on this two-part artwork, I constantly had thoughts of why I followed a certain route, and that became a compositional dimension in itself.

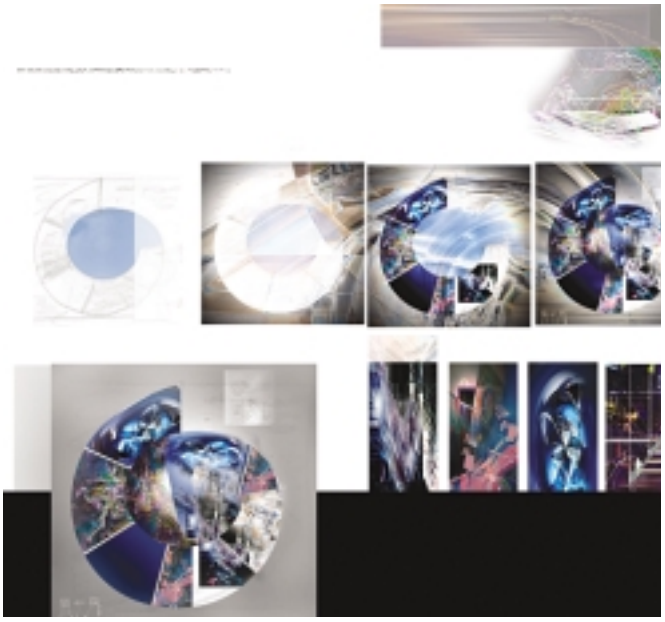
This work deals with taking compositions that are very much separate, and linking or joining them to make new ones. Combining segments works much like trying to combine stories; without guidance, they would lead to confusion and incoherence.

Each piece had a different birth and progressed through its own stress and growth-flow. Each image started as a balanced, self-contained entity (to analyze each of those could be taken to the analogical extreme). As an artist, you seek to find the dynamic interaction that visual illusion demands. There is a precise moment when parts come together, and they become inextricably unified to reveal a definite new framework. This point makes "combinational" work an effective cognitive exploration tool as well as one of introspection, each with its own approach. The process of connecting images in our minds has its variations in blending, or just attaching, but to truly unify is to fuse new ideas. However metaphorical to our thoughts, the process and the ideas it reveals reflect the power of the visual system to abstract and arrange metapatterns: universal inherent structures of thought, within our minds with just a simple stare, an amazing computational feat all viewers execute when they observe the world.

One major theme is complexity. This work's complexity arises from the increasing number of possibilities in the process, as in the expansion of every facet of technology and information. For robotic (computer) vision to be possible, we will have to understand much better how we process what we perceive and induce visually; that is the job of the sense of aesthetics for now. In time, visual engines will be very powerful and will allow us to look into the intricacies of mathematics and physics while rediscovering our own world of art. The elegant symmetry of complexity—deep, cold, and austere—will take us far. Many kinds of languages await us in the pursuit of such patterns and structures at increasingly larger scales. Visual thinking will propel us in new ways.

PROCESS STATEMENT

Base 1. Schemas: Tiling and Reverberation
A schema is an in-built system that activates and drives something, visually or otherwise. This picture starts out with a definite plan, but the end of the journey is left very much a mystery. I started out by aligning the images in the radial cells and directly applying them to the center. For each section, I used Photoshop to place the primary elements and proceeded to order layers and set sizes. I often use the images themselves as brushes; they make unique after-effects. The source images here are different from each other, yet rather homogenous, more related to texture than form, and more neural and digital than defined in shape. This was much more rigorous than I thought, but I found many interesting functioning transitions. A "Zen" mindset keeps thoughts from getting in the way. Lastly, when the images were combined and worked aggressively, it was very difficult to predict what would result. This is a matter of spontaneous composition. Our visual perception guides the process but it will not provide consciously formulated answers until we know most of its mechanisms.



Base 2. Symbolism: The Uncertainty Principle
The artistic ideal is rooted in "knowing" that the image will come together. The parts one starts with are very defined in themselves. They are not traditional elements, since they can each stand on their own, keeping something of their original nature (unlike Schema where they acted as broad inflections). One component is a photograph taken in the Bolivian Andes, another is a watercolor dubbed and filtered (Edge Detect and some tweaking to offset three constituent layers), and the third, the main anchor image, is a composite designed from scratch. They seem very separate, but at the subconscious level higher order is possible. This falls in the domain of dynamicist cognition; it traces some connectionist and symbolic modes of AI. These were the simultaneous ends in mind. Though less abstracted, they preserve the outcome: a self contained, stabilized composition. The key stage is in initially selecting what is to come together without knowing a predicting factor such as the validity of theories, (an uncertainty principle). When it is done, it should be left alone to hold its space. The process becomes really endless when newer forms are introduced.

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Acension
18 x 42 inches, inkjet print, HP 3500C

Scorpion
14.9 x 26.6 inches, inkjet print, HP 3500C

ARTIST STATEMENT

The idea behind *Ascension* and *Scorpion* sprang from an exhibition proposal called "Art From Science." I have been working with satellite imagery over the past four years in my job as a visualization artist at NASA Goddard Space Flight Center. I wanted to incorporate both the satellite images and the scientific diagrams associated with them, as well as my art made outside of this context. I invited three other artists to participate in a collaborative process for the exhibition. Their role was to contribute their own art. I worked with the scientific images and artwork contributed by my collaborators as a starting point to the compositions.

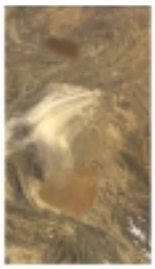
The challenge was to integrate very diverse media into something that would be a unified whole. In *Ascension*, I really had no pre-conceived idea as to where the elements I was working with would take me. As the composition progressed, I began to see things forming that gave me new ideas to pursue, such as the ambiguity of scale and the interplay between abstraction and reality.

In *Scorpion*, my initial idea was to juxtapose two disparate elements: desert and ice. I began by using images of the Sahara and Siberia, to which I added a series of mathematically created images by Greg Shirah. The idea began to evolve that both desert and ice were hostile elements for survival, which was reinforced by the addition of Greg's surrealistic and alien-looking artwork.

TECHNICAL STATEMENT

I use a Macintosh G4 computer, and the files were created in Photoshop. The prints were printed on an HP 3500CP inkjet printer.


1.


2.


3.


4a.


4b.


4c.


6.


7.


8.


5.


9.


10.


11.


12.


13.



14.


15.


16.



17.


18.


19.


20.


21.


22.

Sources and Layers in *Scorpion*

Composed by
Marte Newcombe

Contributor
Greg Shirah

Satellite images courtesy of
NASA

1. Sahara (MODIS, NASA)

2. Afghanistan (MODIS, NASA)

3. Siberia (MODIS, NASA)

4a. Greg Shirah's mathematical artwork

4b. Greg Shirah's mathematical artwork

4c. Greg Shirah's mathematical artwork

5. Western Australia
MODIS, NASA

6. Afghanistan and Sahara combined using overlay mode

7. Siberia with alpha channel (next frame)

8. Mask for Siberia used as shown and also inverted

9. Baffin, MODIS, NASA

10. Baffin masked

11. Sahara, Afghanistan, Baffin, Siberia

12. Greg's mathematical art, masked

13. Step 12 added in luminosity mode

14. Greg's mathematical art with mask

15. Previous layer added with transparency

16. Some layers desaturated with shadow effects. Layers copy merged

17. Double Australias added in hue mode

18. Result of adding previous layer

19. Gregs mathematical art desaturated and adjusted for tonal contrast

20. Previous layer stretched and used as alpha channel

21. Gradient layer added

22. Alpha channel and gradient layer added

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Yoshiki Nishimura

Transposition III
13.2 x 147.9 inches, digital print

ARTIST STATEMENT

This work is aimed at visualizing the movement I experienced in a certain environment. For example, it is difficult to perceive a flight path in the vastness of the space that is visible from a small side window of a jet liner at high speed. After landing, I have a peculiar feeling of looking back at a far-away landscape that the plane flew over just few minutes ago.

In *Transposition III*, I intended to visualize this sort of unordinary movement in unfamiliar environments with a graphical method. A successive series of photo images is the basic structure of my work. These images contain some hidden information of space. With the help of 3D computer graphics, it becomes clear and we could find some very amusing things that never appear on photo images by themselves.

In the continuous photo images of *Transposition III*, it is very difficult to grasp the spatial relations of clouds in the sky. By composing correct 3D graphical elements generated by a match-move software, these relations become exceedingly clear. Furthermore, the well-defined path of a camera makes it possible to show my real experience of flying movements in the world of 3D computer graphics.

Transposition III consists of 13 sequential photo images combined with 3D graphics and some diagrams that present the flight path of an airplane. The sequence is the main theme of this work.

TECHNICAL STATEMENT

A series of photographs was taken from the side window of a commercial jet liner flying at high altitudes. The match-move software Mamoe was used to capture XYZ values of tracking points on these photo images. The camera path and parameters were also defined. These perspective-matched 3D data were imported to Softimage3D to reconstruct a virtual 3D CG environment that could consequently be composed on the original sequential photo images.

Software: Mamoe, Softimage3D, Photoshop
Hardware: Windows NT machine, SGI O2

PROCESS STATEMENT

1. Some sketches were drawn to make my concept solid.

2. Many sequential sets of photographs were taken from various moving objects, such as a revolving ferris wheel, a commercial jet liner, a super express train, etc. These series of photographs were taken because parallax views were absolutely necessary for the use of the Mamoe match-move software, which calculates 3D space and locations of a camera.

3. *Transposition I* and *Transposition II* were completed earlier. These preceding works have not been presented in public yet because both of them were not quite satisfactory.

4. Lots of sketches were drawn for *Transposition III*.

5. Using Mamoe for successive cloud images was extremely painful and tedious work. When 3D space is defined by Mamoe, fixed locations on photo images are generally used for tracking points. However, clouds in the sky kept changing their shapes and also shifting locations. To obtain satisfactory data, I had to overcome numerous failures.

6. The 3D data calculated by Mamoe were imported to Softimage3D.

7. Photoshop was used to combine the rendered images with the scanned photo images.

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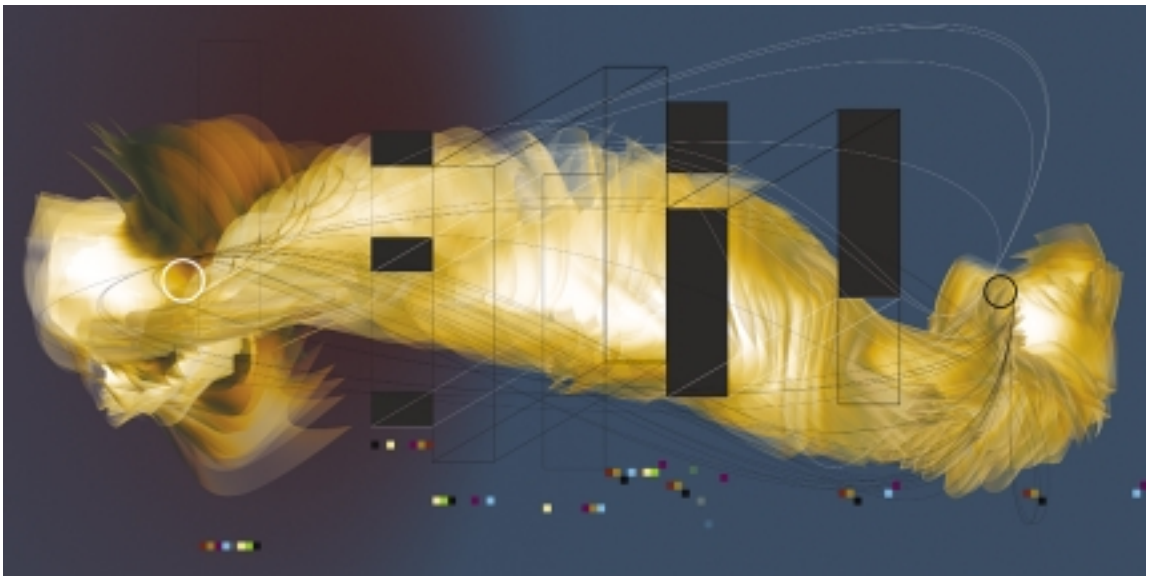


Frozen Etude
17 x 9.5 inches, inkjet on watercolor paper

ARTIST'S STATEMENT

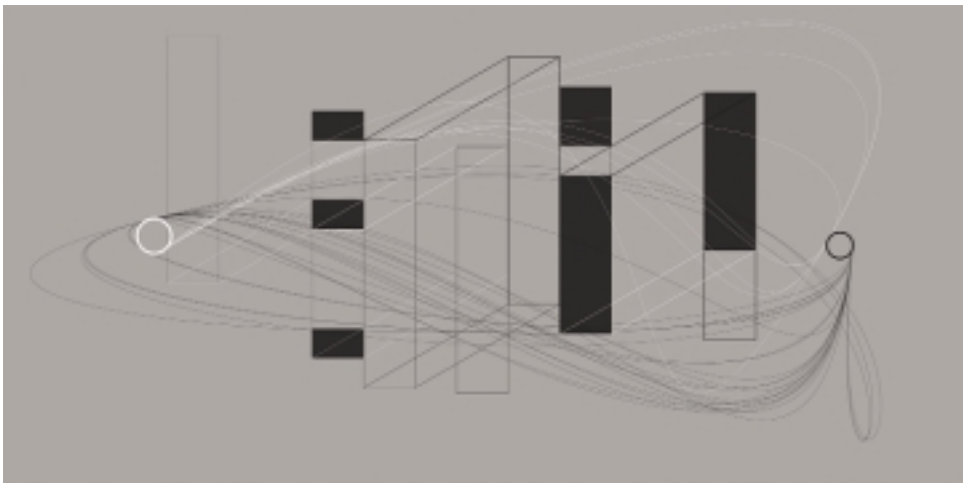
In this piece, I explore the potential diagrammatic and emotive qualities of a musical composition. An etude is a composition that is meant as a means to develop skill in performance. This is echoed in the work as a technical approach to breakdown of the composition into two dimensions.

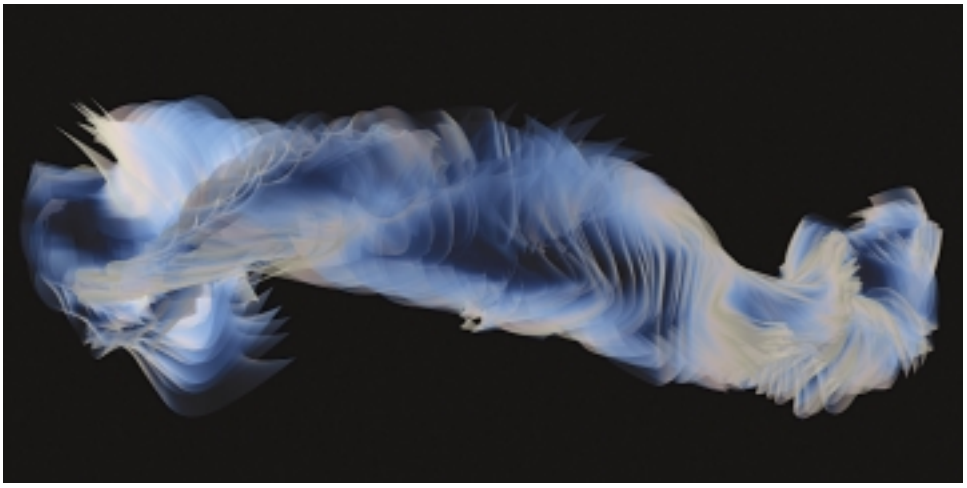
TECHNICAL STATEMENT

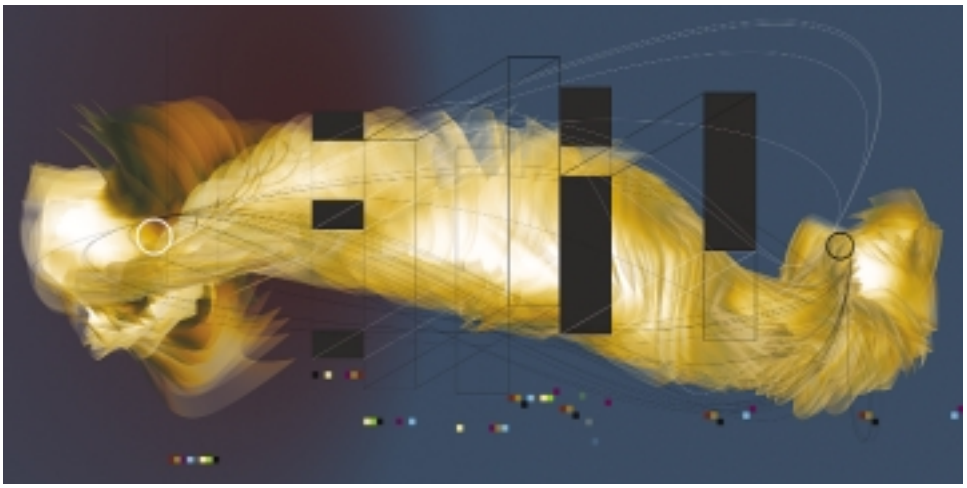
I use the computer in this work as a means to create, investigate, and manipulate forms to convey the idea. The fluidity of the medium coupled with the ability to rework portions of a multi-layered piece are particularly significant in my work.

PROCESS STATEMENT

I view the process as a series of elements coming together. The states depicted are significant milestones in the development of the piece. When working, I tend to develop ideas in the form of a branching grid. Only pieces that are relevant to the final work are illustrated in the final grid.







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Cynthia Beth Rubin

Safed Hiding Places
22.9 x 23 inches, digital print

Wilder Building
22 x 35 inches, digital print

TECHNICAL STATEMENT

My work begins before the technical. I visit a site to photograph it, to gather information, to gather thoughts. I contemplate, I imagine, I search for the icon that points to the ordinary thoughts of those who occupied a specific place at a given time in the past.

The painterly juxtapositions of the photographic elements come from a non-linear process. Beginning with a few layered photographs, the procedure quickly turns from additive to subtractive. My primary tool is a pressure sensitive eraser. Subtractive gestures are positive actions, allowing one image to poke through another, then to be pushed back by something else, and then to poke through just enough to make it all come together in a series of dancing relationships.

As the complexion of the image emerges, additional elements are integrated into the evolving imagery not only by pasting them on top, but then by erasing again to reveal the underlying elements. The process is repeated many times, so that the imagery is interwoven rather than applied. I have been working in this fashion since the days of Electronic Arts Studio/8, which incorporated a draft page as a precursor to the layers of Photoshop.

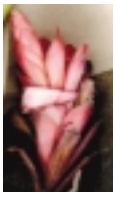
PROCESS STATEMENT

In 1492, a beautifully illuminated Hebrew Bible fled Spain in the arms of expelled Jews, who found comfort in the teachings of mysticism and safety in the hidden caves of Safed. While they protected and studied the Bible, they wondered what forces had caused such upheaval in their exterior world. *Safed Hiding Places* is about this moment in history. It is about a real occurrence that continues to be repeated in various forms. An outside force causes everything to shift in a flash, and only culture, memory, and a few precious objects persist.

Eventually, the Bible made its way to Marseilles, where I befriended it. Throughout the years, I turned to the carpet pages painted in 1260 in Toledo and found a certain sense of history and connection with the past. While my earlier works borrow visual form from the Bible, this image is a tribute to the Bible's own story.

The Wilder Building in Rochester, New York was a building of detective stories and shadowy black-and-white movies, where names were printed on translucent glass windows in heavy doors, and letters dropped through mysterious slots to be magically transported away. It was here that my father, as a young attorney, set up his desk and swivel chair and awaited his future. This is where, in my imagination, Bronco the dog (his first client) came to see him, although I know in reality that Bronco stayed at home protecting the world from litigious mailmen. (My father won the case for Bronco.)

In 1995, in the final weeks of my father's life, I gave him a print of my work *Krakow, Prague, & Rochester*. As I pointed out the hidden windows of the Wilder Building, his eyes lit up, and I knew that the memories of the Wilder Building were powerful enough to merit a work of their own.



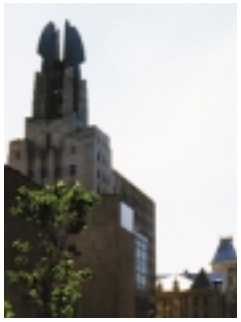
(above far left)
Carpet page from the Marseilles Bible dating from 1260, Toledo, Spain
(above middle) Italian scroll of Ester
(above right) Ginger flower
(left)
Interior of synagogue in Safed, Israel

(left)
Caves of Safed, photographed in 1988
(below)
Roman ruins in the Negev in Israel

(left)
Early versions of *Safed Hiding Places*

(above)
Details of Wilder Building exterior decor
(right)
View of Gannett Building, near Wilder Building
(below right)
Early versions of *Wilder Building*

(above)
Panoramic views from the banks of the Gennesse River in Rochester



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Refinery #53
16 x 87 inches, lightjet print on photographic paper

Mesh #3 Iso
24 x 24 inches, lightjet print on photographic paper

ARTIST STATEMENT

The universe is rich with competing forces whose confluence creates the spatial and temporal patterns and shapes that we, as humans, experience every day. Any given force or effect (gravity, erosion, viscosity) operates over many scales of time and space, but is typically dominant over a smaller range. The bounds of this range are where alternative forces' influences become considerable. The characteristics of the pattern or behavior resulting from each dominant force are different, and at the length and time scales where two dominant forces overlap, new patterns will emerge.

I use computer simulation of natural and artificial phenomena to visualize patterns created from either the isolation of a particular dominant force or the interplay between co-dominant forces. An advantage of working with computer models for these physical systems is the availability of data for any component of the system: effectors or inerts can be made visible and temporal, spatial dimensions can be swapped, and non-physical projections of the data can be created. New patterns can be explored by nearly any combination of forces or projections. The aim of my work is creative exploration of this space.

A paradox of real and unreal natures exists in *Mesh #3 Iso*. The image is a photometrically accurate computer rendering of a specific scene. The scene is composed of cylinders assembled into a structure that could not possibly support itself if manufactured. Each visually solid cylinder represents the mathematical "vortex core" of a small packet of air. The arrangement of these vortex cores is the result of a computational fluid-dynamic simulation of the self-evolution of vortexes in free space. The initial conditions that resulted in this shape were completely arbitrary and unrealistic. The superposition of these real and unreal elements pulls the viewer's perceptions in opposite directions.

In the future, when personal entertainment relies on fooling a viewer with scenes of natural and constructed objects and behavior, the lines between nature's actual behavior and a computer's simulation will be gone. The laws of physics used to calculate visually realistic images will be mutable, even irrelevant.

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FRONT

ARTIST STATEMENT

Millefiore_Effect explores the nature of human interaction, investigating and exposing social behavior and communicative codes through their interactive installations and objects. In *FRONT*, two humans don ceremonial conflict-suits that inflate in response to their shouts and growls. The victim and the aggressor experience a distortion of body that affects both themselves and the other simultaneously. A dialogue is established. Internal conflicts become external via body transmutation.

Both aggressive and defensive inflation systems work to distort and manipulate the body of the wearer; armpit sacs push the arms up away from the body; neck sacs push the head up and obscure vision. The suits are not just an expression of the wearer's actions, but also action upon them, so the suits read as both a ceremonial expression of conflict, and as a physical manifestation of the consequences of rage, aggression, and submission.

When the suits have been publicly exhibited, they have elicited a very active response from wearers. They create a space in which people perform playful aggression and domination/submission actions. The suits make emotion, intent, and response visible through the more overt, corporeal mechanisms that some creatures have retained, and the human body has largely lost. They draw attention and make analogies to what physical expression humans have left: shouting, gesturing, cowering and blushing.

TECHNICAL STATEMENT

FRONT is comprised of two inflatable plastic suits worn by two participants within a small arena. Each suit has two systems of air sacs, one for aggressive movements, and the other for defensive responses. The level of participants' voices controls the inflation of their own aggressive sacs and the defensive sacs of the other person.

The suits are made of thin polythene plastic sewn into sacs of varying sizes and shapes, making up a suit that straps onto the upper body. Hacked hairdryers pump air into and out of the inflatable sacs in the suit through plastic pipes.

A small microphone in the neck of each suit sends an audio signal to a computer, which uses Geoff Smith's GetSoundInLevelXtra for Director to monitor the volume of the sound coming from each participant. When the volume exceeds a certain level, Director sends a serial communication to a microprocessor that controls a motormind on each fan. The motorminds normally keep the fans sucking air out of the suits, but they reverse the fans to pump air into the appropriate sacs when triggered by the microprocessor to do so.

PROCESS STATEMENT

Millefiore_Effect met in the Interactive Telecommunications Program at New York University. Interest in each other's work led to work on a project together. Our varied backgrounds inform our work: Ralph studied sculpture, Margot industrial design, and Jessica performance. We were all interested in creating work that uses interactive devices and environments to elicit and facilitate emotional responses and communication between people.

FRONT developed from the idea of creating something wearable that would change in response to the wearer. We thought of analogies to certain animals that have the means for very physical expression of their internal state. We set out not to dress the user as an animal, but to create a similar means of expression.

Inflatables interested us, so that was an obvious choice. We experimented with gluing and sealing plastic until we found that under the positive inflation sewing was sufficient. It also created interesting "drawings" across our suits. Hairdryers worked perfectly as fans (thanks AdLib).

We all work with sound and found it to be a sufficient analogy for emotions that are more difficult to track. We do have plans for variations that monitor other body processes.

We liked the idea of a pair of suits in a symbiotic relationship, so we created the self-contained *FRONT*. We are busy working on *FRONT 2*, in which the suits are networked to each other from separate, remote locations. Millefiore_Effect: taking it to the next level...2002.


front
Strong aggression or greeting (depending on accompanying vocalization)
Normal, relaxed
Defense posture
ZOOBOOKS

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Paul Kaiser
Shelley Eshkar

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Loops

ARTIST STATEMENT

This digital portrait of Merce Cunningham is derived from a recording of *Loops*, his solo dance for hands and fingers. The motion-captured joints have become nodes in a network that sets them into fluctuating relationships with one another, at times suggesting the hands underlying them, but more often depicting complex cat's-cradle variations. Driven by fragments of Cunningham's motion, the piece seeks to develop a portrait around the uncanny absence of its subject.

The motion of the hands is rebuilt by a colony of synthetic creatures modeled using techniques from artificial intelligence. This visual network is rendered in a series of related styles, reminiscent of hand-drawing, but all with a motion and odd attentiveness quite different from drawing, evoking primitive biological or atomic worlds. These visual worlds are combined with an unsynchronized looping narrative by Cunningham (reading from his diary) and music by Takehisa Kosugi. The piece unfolds across a number of time scales. Things change with almost every frame of animation and moments that occur perhaps only once a day.

TECHNICAL STATEMENT

The *Loops* system runs in real time and generates itself afresh each time it is run. The original motion-captured material drives the movement of 42 small autonomous creatures. These complex creatures probabilistically make decisions concerning their appearance, the quality of their movement, and their structural connections to other points in the hands. The goal was to create a system (and an artistic process) that was complex enough to surprise us often, but controllable enough to let us take advantage of those surprise discoveries.

The architecture is open and networked; a number of visualizations and custom applications running on separate machines were used in the creative process. These span a spectrum from additional interactive graphical applications to offline analyses and simulations to a command language based on the "python" programming language.

The custom graphics, behavior, and motor system run on "high end consumer" hardware, typically dual-processor Pentium III. Simple computer-vision software runs on a separate machine. The graphics system uses Microsoft DirectX 8's interfaces to run on Nvidia GeForce3 hardware, exploiting the programmable vertex- and pixel-shading language support found in these products. The behavior architecture is almost entirely written in the Java programming language. Both the behavior and motor systems used here are adaptations of the Synthetic Characters Group's "C4" architecture.

PROCESS STATEMENT

Driving the "point creatures" that make up *Loops* is a behavioral "script." This 10-minute script (which is looped throughout the piece) does not dictate what behaviors these creatures perform, but it does modify "behavioral tendencies" and opportunities for adaptation.

The creation of *Loops*, therefore, consisted of two main tasks. First, a vocabulary of visual styles, behaviors, ways of connecting the points and motion qualities to be created. Second, the script, an excerpt of which is shown here, was assembled. Both of these two tasks were achieved collaboratively and interactively. While a version of the *Loops* system was running, the artists manipulated the rendering, visualized the behavior, and modified the stored vocabulary of the point creatures in real time using a network of computers synchronized to the main behavior system.

```
new Event( 45 + 30 + 45 + 20 + 25 + 80 + 45 + 45 + 14 ).add(new String[]{
        "s_tendril=5",
        "s_forestFireOne=50",
        "s_doForceFlare=100",
        "s_timeFlow=2",
        "globalForceX=2",
        "globalForceY=2",
        "s_randomPointSize=0"
]);
// keep building up the complexity and the confusion in the colony
new Event( 45 + 30 + 45 + 20 + 25 + 80 + 45 + 45 + 14 + 10 ).add(new String[]{
        "s_doForceFlare=0",
        "s_timeFlow=1",
        "pointTrans=0.002"
]);
new Event( 45 + 30 + 45 + 20 + 25 + 80 + 45 + 45 + 14 + 25 ).add(new String[]{
        "s_nothing=5",
        "s_tendril=100",
        "s_forestFireOne=40",
        "s_timeFlow=0.5",
        "s_camersTime=0.4"
]);
new Event( 45 + 30 + 45 + 20 + 25 + 80 + 45 + 45 + 14 + 35 ).add(new String[]{
        "s_timeFlow=0.05",
]);
new Event( 45 + 30 + 45 + 20 + 25 + 80 + 45 + 45 + 14 + 42 ).add(new String[]{
        "s_timeFlow=0.5",
]);
new Event( 45 + 30 + 45 + 20 + 25 + 80 + 45 + 45 + 14 + 50 ).add(new String[]{
        "s_nothing=0",
        "s_timeFlow=1",
]);
new Event( 45 + 30 + 45 + 20 + 25 + 80 + 45 + 45 + 14 + 60 ).add(new String[]{
        "s_nothing=0",
        "globalForceX=1",
        "globalForceY=1",
        "s_camersTime=0.5",
        "pointTrans=0.2"
]);

// then, a fast, sudden transition into "amoeba"
new Event( 45 + 30 + 45 + 20 + 25 + 80 + 45 + 45 + 14 + 81 ).add(new String[]{
        "s_amoeba=100",
        "pointTrans=1",
        "pointWhite=0.4",
        "s_randomPointSize=0"
]);
```

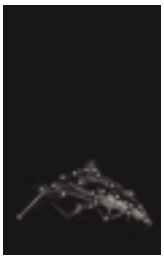

Image 1

Throughout the script there are references to terms such as "tendral" or "amoeba." These are names that the artists used to talk about the basic stylistic vocabulary built for the piece. They refer to behavioral tendencies, connection topologies, and/or rendering styles. These common labels became increasingly important as the piece's stylistic vocabulary developed.

Image 2

By changing how gradually or suddenly new behavioral tendencies are introduced into the creatures by the script we can modify the abruptness of the transition. If we quickly force a behavioral tendency to have a very high value, we startle creatures into revaluating their behaviors. But by gradually introducing new behavior, we can create hybrid and "indecisive" states in the colony.

Image 3

The creatures are responsible for showing how they are connected to other points. Sometimes they choose to connect themselves to points that make sense in a traditional joint hierarchy. However, they can choose to produce complex "cat's cradles" or sparse points.

Image 4

The way in which the point creatures adapt their geometry to indicate how they are "connected" to other points changes throughout the piece. One of the earliest styles we built was the "tentative tendril" growth style, where points seem to be gently seeking nearby points in the hand.

Image 5

"Force propagation" refers to the virtual dispersive medium in which the point creatures are "embedded in." Creatures can inject force into what is in essence a simple cloth simulation, to perturb and expand the geometry of nearby creatures.

Image 6

"Forest fire" message propagation refers to a complex extension of the "force propagation." Instead of passing force into a simple physics simulation, points pass messages of behavioral tendency. This creates a deliberately brittle positive feedback system. Behaviors change between points in a way similar to how fire spreads in a forest. These complex behavioral dynamics were extensively simulated in isolation and could be visualized while the piece was running.

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Uzume, virtual environment, implemented at the CCVE, Fraunhofer IAO, Stuttgart, Germany

ARTIST AND TECHNICAL STATEMENT

Uzume ("whirling") is named after a Japanese Shinto goddess who lured the sun goddess Amaterasu out of the cave where she was hiding. The interplay between *Uzume*'s immediate response and willful behavior shapes the relationship between the visitor's self and the virtual "other." Yet the dialogue with the strange, whirling opposite also shows its ambiguous nature. *Uzume* thus explores issues of identification, reflection, and control in relation to immersive computer-controlled systems.

In *Uzume*, a sensitively responsive, dynamic environment surrounds and immerses visitors, unfolding the communicative nature of an abstract virtual entity. Because visitors are not able to control their surroundings, they need to develop a playful dialogue in order to get acquainted with the opposite. The interface becomes more or less opaque. Engaging and exploring, visitors repeatedly cross the otherwise transparent borderline between their play and the underlying control system.

Uzume bridges past and present as the abstract structure grows in relation to time and space, and is drawn purely by sequences of spatial transitions. Its unpredictable gestures evolve based on spatial representations of the temporal behavior of nonlinear chaotic systems, so called "strange attractors." Moving within the physical projection space and gesturing with their arms, visitors are able to traverse and explore the various states of the system. All of these configurations develop irreversibly and shape an individually actualized, unique moment. Both, the visitor and the whirling opposite are embedded in a viscous fluid-like force field that becomes subtly transformed by the physical presence of the visitor. *Uzume*'s sonic response, shaped by spatially moving sounds, develops individually modulated, tenuous passages along the traces of the visitor's movements.

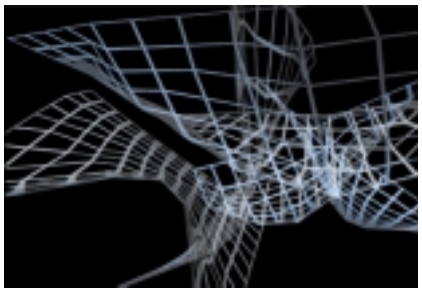
Uzume's world is bound to its physical projection space; there is no navigation. As visitors move physically around the projection, they affect *Uzume*'s current state. There's an almost tangible quality to this projected virtual world, in that the underlying, invisible fluid-like "medium" sensitively responds to every movement and viscously transforms the visible surroundings.

The technological possibilities and limitations of the immersive, real-time stereo projection system of the CAVE, as well as its effect on human perception become an integral component of *Uzume*'s realization. The most interesting quality of this system is the integration of its inhabitant in the evolving progress. The "observing" (tracking and processing) capability of the computer-controlled system permits the viewer to be "present" and involved. Due to the system's attentive and responsive qualities, the dialogue between the visitor and the environment inherently evolves in a state of mutual influence.

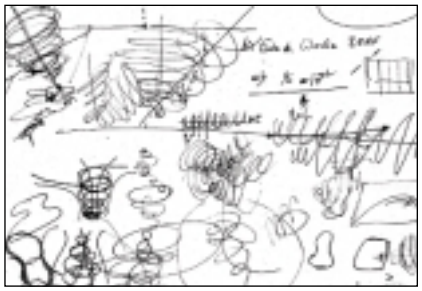
PROCESS STATEMENT

The whirling appearance of *Uzume* is based on the idea of a space that grows and changes dynamically over time, and is "drawn" purely by movement.

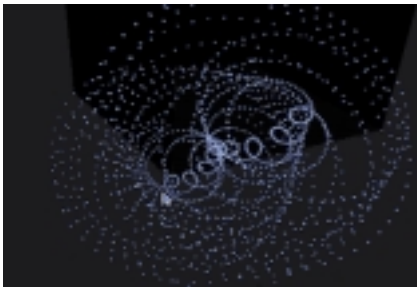
After Aristotle, the dialectic of matter and space appears in the movement. Movement is the material aspect of time, and there is no time without a subject. The material aspect of time thus also determines a formal aspect.

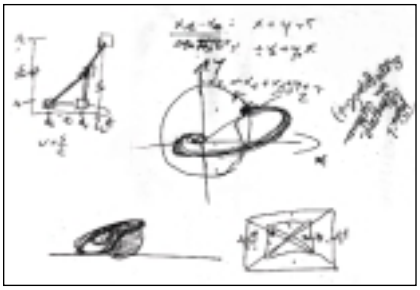


Heinz von Foerster says in "Wahrnehmen wahrnehmen" (perceiving perception) that it is the variation of what we perceive, generated by movements, that enables us to experience three-dimensionality.



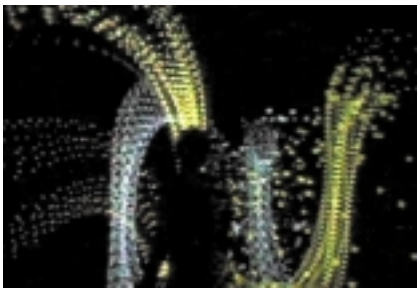
In 1964, Stanislaw Lem described the "phantomatic machine" and stated that the phantomatic effect can be considered "art with feedback" that enables the former recipient to become an active participant, a hero.





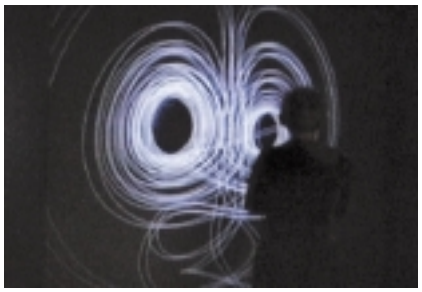
Oliver Sacks describes chaos as referring to systems that are extremely sensitive to the smallest, partly infinitely small, modifications in their initial conditions, and the status of such systems quickly becomes unpredictable.

In "Medien-Zeit-Raum" (media-time-space), Goetz Grossklaus states that time becomes the actual medium of each computer-generated simulation. Cybernetic space (cyberspace), the space of action and movement, is nothing more than a time field.



Participants are challenged to "communicate" with their movements and thus motivate their opposite to respond. It is fascinating to observe what a "lively" character the unpredictable behavior (of the chaotic system) can assume.

Michael Heim's interpretation of the ancient Greek term "prosopon" (face facing another face) describes two faces that make up a mutual relationship, in that one face reacts to the other, and the other face reacts to the other's reaction. The relationship then creates a third state of being that lives on independently.



Metaphoric spaces of virtual environments are not technologically constructed, but rather shaped by the memories, emotions, and social context of their inhabitants.

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New York at night

Time Square

The Village

Wall Street

ARTIST STATEMENT

NEWYORKEXITNEWYORK is an ideal version of a "city," infinitely extending and ever growing. It is a true and unpredictable surfing experience for a not-too-far-in-the-future Internet. It creates a personal space-and-time relationship, different and original for each participant. Each will be able to say: "I've been there, really...and I'm going back!"

After living in New York, we wished to create a piece that would retrieve memories of our personal experience while at the same time allowing participants to create their own experiences, and revisit their own forgotten memories.

TECHNICAL STATEMENT

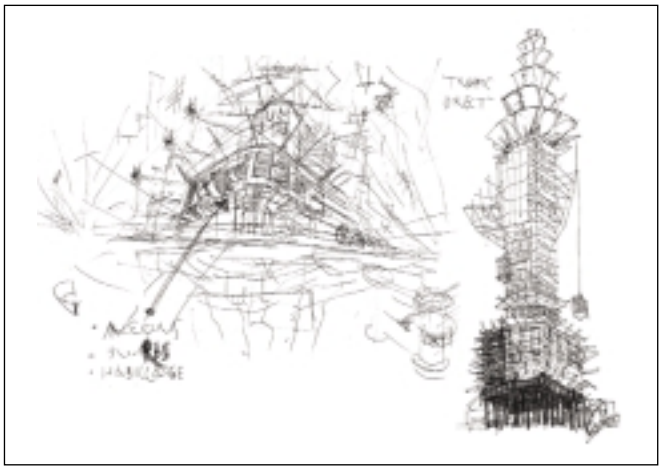
NEWYORKEXITNEWYORK is a virtual environment in three dimensions built from over 6,000 photographs and videos taken during three weeks in New York City. With a joystick controller, users can freely surf the Village, Wall Street, and Times Square projected on a big screen, and partake in the thrill of defying laws of gravity, diving in and out of space and time. Users take part in, and observe, a new interpretation of urban patterns like traffic, noise, colors, lights, signs, materials, and streetlife. Materials in a picture refer to lost sensations such as touching and hearing, marks of space and time. Their emotional states allow the observers to project themselves into the picture.

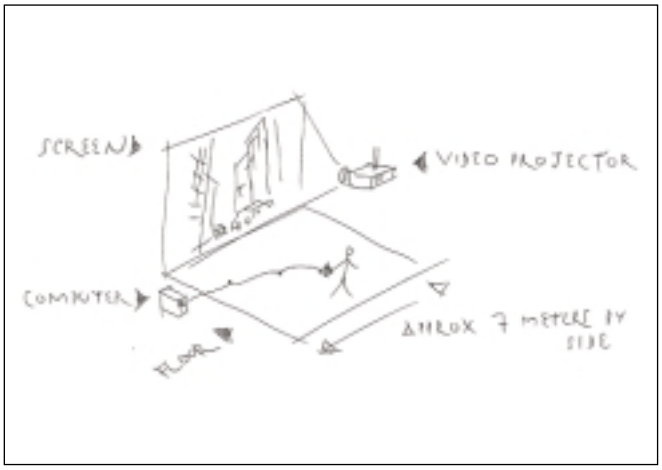
A great deal of the work consists of keeping and even enhancing the "realness" of a texture through compression and the display qualities of the 3D graphic engine. Construction of the 3D universe occurs mostly in real time in a proprietary software called Virtools DEV 2.0 (www.virtools.com). Textures are added on the spot and placed dynamically to form the landscape. Some shapes that require complex polygons are modeled elsewhere and integrated later for texturing into DEV 2.0. After the universe is built, animations and a joystick controller are programmed in DEV 2.0 to bring life to the installation.

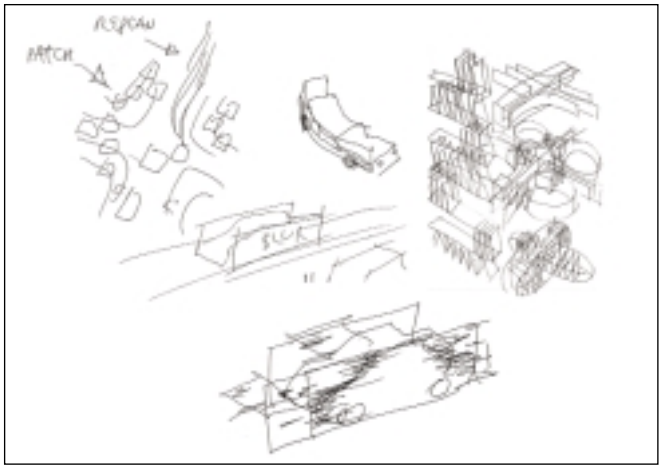
PROCESS STATEMENT

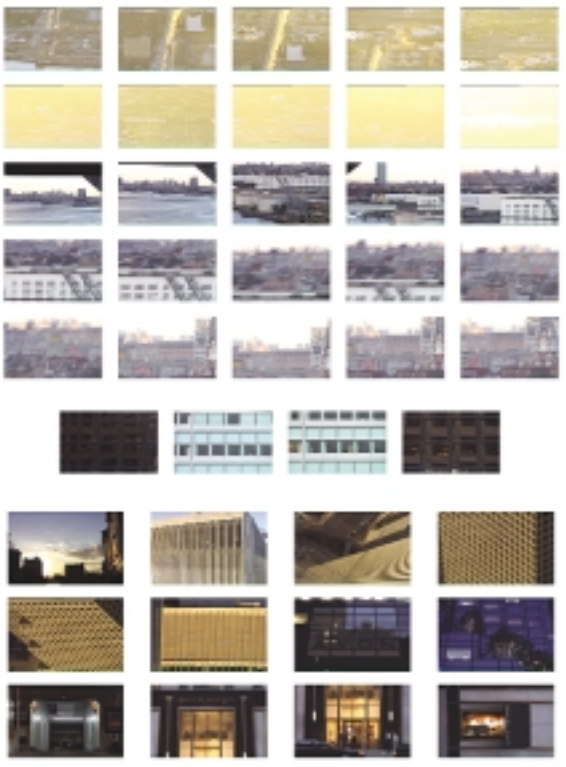
The system reconstructs a composite universe of New York from 27,000 objects. The material is structured in a database that is accessible with a picture browser. The materials and textures are extracted from the photos and processed through graphic software, compressed, and sized for 3D modeling. There is no color filtering or any similar modification that alters the original picture. The point is to extract the essential "real vibration" in the picture (the true colors and patterns taken in the precise time and space conditions of the photographs) and preserve it.

The sketches and samples of process steps show the essential use of planes and transparencies to build and animate objects, everything from cars to people and buildings.









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After the Hunt
installation detail

ARTIST STATEMENT

We carpet the landscape in herds, swarms, flocks, and schools, shaping air currents and vibrating to different rhythms. Our paths are a kaleidoscopic fabric. Only humans need veiling, separation from other living things, elements, each other. We pattern our veils with designs from nature and language.

These fragilities are memories of who we've known and who we've been: a baby's blanket, dresses a father bought for his daughters. On them play shadows of trees, saturated patterns, flocks of birds, creatures of earth and sea—escaping canvas, monitor, and screen, curving over fold, moving to whispers and wind.

Being sent to hang clothes to dry was a dreaded chore. The heat of the Texas sun was mirrored by its white-hot glare on billowing linens. I felt a closeness to my father pinning up his handkerchiefs and socks. The indifference to my sister could be intensely felt and go unwitnessed, as I was careful not to stretch her elastic waistbands.

rippled colors / draw my passing / retold for yours / upon this veil
that separates / always / trapped within / that skin in / which i was
within / this veil on which / shadows / and / your dreams
appear / your hard swift arrow / smooth and straight / for all that
bound / in blood red bleed / are kin to me / we / cannot / be / set free

TECHNICAL STATEMENT

After the Hunt is an interactive installation. On zigzagging clotheslines, stylized translucent garments become video screens. The clothing evokes memories—day-of-the-week underwear, a pocket handkerchief, a fancy apron. Viewers move beneath the lines amid sound and air currents initiated by their presence. An interactive system permits viewers to influence the images that play across the swaying clothing. Visitors hear whispered prose they can almost, but not quite, recognize. The surface of the clothing constantly morphs from vivid colors to nearly indiscernible shadows.

After the Hunt is composed of intersecting lines of clothing strung across an overhead area, data projectors that display QuickTime videos and animations onto the fabric, a support station that houses process documents and hardware, and an interactive station containing a motion sensor.

The installation makes use of Max/MSP 4.0 software, a graphical programming environment by Miller Puckette and David Zicarelli that generates functions for the Musical Instrument Digital Interface (MIDI). Integration of QuickTime media into Max is accomplished with Nato.0+55+3d Modular by Netochka Nezvanova. Infusion Systems ICube translates sensor impulses into MIDI data. Data is received and interpreted by Max and Nato.

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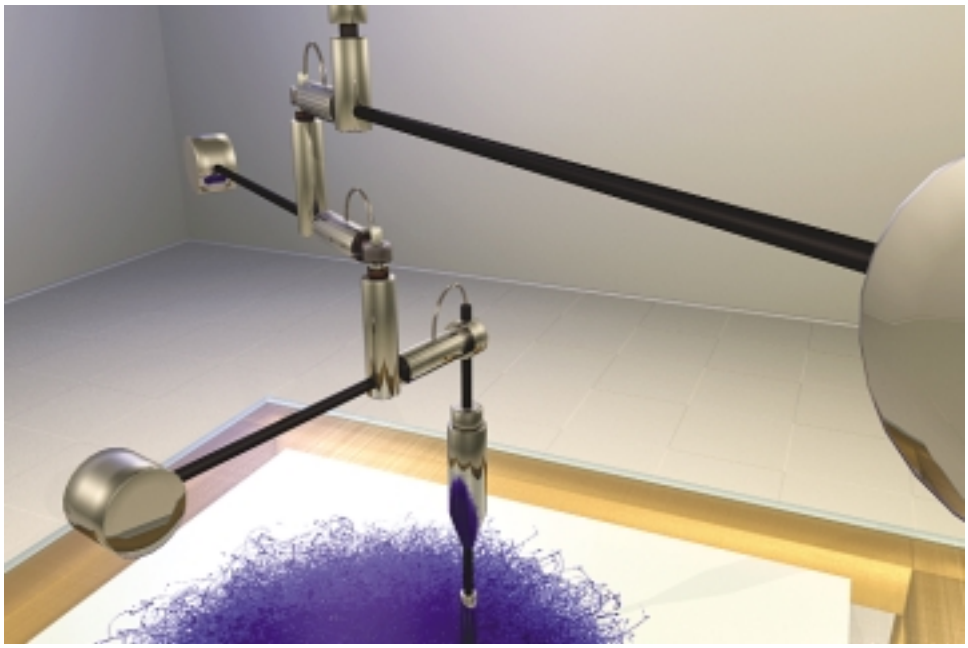


The Drawing Machine 3.1415926 v.2

ARTIST STATEMENT

The connection between the arts and the sciences has consistently intrigued students of both disciplines. This connection has led some scientists to make art, believing that their discoveries are as appropriate for museum walls as paintings. Similarly, some artists who work closely with scientific fields believe that their discoveries are important enough to warrant placement in any scientific journal. This marriage of art and science is not a phenomenon specific to modernity. Throughout history, a fine line has separated where art ends and science begins; Da Vinci, Tesla, and Kandinsky are some examples. In the information age, artists and scientists are increasingly using the same language, and they are carving out new paradigms in techniques, materials, and process for both disciplines. With an emphasis on experimentation and exploration, I, too, have found my way down this undefined path.

The most recent manifestation of this exploration is my series of drawing machines, all of which are examples of my experiments with physics, electricity, drawing, and chaos. Each machine, controlled by a micro-processor, is fed random behavior to change the quality and weight of line. This behavior allows the machines to have a pseudo-intelligence that can be perceived in the drawings and the machine's behavior.

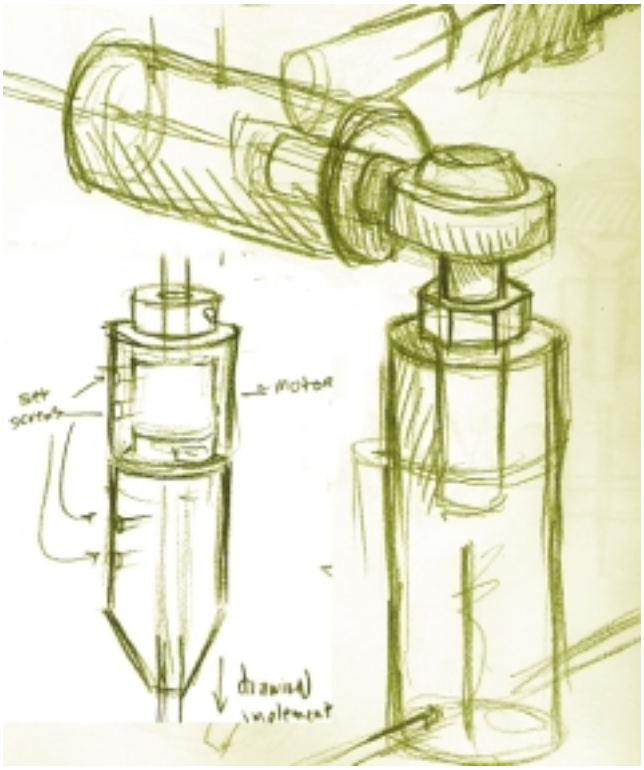
TECHNICAL STATEMENT

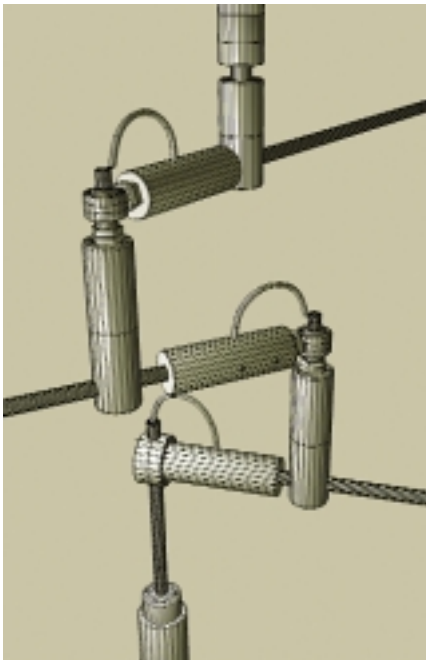
The Drawing Machine uses the Parallax Basic Stamp 2 module as its primary control device. In addition, the piece uses custom electronics and four microphones to monitor the audio levels of the space. These audio data are then fed into the Basic Stamp, which interprets it and uses it to generate different drawing styles for the machine. The Basic Stamp is programmed using BASIC computer language.

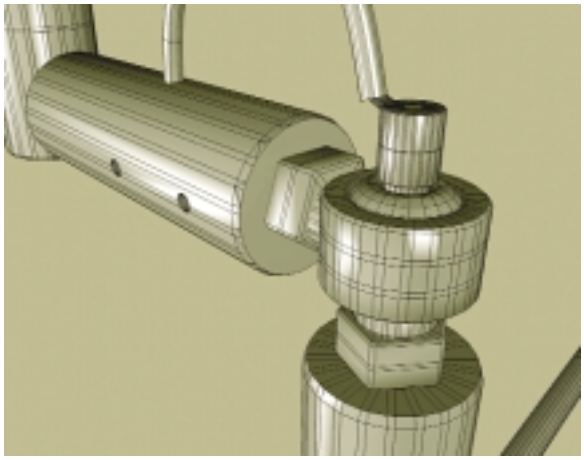
PROCESS STATEMENT

The Drawing Machine 3.14159 v.2 explores the possibility of creating machinery or systems that create art objects on their own. In this case, the machine has been designed to listen to its environment, using a microphone installed in the gallery. What it hears is then interpreted by the machine's software and used as the primary driver or inspiration to make complex, non-representational drawings. Since the noise the machine hears is relative to the given event or venue, the drawings generated can be said to be the machine's interpretation or portrait of that experience. Using several Papermate ball point pens (blue ink), the machine can generate one drawing measuring 4 feet x 4 feet over a period of 144 hours, the length of the SIGGRAPH 2002 conference.

For the last several years, I've been using 3D visualization tools to design and build machine/sculptures. Especially in the early stages of design development, I find it very helpful to be able to pre-visualize what the materials, size, mechanics, movement, and general form might look like in virtual space. In recent designs, I have been using 3D simulation techniques such as gravity, friction, and inertia to synthesize the "real-world" behavior of the machines.







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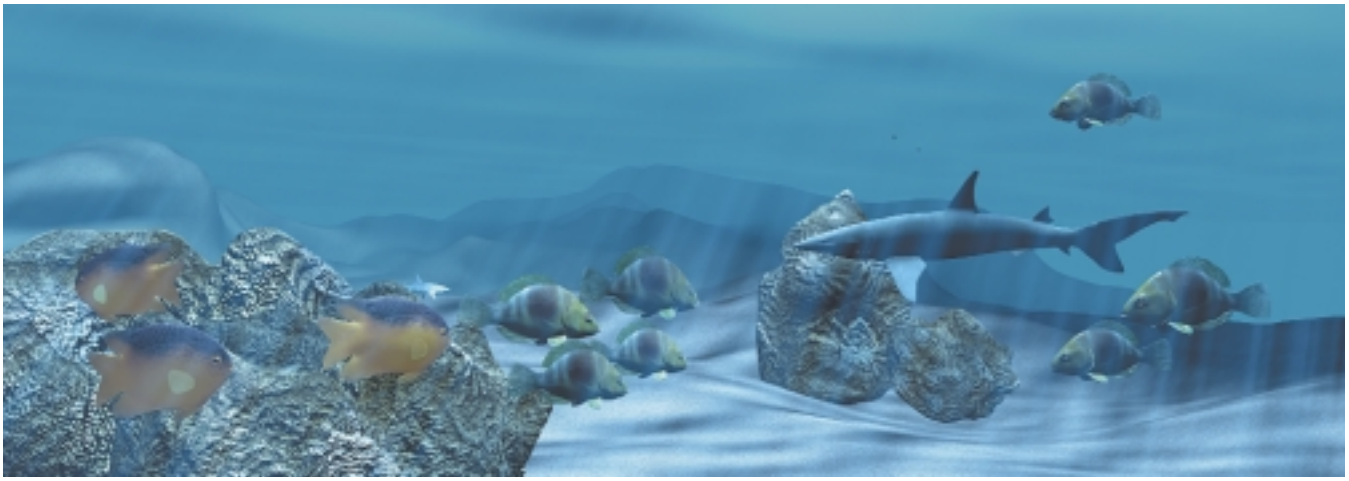
Director



Journey to the Oceans of the World

ARTIST STATEMENT

My work must meet two primary requirements: it must have a strong conceptual viewpoint and it must be visually aesthetic. It doesn't matter whether the work is created for commercial, communication, or artistic and self-referential purposes. All art can be valued according to a set of criteria that is derived from its visual and formal elements. Conceptually driven work adds a layered set of criteria that can enhance the value of the work and the experience of the work by the viewer.

The fact that we use technology to create, produce, or mediate the work and the experience of the work is really beside the point. All work must be able to transcend the technical. The value of the work must be found in the vision of the artist and the execution of that vision that integrates the work as a whole.

TECHNICAL STATEMENT

Journey to the Oceans of the World is a site-specific installation of a one-of-a kind animation and media project for the entry vestibule at The Aquariums at Moody Gardens, Galveston, Texas. Using computer-generated three-dimensional modeling and animation and the integration of live-action video, text, and graphics, we created a seamless 360-degree panoramic presentation that highlights and introduces each of the four habitats of the Aquarium. With IK, FK, and scripted animation techniques, the characters are animated to interact with each another and the environment. Using flocking and schooling scripts, we can have prey fish being chased by other larger more aggressive species.

The environment is rendered using six cameras arranged to capture a full 360-degree panorama of the environment and all character animation. Each camera scene is rendered to a separate stream of images. Each image stream is post-processed and burned to DVD. Using six LCD projectors and a constructed 360-degree projection screen setup the animation is played back to create a full panorama that places the viewer in the center of the virtual environment.

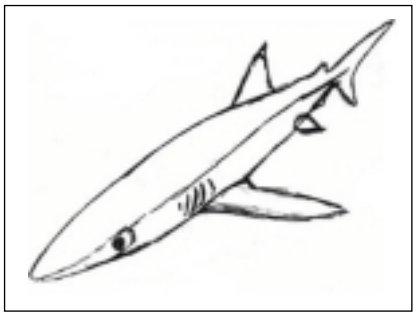
The piece was created in collaboration between digital art and animation students at the William Paterson University of New Jersey and professional animators as an educational experience in design and development of large-scale media projects.

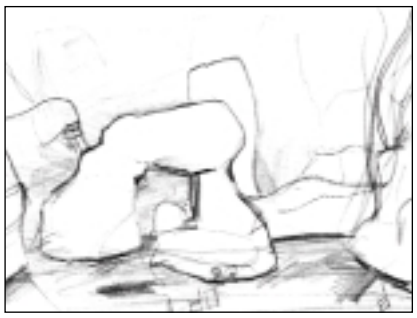
Collaborators
Ian Bizub, Brian Falotico, Eric Holden, Catherine Hsin, Steve Lewis, Tim McCarthy, Karen McKenna, Biaggio Pagliguro, Steve Rittler, Christopher Rogers, Colin Szygl, Chi Tai

Alias|Wavefront Maya 4.0, Discreet 3DS MAX, After Effects, DPS Velocity running on Dell and Box Win2000Pro workstations.

PROCESS STATEMENT

Each character in the animation is based on directed observation at the aquariums. Through the design process, we conceptualize and formulate the characters and their motion and interaction with other characters. The process begins with a sketch on paper, followed by rough clay models and, eventually, modeling and rigging the characters. Materials and textures are created, and the envioronment is lighted, Finally, animation of the characters in the environment is achieved through IK, FK, path, and scripted schooling.





From sketch to rendered model.

Zachary Booth Simpson

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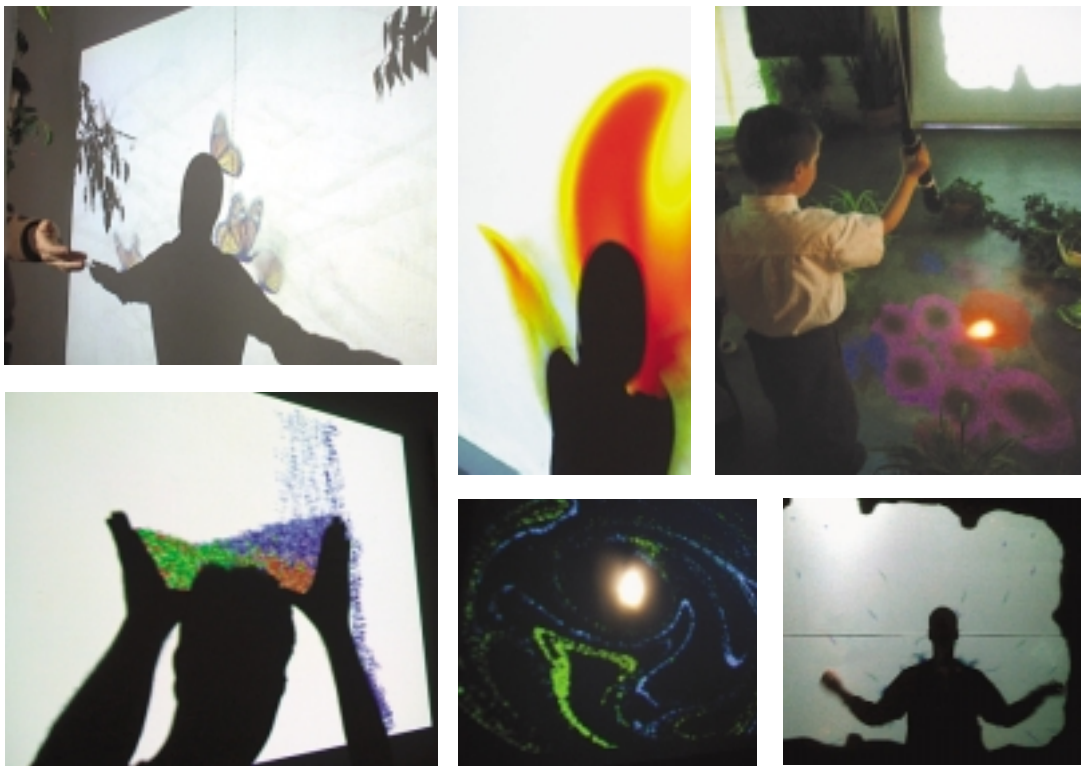


Shadow Garden
(clockwise from top left) Butterfly installation, Fire installation, Flashlight Garden installation, Sand installation, Smoke installation, and Swarm installation

ARTIST STATEMENT

Shadow Garden is series of interactive pieces where participants discover a world that reacts to their shadows. The participant walks between a projector and a screen, casting a shadow. A computer paints images, through the projector, that appear to interact with the shadow in real time. The psychology of the shadow as an extension of one's body is such a natural concept that participants immediately grasp the interface. The connection between shadow and body is so innate that many participants claim they "feel" the projected images touching them.

The work uses a garden concept to de-emphasize the technological and evoke wonder and awe. Often, digital artwork over-focuses on the technical by choosing modern themes that isolate participants from the virtual world into which the artist invites them. The organic nature of gardens puts the participants at ease and focuses their attention away from the technical gadgetry and toward the beautiful interactive imagery. Six independent systems are displayed on the same screen: a flurry of butterflies, a stream of liquid sand, trails of swirling flame, swarms of creatures like fish or ants, a diversity of growing flowers, and undulating colors of galactic star clusters.

Fundamentally, the pieces are neither about shadows nor gardens but rather the feelings created by interactivity. For example, participants attempting to catch butterflies will talk to each other saying: "Shhh! Don't move, I've almost got one." Sometimes they will shake with the tension of trying to hold still. Or, when playing with in the insect swarm, participants will timidly insert their hands to create a shadow and then jerk away with fear as soon as the creatures swarm towards them.

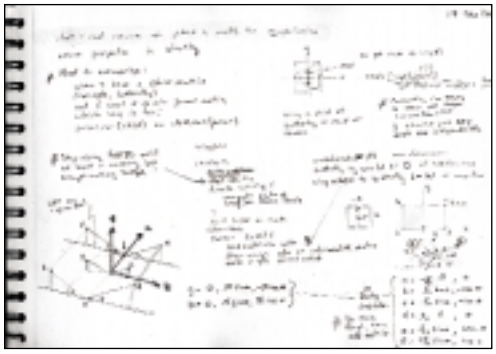
As they warm to the creatures, participants play with them as if they're a school of fish and begin to enjoy them. It is such feelings, both mental and corporeal, that we, as artists, seek to evoke through interactivity.

TECHNICAL STATEMENT

The computer, a standard PC at 800+ MHz running a common 3D accelerated video card, samples from a digital camera synthesizes images in real time that interact with the shadow. When latency is unimportant ("Butterflies"), relatively cheap USB Web cameras are used; in other cases ("Sand"), DV cameras over IEEE 1394 are used to minimize latency. Preferably, the projectors use LCD technology instead of DLP to minimize temporal aliasing between the camera and the screen caused by image flicker due to the DLP color wheels. Calibration between the camera's point of view and the projector's is achieved by a sampling method that permits non-affined (for example, around corners) mapping.

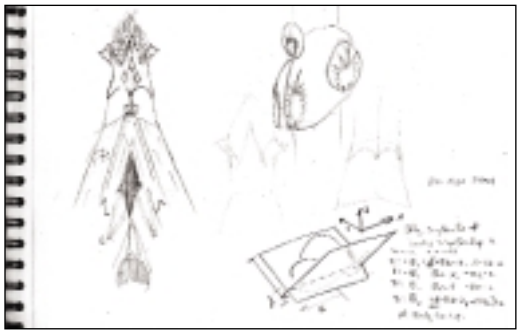
PROCESS STATEMENT

Much of my work involves creating simulations that often turn into tricky mathematical modeling problems. For example, a page from my journal dated 17 December 2000 shows my thoughts as I worked out the butterfly model for the first time.



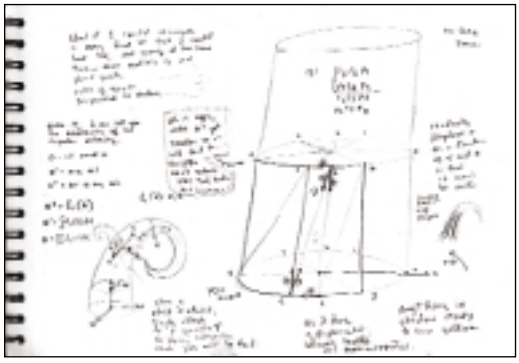
17 December 2000

Later, I realized that the butterflies looked better if I made the two wing polygons intersect a little bit. The next image shows a sketch of the revised wing model and notes the vertex functions. Also seen on this page are sketches from La Sagrada Familia. I was living in Barcelona at the time and apparently I had gone there that day; my journals are often intertwined in this fashion.



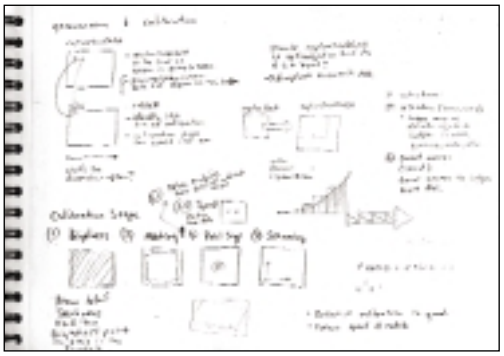
20 April 2001

Often, enormous effort will go for naught. This image (below) shows work on a parametric model of a tree-like branch. The idea was abandoned after a few days of work when I realized how much time it would take relative to its interest level. This is the fate of 80 percent of my ideas.



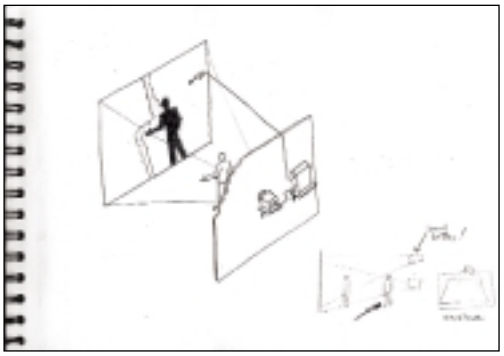
20 December 2001

One of the most complicated parts of the system is the calibration that no one but me ever sees. The sketch below shows some of the original design for how the calibrator would function. Most of this is a diagram for a state machine. I often model computer algorithms in a storyboard fashion such as this.



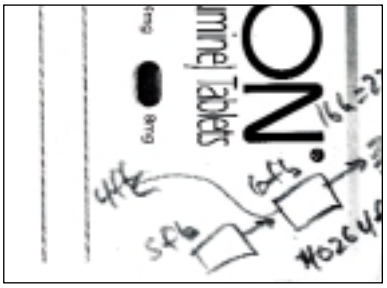
November 2000

The image below shows the first diagram that illustrated the technical workings. I had already built the system by the time I drew this but had not yet installed it formally. When I drew it out carefully, I realized that it would be better to project from above rather than from waist level (as I had drawn) because it would allow people to pass undisturbingly behind one participant. A quick after-thought sketch in the corner captures my realization as well as the fact that I would have to pay for this with a keystone effect.



May 2001

Of course, ultimately all of my artistic ideas must be realized in code that must be debugged. Little scraps of paper litter my desktop with typical programmer hieroglyphics. The image below appears to be debugging notes regarding address of a corrupt linked list written on the corner of a doctor's prescription.



June 2001

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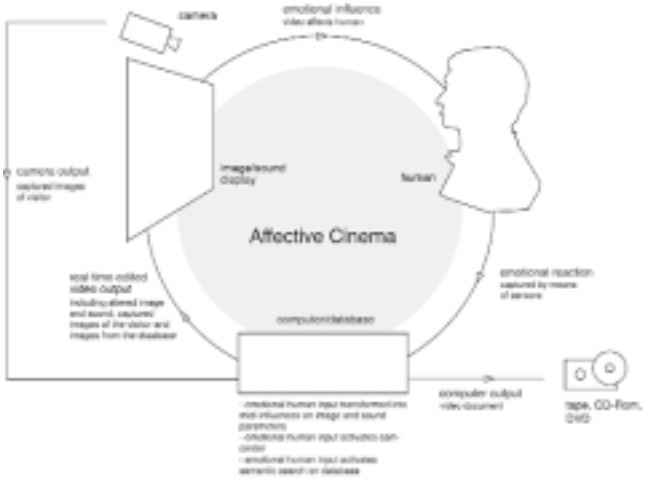


affectiveCinema installation

ARTIST STATEMENT

Inventions often expand human capacities. As a car is a physical protease and improves transport speed and comfort, a computer can be seen as a mental protease that speeds up calculations. Marshall McLuhan considers all media forms as expansions of the human senses, and the global network as an extension of the nervous system. Our intention was to make the first small steps toward the emotional protease that could allow us to influence our surroundings by means of affective input—a new way of non-reflected and unconscious decision-making.

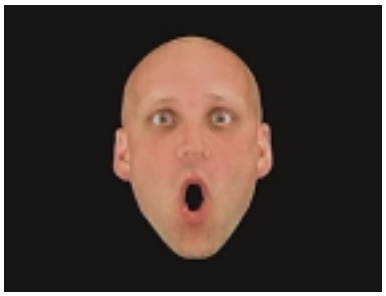
When visitors put their hands into the installation's sensors, their emotions are measured by galvanic skin response. As a result, visitors get a personalised video performance that influences the character of image and sound, the order and the rhythm. As visitors follow different branches of the non-linear structure, they enter an emotional-technological dialog.

affectiveCinema is difficult to categorize. It is somewhere in the convergence of art, games, and science. The idea of emotional navigation can be very close to inter-human communications, which include many more factors than the spoken language. The video image is exclusively the face of an actor whose limited expressions are extended by means of multimedia. *affectiveCinema* could be interpreted as an encounter with someone strange, someone virtual, or even oneself. Because *affectiveCinema* includes live takes of the visitor's face, the frontier between monitor and visitor is even blurrier.

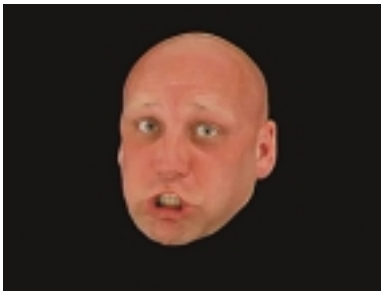
TECHNICAL STATEMENT

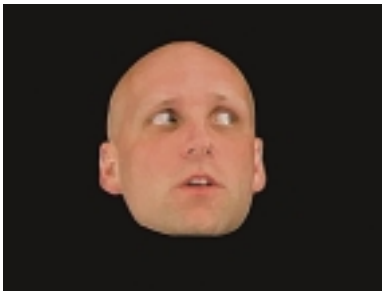
affectiveCinema is a video installation that deals with unreflected human reactions and perceptions. Humans respond to affective content from a video. The intensity of the emotional response is measured by sensors, and the resulting signal is sent to a computer. Each person follows different branches of the non-linear structure of the video clips depending on their different ways of perceiving and reacting. Furthermore, the parameters of image and sound on the video are influenced by the visitor's emotional input. A camera built into the system allows live video of the visitor to be built in real time. The resulting personal video can be recorded and documented on CD-ROM.

The Installation
The appearance of the installation is rather functional and can be adapted to different productions. For this first production, there is no need to hide the technical equipment because it represents the actual physical appearance of the character. The installation consists of two main elements: the sitting and background unit for the visitor and the display element for the technical equipment. A lamp guarantees optimal light conditions for the built-in camera. *affectiveCinema* is meant to be set up in a quiet area, with no special separation elements. The minimal measurements are 50 x 250 cm, but some additional space for access and ambience is required.

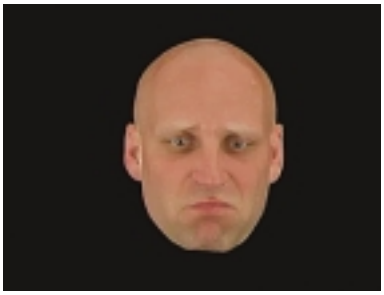

Excited


Provocative


Insult


Secret


Mad


Sad

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Homo Indicium

ARTIST STATEMENT

My work is interdisciplinary, exploring how technology affects human beings as individuals and as a society. Technology mediates our lives, constantly revealing the need to be an informed user of technology. Much of my work attempts to educate its audience on this subject. When I teach students how to use technology as part of their art practice, the most important lesson I share is the need to use technology intelligently. Instead of using technology in a manner suggested by its design and marketing, people should use technology in ways that benefit themselves.

Homo Indicium is an installation based on my exploration of digital identities. In a society where technology assists in every aspect of life, most people have accumulated a digital identity. It is an identity based on bits and pieces of information stored in fragments over a vast network of computers. Buying habits, means of identification, medical histories, and personal histories are all stored virtually.

Homo Indicium started with the question: "What can a machine know about a person?" Every day, machines continue to compile digital identities. These identities influence countless decisions made by both humans and machines. The question is: "Is this information enough to truly know someone?" *Homo Indicium* allows its audience to interact with information-based identities as a way of exploring questions raised by this process.

The name, *Homo Indicium*, is derived from the Latin words "homo," which means man, and "indicium," which means data or information. Together, they form the scientific name of the species of humans that exists purely as information.

TECHNICAL STATEMENT

When you enter the installation, you are confronted with a wall covered by test tubes. Closer inspection reveals human hair in some of the tubes. Above these tubes are bar codes.

Each bar code represents a person who chose to participate in the installation. Participants create information-based representations of themselves, which become part of the piece. This is done by filling out an online questionnaire, giving fingerprints, and providing a DNA sample, in the form of hair. The responses to the questionnaire and the fingerprints are then stored in a MySQL database. The hair sample is placed in a test tube and stored on the wall. A unique bar code is created for each participant and then placed above the hair sample. This bar code is used to identify each individual in the database. After the data is collected and stored, it can be retrieved using the bar-code scanner attached to the database server at the center of the installation.

In front of the test tubes is a computer station. This station is a Windows 2000 PC, running an Apache Web server, a MySQL database server, and PHP. This station serves as the interface for scanning barcodes and reading about an individual. It also serves as the host to the Web documents that allow users to fill out online questionnaires and add their data to *Homo Indicium*.

PROCESS STATEMENT

What can a machine know about a person? Can someone be known/ reconstructed from this information?

Online Component
The database generated by this piece will be accessible online through a Web site, where people can find out about the piece, look at the data gathered by the piece, and add themselves to the piece. (This will require they mail a sample of their hair.) Everyone who participates through the Web site will also receive a laminated card with a logo that indicates it was a Web submission.

Installation Elements to be Explored
The data retreival station may use a projector instead of a monitor. When it is idle, it will enter a slide-show mode in which it randomly accesses data and displays it on the screen. This slide show will probably also cycle through the voice recordings, giving an audio element to the piece. The computer and trackball used by this station will be installed so that the CPU is hidden. The interview station will be set up to create a very clinical feel. A height and weight measurement will be part of the interview process. The interview may include a very basic health check-up.

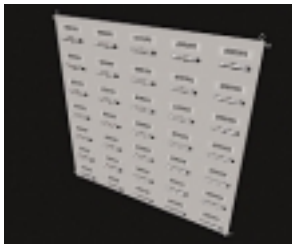
Data Confidentiality
The data available to the public will not contain names or personal information. The names in stories collected during interviews will be randomly changed. At the end of the interview process, participants will get a chance to view all information gathered and block public access to specific information. This will be clearly stated in a confidentiality agreement signed by all participants.

Data Not Collected
Pictures or images
Social Security numbers
Credit card numbers, etc.
Name
Address
Email
Phone numbers

Current list of Data to Collect
Age
Gender
Height
Weight
Birthdate
Birthplace
Marital status
Children
Siblings
Parents
Education history
Employment history
Medical history
Biometrics
Fingerprints
Voice
Facial proportions (for facial recognition algorithms)
Retinal scan (most likely not feasible at this time)

Other Sources of Potential Questions
2000 Census questionnaire
Personality tests

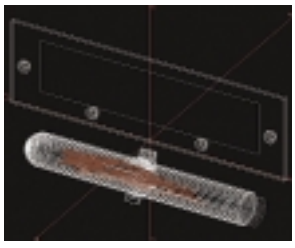
Important reiteration: I have no intention of displaying information that may be harmful to a participant and will take every measure to ensure that this is clearly stated and implemented.



Test tube panels



Installation floor diagram



Test tube

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FLUID Installation

ARTIST STATEMENT

Housed in a blue plastic industrial waste container, *FLUID* is a multi-level touchscreen installation, an ecosystem as play, a system designed for meaningful interaction. The touchscreen is parallel to the floor, and players interact with the system by touching, stroking, and poking at the screen. This core activity is the sensual substratum with which the user explores relationships among the elements of the system.

Within the ecosystem of the screen live a number of simple organisms, each species relating to the user and to each other in unique ways. Some of the organisms need to be guided by the user in order to move about the environment. Others have their own means of locomotion. Some of the elements can be combined with others to form new organisms. And some of the organisms have the ability to transform elements of the ecosystem.

The elements of the ecosystem include:

- Algae, the grid of dots that form the substratum of the system.
- Feeders, organisms that have to be assembled by players and that in adult form turn algae into edible food.
- Foragers, hungry creatures that move toward and eat edible food.
- Muck, the gray substance that first appears and spreads slowly about the screen when a player touches a forager.

FLUID is a system, abstracted to a simple, stylized language. The graphics resemble geometric design patterns of the 1950s. The rich audio mixes natural sounds with procedurally generated electronic static. Playing with *FLUID* means exploring the relationships between the organisms. In a sense, the structure of the ecosystem, the interactions between the organisms, is itself the content. The immediate sensuality of the experience, combined with the dynamic quality of the evolving ecosystem, provides a curiously structural set of pleasures. The toy-like interaction rewards deeper and deeper exploration, as players continue to uncover the relationships between the organisms. For example, to rid the ecosystem of muck, the player has to lead the foragers around the screen by strategically moving the feeders over algae, creating a trail of "bread crumbs" that indirectly maneuver the foragers toward the muck. In order to accomplish this goal, the player has to understand the properties of all of the elements in the system: the algae, feeders, foragers, and muck.

There is also within *FLUID* a kind of moral fable. Interacting with one of the organisms in the ecosystem releases an unpleasant gray "muck" that slowly spreads across the entire screen if the player does not discover a way to stop it. If *FLUID* is a game, then the goal of the game is to eliminate the muck from the screen. Yet paradoxically, the muck is only present because of the user's own seduction to interact with the system.

FLUID was commissioned from gameLab by the Swiss Re Center for Global Dialogue.

TECHNICAL STATEMENT

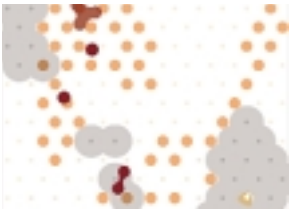
Inside the plastic industrial waste container is a high-end Windows PC. Speakers and a subwoofer are also inside the container. The LCD touchscreen measures 20 inches diagonally. It is set flush inside the lid of the waste container. The FLUID software is a Director 8 Projector file.

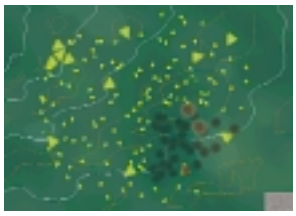
PROCESS STATEMENT

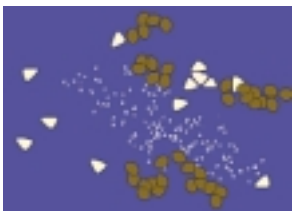
As with all gameLab projects, *FLUID* evolved through a highly iterative process. Our design and development methodology has a strong emphasis on prototyping and play testing, in which we develop a playable version of a project as early as possible and then base our design decisions on our actual experience of interacting with the prototype.

gameLab was initially approached by the Swiss Re Center for Global Dialogue to create a game experience on the theme of water and sustainability. *FLUID* began life as a short written treatment, which was quickly turned into a rough, skeletal prototype. The visuals evolved as we altered, redefined, and tweaked the player interactivity and the relationships among the elements of the system.

While our initial impulse was to create a graphically rich 3D experience, the game visuals became simpler and simpler as we proceeded. Since we were aiming for a gallery context, the moment-to-moment interactivity had to be self-explanatory and immediately gratifying. At the same time, it was important that players be able to discern the actual relationships among the ecosystem elements. The final version of *FLUID* has a balance of ambiguity and clarity. It is a puzzlingly abstract system that rewards exploration and experimentation.







FLUID screenshots

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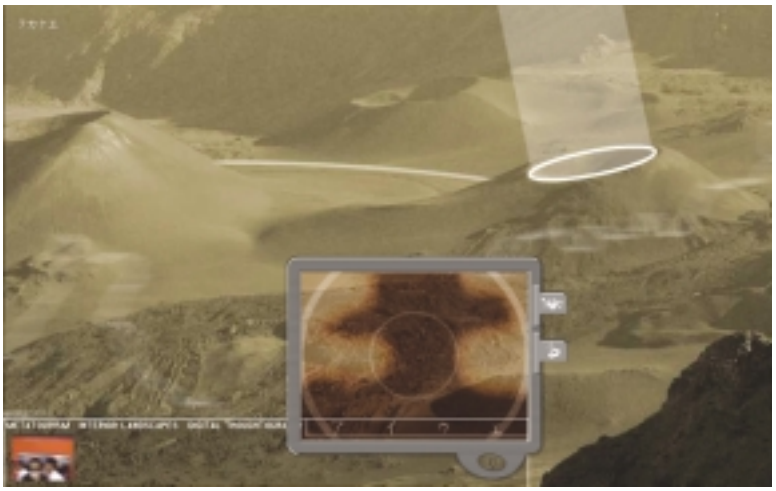


FILMTEXT Scene 01

ARTIST STATEMENT

As art becomes less elitist and more cybernetic in its behavior and cultural performance, it takes on rhetoric's early role as persuasive critique of everyday life. As a result of this movement out of art elitism and back into everyday life, art itself becomes integrated into the workings of everyday life by situating itself in corporations, universities, governments and, more importantly, the fluid vistas of the vast electrosphere where all of these "cultures" collide and mix.

By trying to fully immerse ourselves in these colliding "cultures," we hope to explore the interrelationship between digital narrative and rhetoric using what has become the in-progress language of the World Wide Web and its strategic positioning in the new media economy.

TECHNICAL STATEMENT

Our team of collaborators worked with a variety of tools such as digital video cameras, digital cameras, portable digital audio recording devices, 3D and Web animation programs, computer graphics software, HTML and text editors, audio editing software, stereo microphones, etc. The images captured for the piece were shot on remote locations including the Haleakala desert landscape, and this required portable yet reliable and powerful technology as well. A small sampling of the technology used includes a Powerbook G3, a Sony TRV-900 DV camcorder, a Nikon 990 Coolpix Digital Camera, Simpletext, Photoshop, Flash, Vegas, Acid Loops, QuarkXPress, Acrobat, etc.

The most significant technology used in the creative process associated with our collaborative *FILMTEXT* project was decidedly non-instrumental: the social network itself. As with all of my previous Web-based projects, *FILMTEXT* grew organically from a seed concept that essentially asked: "What is the difference among a work of digital video art, a film, an interactive animation, an audio ebook, and a online novel and an expanded concept of cinema?" Working on the WWW confuses genres and makes problematic the creative process in terms of practice, theory, and notions of authorship. The artists who contribute to *FILMTEXT* as an ongoing work in progress all use current hardware and software platforms to manifest their desired digital effects, but the artwork itself, once published/exhibited on the Internet, becomes something bigger than any of the constituent artists could have ever expected, and this inevitably leads us to question the role of technology even further.

PROCESS STATEMENT

FILMTEXT is a digital narrative for cross-media platforms including Flash animation, MP3 soundtracks, experimental artist ebook, and live net performance.

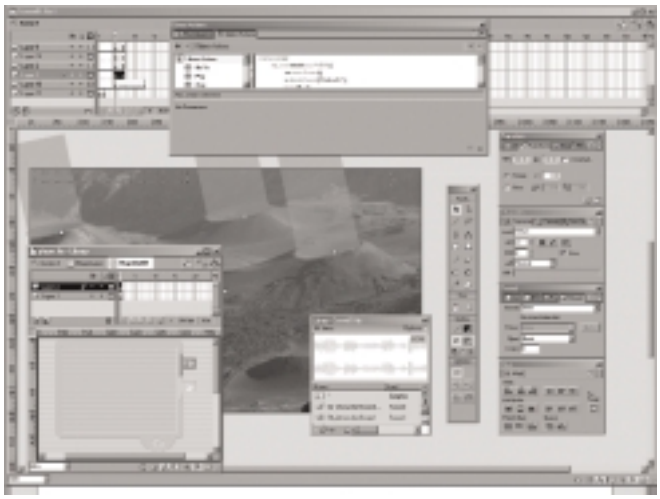
Created in the tradition of filmmakers such as Vertov, Godard, and Marker, *FILMTEXT* attempts to translate cinematic language into more multi-linear navigational forms associated with emergent new media genres such as net art, hypertext, and motion-graphic pictures.

FILMTEXT integrates my digital film/video art, digital photography, writing, animation, and sound art into a unique online work of interactive cinema. The work also comes equipped with an MP3 concept album and a conceptual art ebook.

As with many works of digital art, *FILMTEXT* initiates three separate, yet interconnected, artistic unfoldings: image, sound, text.

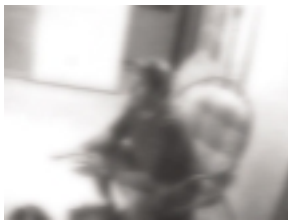
The project is currently being developed at the University of Colorado's TECHNE practice-based research initiative under the direction of Mark Amerika. TECHNE focuses on the evolving forms of digital narrative, multi-media performance, and network installation, while paying particular attention to the research and development of hybridized forms of Internet art that challenge conventional exhibition contexts.

filmText

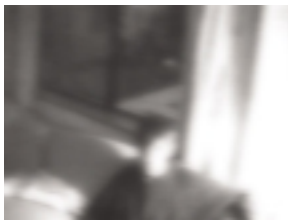


Behind the scenes

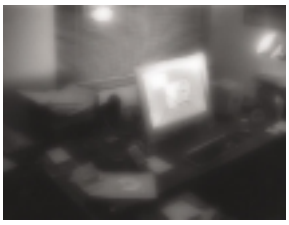
Mark Amerika



John Vega



Twine



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Reynald Drouhin

Red Clown

ARTIST STATEMENT

Defragmentation of the Internet: with the aid of one or several "key words" to determine the images to be researched (mosaic modules); to recompose the image that you have submitted (the matrix). *Des frags* is a project using the resources available on the Net and putting them to use in a different way than that which they were originally designed. The project is, in appearance, very simple: using existing tools available on the Web to create the final work from, by, and with the Net. *Des frags* is the defragmentation of the Internet. A multitude of information is available on the Web, and this project allows all this information to coexist together in one final image—a matrix that will serve as a global reference point for the different elements of which it is composed. *Des frags* is also a "blow" (a murder for players of video games), meaning a "hold-up" of existing images on the Net; the appropriation of the raw material present on the Web and the reactivation of this "dead," archived memory into a live, ephemeral memory.

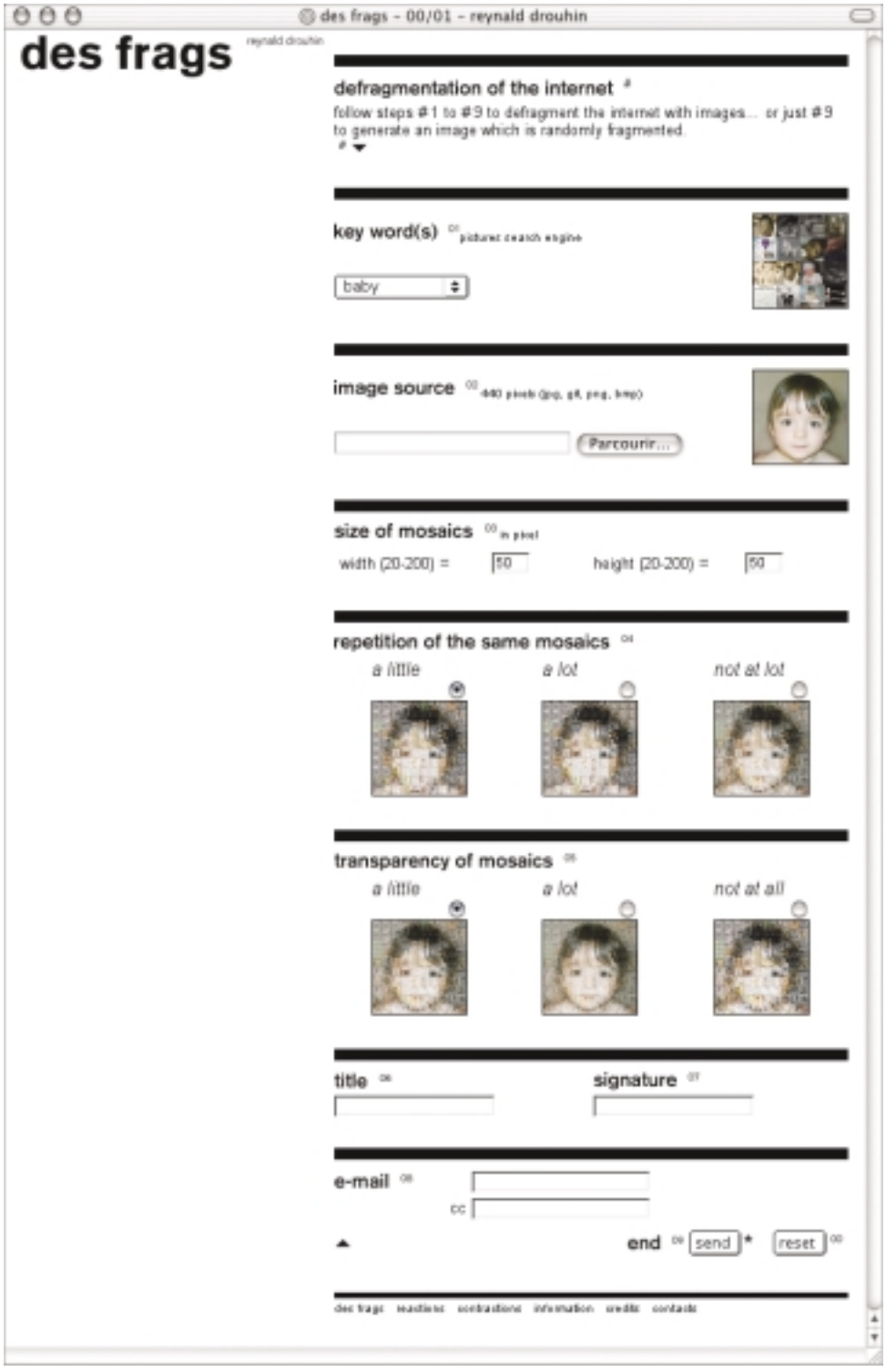
TECHNICAL STATEMENT

Des frags all comes down to the creation of an ensemble of mutualist applications (in PHP and MySQL), allowing for the transparent circulation of the information from one pre-existing tool to another: the Web-based text translation engine of SystranSoft (for the automatic translation of key words from French to English); the Yahoo Web engine for the research of images (for the recuperation of mosaics); and the metapixel photomosaic composition program for the final rendition, a collection of image-processing programs from ImageMagick (for the degradation of the "contradiction"). All these mutualistic applications, in turn, all function within a simple HTML interface.

Des frags also uses system processing (Linux) that is brutally dissociated from its parent, with the information extracted by breaking certain "Web windows"—a continuous breakage whose splinters, far-away and indeterminate, are recomposed into a familiar image.

PROCESS STATEMENT

Defragmentation of the Internet: creating the positive association of autonomous, specific, and dispersed resources; diverting contingent functions to channel them towards an open finality; going beyond the discordant multiplicity of languages and types of information to create a “melting pot” with a new coherence.



Ruth Fleishman

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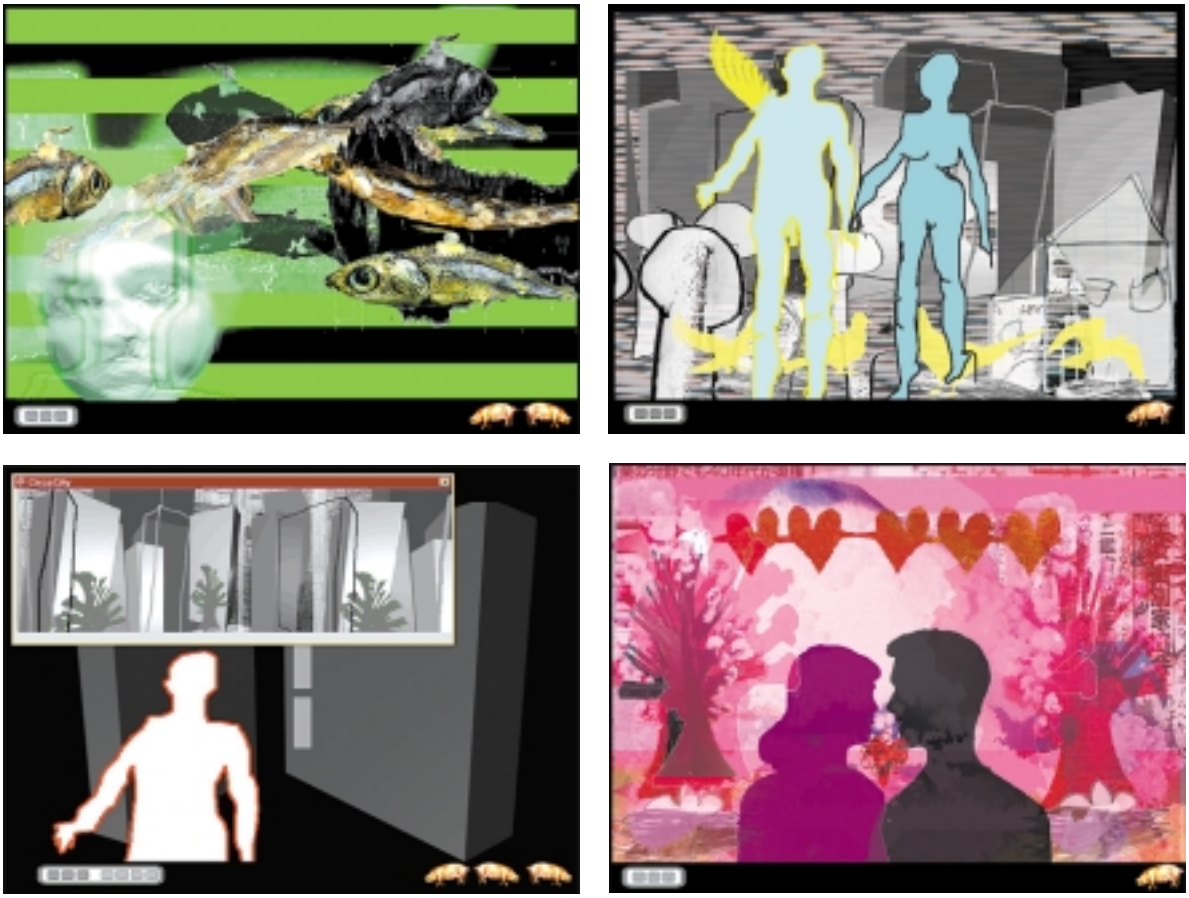

OINK!

ARTIST STATEMENT

I make interactive works on CD-ROM, but I work in a manner that uses more traditional mixed-media materials. These works are then digitalized and collaborated (combined) with imagery made on computer. Software is exploited for its specific aesthetic and visually unique qualities.

The concerns and themes of my current work include:

• An emphasis on the aesthetics and specific visual capacities that digital imagery allows when engaged with more traditional art forms.

• A use of technology as a tool that is secondary to the ideas and content of the work, as opposed to focusing on the capacities of the newest technology.

• Non-linear environments and the vast capacity for art to occur in time-based and non-linear structures.

• Blurring lines between art and design, narrative and non-narrative environments.

• Creating very lush visual environments, specific to digital conditions.

!OINK was an exploration of the process required to deconstruct a book into multimedia. My aim was to make the most of the non-linear environment that interactive work facilitates and at the same time honor the spirit and attitude of the novel. It was an opportunity to adapt a developed aesthetic to a writer's vision.

PROCESS STATEMENT

These pictures are a selection of source material used to make the interfaces from *!OINK*. Some are Photoshop layers that make up the final image for each interface.

These images give a feel for the very diverse way in which I use a range of imagery and source material. I then collaborate and integrate it, so it will work harmoniously together. Sometimes my sources include paper constructions, digital photographs, previous unrelated drawings, collage, digital imaging, and scanned objects.

Unused images often make their way to other projects or become source material themselves, adding to my ever expanding resource collection. This is the most vital aspect to my working process. I am an eager collector and hoarder of imagery and objects that usually lend themselves to use at a later date. I usually don't have a specific purpose in mind for this content. I collect these source materials with an instinct for what will integrate well with other source materials I have collected despite their apparent differences.

When I am making interactive work, this type of documentation sits close to my computer. There are also screen grabs of other interfaces still in progress. Having a range of the images at hand allows me to get an idea of how the project is coming together as a whole, and I can make sure there is continuity with all screens.

Technically, I use Photoshop and Director, a scanner, a digital camera, and a PC.

Erik Loyer

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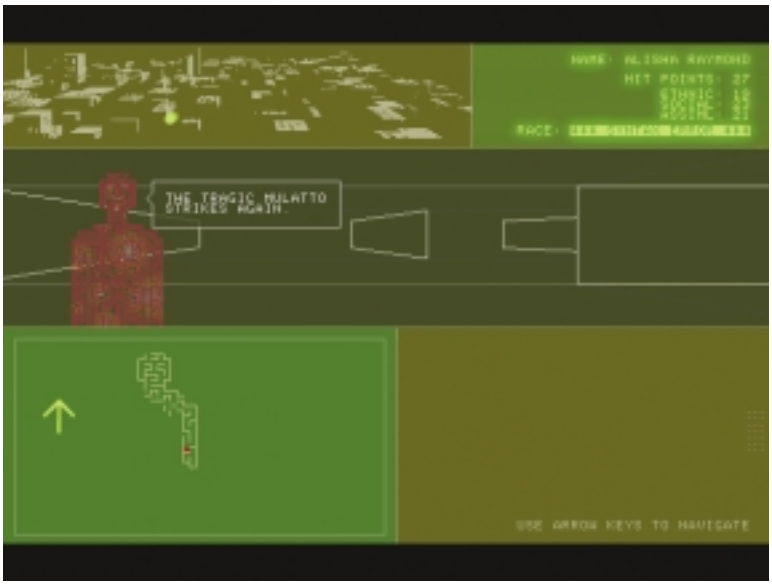


Chroma screen grab

ARTIST STATEMENT

If you could redesign your body, what form would you take?

A computer interface is a filter that translates human action into digital space. Thus, it gives us a new body within that space, defined by its parameters. Interface design gains an ethical dimension in the degree to which it limits or augments our natural capabilities. For eight years, I've been exploring real-time interactive animation as a way to give the user a presence within the screen that is responsive, conceptual, and intimate. I rely heavily on algorithmic animations that react instantly to mouse movement, presented in a narrative context where they become expressive of the thoughts and emotions of characters in a story.

Chroma is a large-scale application of this approach, in both its form and its content. An experimental interactive Web narrative, the site explores the nature of racial identity in the digital environment. *Chroma* follows four characters as they construct new digital bodies for themselves, encountering thorny questions of identity and race along the way. The piece is episodic in nature, containing 25 total episodes that are published on my interactive art site, "The Lair of the Marrow Monkey," as they are produced: www.marrowmonkey.com

TECHNICAL STATEMENT

Chroma was authored using Macromedia Director and is experienced via the Shockwave plug-in. The piece is built on a custom Director-based multimedia engine called "Mneme," which handles the complex animation and synchronization tasks required for each chapter.

Most of *Chroma*'s animation is algorithmic (generated dynamically by the program code). In this way, the visuals can be as responsive as possible to the user's actions without increasing the download time of the chapters. As a result, *Chroma* delivers more experience per kilobyte downloaded than the typical Web site.

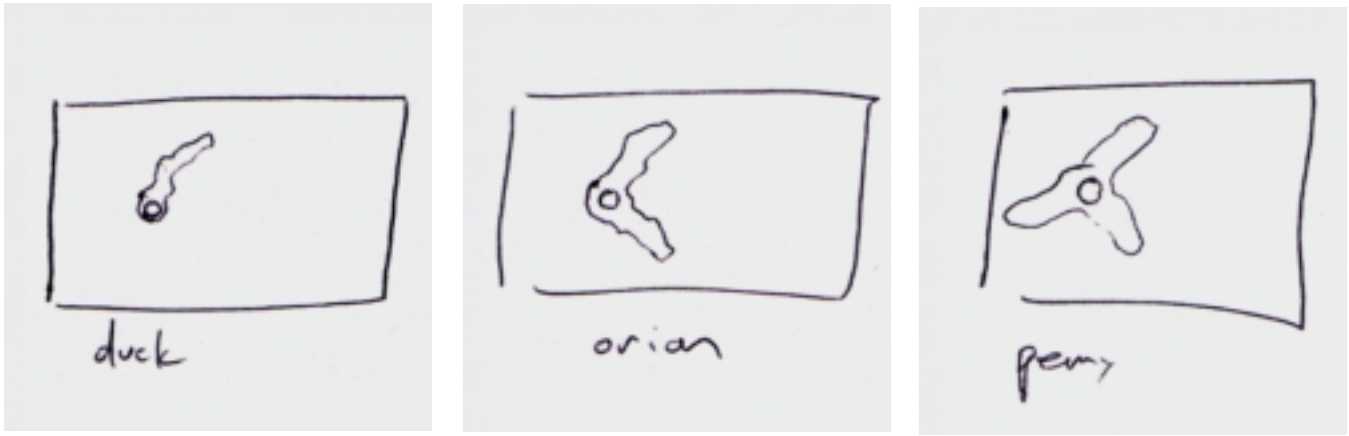
The visual design of *Chroma* was developed using Adobe Illustrator and Adobe Photoshop, with some complex vector elements converted to Macromedia Flash format for inclusion in the various Director movies.

Chroma's voice-overs were recorded on a DigiDesign ProTools system, and the final musical score was recorded and mixed with Steinberg's Cubase software in conjunction with a Mark of the Unicorn 2408 mkII audio interface. Streaming Audio was compressed into the Shockwave format using SoundEd.

PROCESS STATEMENT

"This amoeba-like object starts to slowly increase in size, and then organically grows three 'legs.' These legs are in constant, fluid motion, like the tentacles of a sea anemone or the legs of a floating starfish. The appearance of the legs coincides with Dr. Anders' reading of the names of his protégés."

From the script for Chapter Three of *Chroma*



Sketches

Prototypes

Screenshots

Lien Fan Shen
Ching-Fang Chiang
Caroline Quilan
Edward Schocker

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'Old Tree' from *Reconstruction*, a DVD installation

ARTIST STATEMENT

Reconstruction is a multimedia DVD project focusing on issues of confinement. It captures the tension of serene and disturbing emotions associated with small confining spaces. Based on still images, *Reconstruction* is converted to a virtual environment with motion pictures and surround sound.

Space and emotion are investigated through an old Illinois State Hospital that was abandoned in the 1970s. The architectural structure of the old hospital was built on the top of a hill in a small town called Bartonville at the end of the 19th century. Over the years, it grew into a huge structure, occupying more than 35 buildings. At one point, more than 3,000 patients lived there.

The main theme of *Reconstruction* is not about recreating a particular room of a particular building but a collective experience derived from many sources, including photographs, research, and the viewing response of the audience. It is the spirit of the hospital and the unusual atmosphere of the hundreds of empty rooms that once housed thousands of now-deceased residents that the artists wish to convey.

Reconstruction consists of three major parts: "destruction," "reconstruction," and "documents." "Destruction" contains two parts: photographic documentation of the current condition of the abandoned hospital and a collection of research documents, mainly black-and-white images of the hospital from the collections of the Peoria Public Library and the Zeler Mental Institution Library. The "reconstruction" section recreates the hospital through digital video. "Documents" is a video documentation of the installation exhibition: "Within the Walls."

Reconstruction is a digital video based on still images, with surround sound, that uses new technologies to create the atmosphere of a virtual place. Its "documents" include text, artists' biographic information, credits, and the complete version of the artists' statement.

TECHNICAL STATEMENT

Reconstruction is an artwork based on still images. Using digital media, including video and audio, the artists intended to create a virtual environment that allows viewers to experience the full impact of multiple images with surround sound. The interactive feature of the DVD provides viewers with options to link to and experience various layers of the images and sounds more freely.

The project was created using Macintosh G4 computers. Software includes: After Effects 5.0, DVD Studio Pro, QuickTime Pro, Media 100, Photoshop 6.0, Pro Tool with Dolby digital 5.1 sound system.

PROCESS STATEMENT

Reconstruction contains several generations of images and sounds gathered and produced in a long progress of technical and conceptual development. Four artists contributed to the final product:

• Photographer Ching-Fang Chiang, who spent nearly four months documenting and researching the abandoned hospital, initiated the earlier stages of the project:

> Years ago, when I was just beginning to experiment with digital image making, the digital medium was simply a tool for me to manipulate original photographs and to create the "extension images" or "sub-images" of the originals. This concept has changed over time. While working on *Reconstruction*, I have experienced the different creative methods that are strongly connected with the availability of the new technology. Often, when I discussed certain ideas about this project with Lien Fan Shen, the ideas began to grow and shift according to what I heard or learned about what certain programs or devices can do for image and sound creation. New technology actually directs new ways of thinking and art making. This DVD is the product of such new-tech inspiration.

• Choreographer Caroline Quinlan created movements and a dance performance for the exhibition "Within the Walls," a multimedia installation presented in the Lindley Cultural Center Gallery at Ohio University in January 2002:

> Dance is more than an outpouring of emotion; it involves a need to move, to explore movement, and to explore the surrounding space. Our bodies receive information through physical activity, sensation, and experience of the space that surrounds us. Information flows from the external to the internal, so the internal process needs some outlet. This external outlet can be expressed through a dance, making a statement about a formal investigation of not only the space around us, but also the emotions evoked from the architecture of that space. People may become uncomfortable and tense when they feel trapped by their surroundings, yet they may also find comfort in knowing that their whole life exists in a small room. To many, this thought seems disturbing. I have tried to capture this tension between the comforting and disturbing effects of a confining space. Utilizing the positive space of my body contrasted by the negative, projected images, I explore both the internal and external, crossing the boundaries of mind and body. With minimal, intense, strong movements I delve into the depths of the subconscious mind.

• Composer Edward Schocker writes for a mixture of alternative tunings and non-traditional instruments. His original music score, "Blesch," forms the basic audio element of the DVD.

• Lien Fan Shen designed the DVD structure, and the digital audio and videos were created by a computer artist who conducted and completed the final stage of *Reconstruction*:

> The progress of new technology expands the possibilities in art creation. While traditional media interact with the viewer internally as mental events, the digital arts actually create the "virtual object" with the user or viewer. In the DVD of *Reconstruction*, the elements, including images, performance, sound, and music, not only interact with the viewers individually, but also create virtual interactivity between the artwork and the viewers. *Reconstruction* reveals the process of simulating my personal emotional perceptions from these strong documentary images into a virtual object. It is assembled through diverse media to achieve new dimensions of artistic expression in space, movement, and sound.

Brooke Singer
Paul Cunningham

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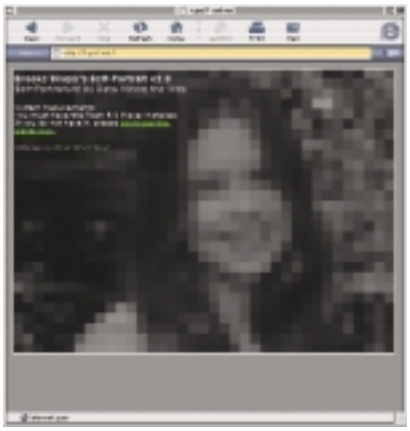
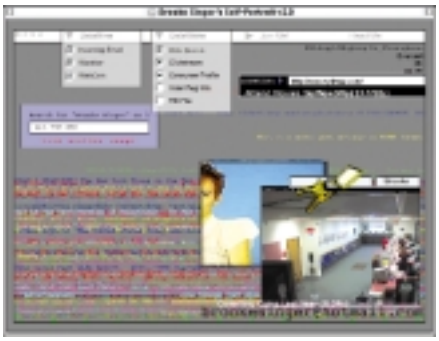




Self-Portrait version 2.0

ARTIST STATEMENT

Self-Portrait version 2.0 (SPv2) is an online application available at www.spv2.net. *SPv2* explores how identity can be constructed and perceived through data collection in cyberspace. Some data in cyberspace we consciously create to represent ourselves (emails and Web sites, for instance). Other bits of data accumulate without our efforts—and many times without our knowledge—tracing certain of our interactions both in the physical and virtual worlds. Because of this data we do not willingly disperse, our cyber image is not always in our control nor ever fully knowable to us. *SPv2* explores to what extent we are accessible online and what we may look like through mining Internet data.

When you enter *SPv2*, you can choose to activate data from three categories: DataMine, DataWake and Join Me! As a user makes their selections, *SPv2* grabs data from the chosen source, translates the data into a visual representation and displays it to the user. One may layer the various visual depictions to eventually achieve data chaos.

SPv2 updates the genre of portraiture for the information age. In the history of Western art, portraiture traditionally fulfilled the purpose of reinforcing wealth and power. *SPv2* is an inversion of this power structure; it results in a reconstruction of the self after it has been digitized, analyzed, shared, and sold.

TECHNICAL STATEMENT

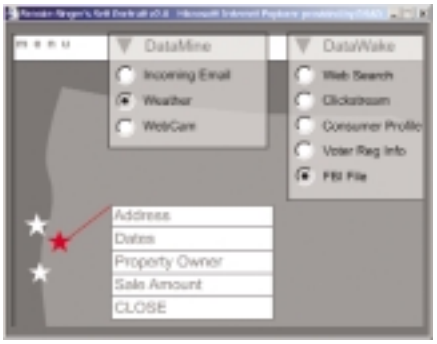
The brains behind the *SPv2* server uses Comet Way's Agent Kernel written in Java. The *SPv2* project depends on dynamic retrieval of information from the Internet. For this purpose, Java agents search, retrieve, and interpret online information. Since none of this data is directly readable by Macromedia Flash (the program used to create the *SPv2* Web site), agents must translate the gathered information into a Flash-compatible format. Java agents make the translation using shareware called Swift-Generator (www.swift-tools.com).

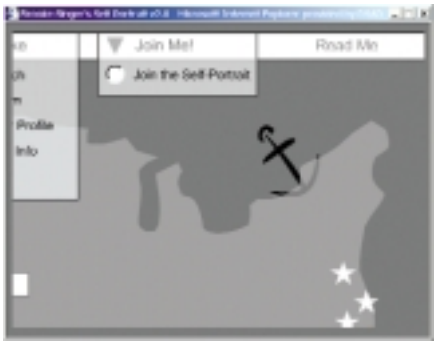
For example, a Java agent is at work in *SPv2* when a viewer clicks on the "Incoming Email" option under the DataMine menu. A Java agent accesses Brooke's POP3 account, dynamically generates text files based on email contents, and then serves these files as Flash properties to the *SPv2* Web site. Another instance of agents at work in *SPv2* is when the Web search option is activated. Here the Comet Search agents handle the more complex process of using popular search engines to find links related to Brooke Singer that are then crawled to find image files. These image files are deposited onto the *SPv2* server and later appear in the *SPv2* browser window.

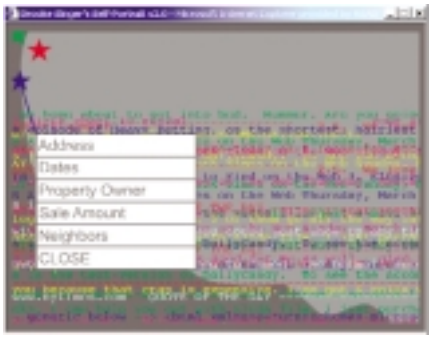
The entire *SPv2* server is, in fact, comprised of Comet Way agents—even the Web server is an agent and has been running on Macintosh servers under Mac OS 10.1. The Comet Ways Agent Kernel is open source and available at www.cometway.com/downloads.

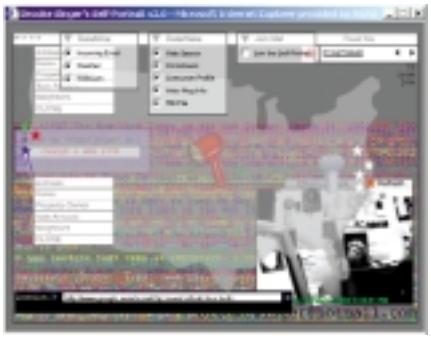
PROCESS STATEMENT

SPv2 uses Java-based agents:
- to retrieve Brooke's email over POP3
- to retrieve weather information for a specified zip code
- to download Web cam images from Brooke's studio and other sites
- to search the Web for pages relating to "Brooke Singer"
- to crawl Web search results and download GIF and JPEG images
- to convert all images into swf files for use by Macromedia Flash
- to retrieve a person's date of birth using specified name and zip code
- to retrieve census (lifestyle) information for a specified name and zip code
- to retrieve Google images for a specified name
- to periodically remove old Google images from the file system
- to report system errors and activity to Brooke via email
- to log user activity to the filesystem
- to serve flash content over http









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ARTIST STATEMENT

My idea was to develop analogies for the organic identity of the city as an urban community and make links with electronic networks and virtual communities. The work is a visual collage reflecting on certain themes within our urban consciousness. This is contrasted with man-made structures, as well as patterns and forms of urban design. The spaces are for dreaming, thinking, meditating, and transience. The form and content of my work is the visual world of the city and its structure: a visual labyrinth, a maze of circumstance. The city itself is always changing; it is always in flux. Each aspect of city life seems to demonstrate specific characteristics, which can be developed into individual parts of the labyrinth, making up the images that will be used. The city acts as a focus for community and as a territorial boundary to explore the world outside through virtual means.

I use the "urban metaphor" a lot in the work for obvious reasons. The nature of the Web as a network has a direct parallel to a real world metaphor of the city. I think of vast utopian cities, babel towers scarred with roads. Not unlike masses of cables, with packets of zeros and ones flowing through their veins. However I have always used the city as a central motif in my work.

The project itself has become a reservoir of texts, computer graphics, stills, video, and sampled sounds. All this forms a composite, a conundrum, a view of the city experience at the end of the twentieth century. The city itself is evolving. These themes have inspired the making of this piece.

TECHNICAL STATEMENT

The Central City is comprised of a series of assets that include digital imagery, soundtoys, digital movies, and emergent net art. In essence, the city codes itself into a growing pattern, based on algorithmic patterns. Tools used to build such an environment include elements of HTML, Javascript, and could also incorporate Flash, Shockwave, and Java.

PROCESS STATEMENT

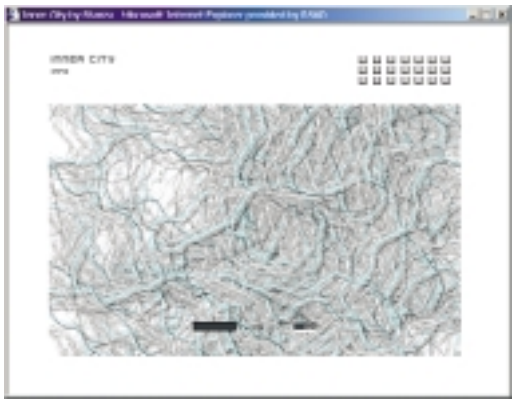
Towards the matrix. Grid city.

Giant cities paint a gloomy picture, of mass urban sprawl. The megalopolis is spreading upwards and everywhere; 70 - 80% of the populace now lives in cites worldwide.

The problem with cities is they seem to exist with laws of their own. My artistic intervention tries to look at the fragments of our experience of cities, that make up the whole city. The central city is a place that appears out of control, but that we try to control through design. The city as grids, and repetition, can appear sublime or it can confuse and appear prison like. In western art the grid is for painting—it is the very structure of western art—the grid is for the city. This grid is ever expanding to cover the whole surface, growing and crawling to the edges. The fascination of cities lies in their similarities and differences. Familiar forms, identities, and sounds are common to all cities, and yet each have special forms that separate and identity particular places and spaces. These online works represent spaces, they are idealized spaces. I don't see *The Central City* as a simulation. In fact, I am not aiming for or particularly interested in simulation. I view the final evolution of the project as an experience, an online Internet experience, which can be viewed inside the white cube of the box that is the computer. The framework, the grid, that contains this work is the computer and the Internet: images of maps redrawing and reprocessing themselves. This lends the city a perpetual evolution, no single similar path need be followed.

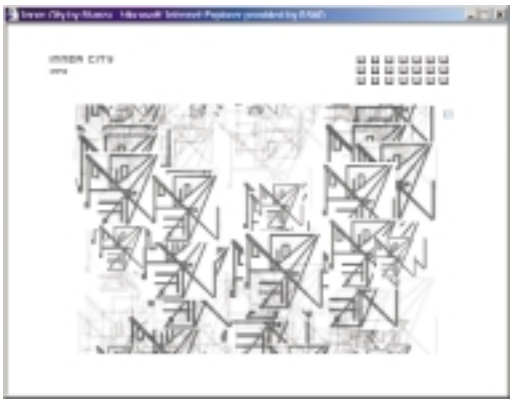
My initial impulse for *The Central City* was to deconstruct a language of the urban and city environment, and to build it back up as an art image, to try to constitute both as a new form and new meaning. By placing oneself in the middle of this particular structure, the meaning or aesthetic experience is only encountered when you decide to move from any one place to the next. I use these small fragments as rhythms, to interact with the next part and evolve into something new. These parts are cells, or parts of a whole that generate themselves. The nature of the sounds and noise of cities varies in tone and language. A background rhythm may emerge. It mixes itself, and evolves. The city is its own music, constantly evolving, a beautiful composition of squeaks, clanks, and pulses. We are familiar yet distracted as it bombards our conscious slipstream. Yet the sounds grow, move, die, fade, and shift. They are out there all the time. The children, the cars, the drills, the animals, the micro sounds, the sounds of our bodies, the insides of our souls.

I am interested in the sounds of specific places, how sounds reflect this identity and re-impose characteristics back onto the location or environment. Cities all have specific identities, and found sound can give us clues to the people that inhabit these spaces, as well as provoking and stimulating our senses in a musical way. The sounds of language impose a rhythm with which the visual narrative can interact. The intention within newer sections of *The Central City,* is to create an audio visual experience that evokes place, both as literal description but also developed musical composition. These are the ideas that inform my new *soundmaps* series, and *soundcity*. Recent pieces that the user can control and manipulate through movement.



Inner City

Inner City



Inner City

The Central City: textus

Geoffrey Thomas

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Storybeat

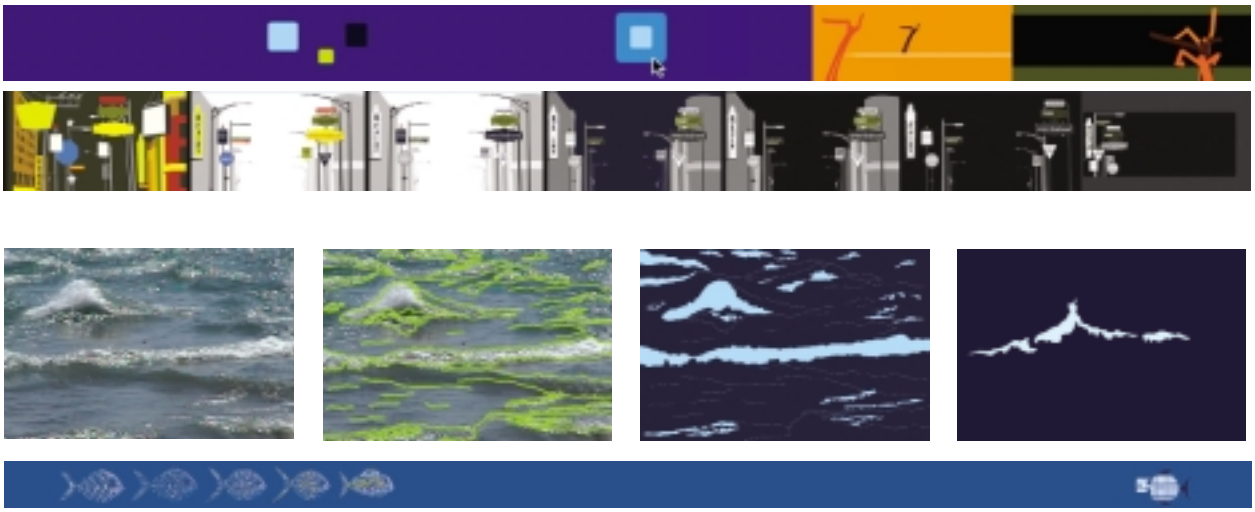
ARTIST STATEMENT

In my work, I am most interested in exploring themes of human connection. These explorations are often filtered through the culture of technology. I am increasingly influenced by the destabilizing elements of digital media. In my work, I hope to find ways to unravel the control of traditional narratives, adopt nonlinear and nonhierarchical structures, develop more responsive interaction, and include moments of chance.

I created the Web site *Storybeat* to house experiments in interaction, animation, and narrative. The site hopes to explore the potential of a responsive, motion-based space. I view *Storybeat* as a fluid site. Posted work will be continually adjusted, rearranged, expanded, and modified.

TECHNICAL STATEMENT

To build the site, I used a range of software applications: Macromedia Flash and Director, Adobe Illustrator and Photoshop, Apple Final Cut Pro and Bare Bones Software, BBEdit. The site requires a 4.0+ Internet Explorer/Netscape browser with Director and Flash plug-ins.



PROCESS STATEMENT

I try to approach each project as a new beginning, a chance to explore unfamiliar combinations of motion, interaction, and storytelling. I view my work as an ongoing process, a discourse with my cultural environment and a reflection of my current concerns and interests. As each project progresses, I expect awkward moments of disorientation and doubt combined with flashes of clarity. Through the process, I try to discover potential areas of investigation and expression. In my work, I hope to examine, entertain, re-contextualize, and parody. I also hope to connect with others through moments of shared experience and recognition.

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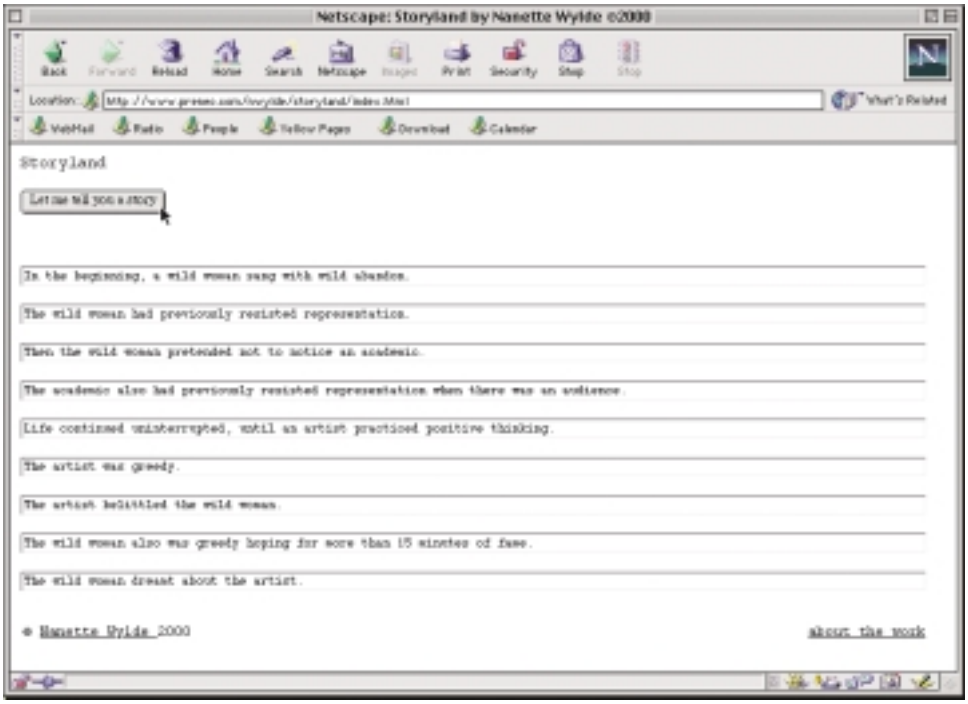
Storyland

Postmodern Conditions Contemporary Tales



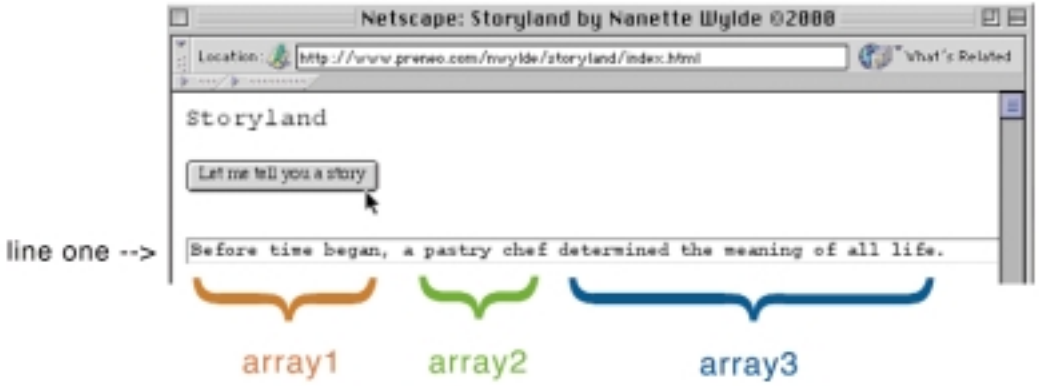
ARTIST STATEMENT

Storyland is a randomly created Web narrative. Each line is constructed from a pool of possibilites, allowing each reader a unique story. The work is a one-page Web site created with Javascript. Upon entry, the reader presses the "Let me tell you a story" button, and a story is created for that moment in time. It is unlikely that any two stories would be identical.

Storyland exposes its narrative formula, thus mirroring aspects of contemporary cultural production: sampling, appropriation, hybrids, stock content, design templates. It risks discontinuity and the ridiculous, providing opportunities for contemplation beyond the entertainment factor.

Storyland will play from any Javascript-enabled Web browser. Elements for each line in the story are randomly selected from a series of arrays that hold *Storyland* elements.

Elements from three arrays make up line one.



index = the randomly returned number for the number of items in the array

line one = document.storyland.one.value = array1[index1] + " " + array2[index2] + " " + array3[index3] + ".";

array1 = new Array("Once upon a time,", "A long long time ago,", "In the beginning,", "Long ago and far away,", "Only just yesterday,","In the not too distant past,", "Before things were written,", "In the town were I was born,", "In my dream,", "Prior to the creation of Heaven and Hell,", "**Before time began**,", "After the creation of good and evil,", "When things were different,","Last Saturday night,", "Before the dawn of history,", "Prior to the invention of patriarchy,", "Before the invention of timepieces,", "Before the invention of time travel,", "On a very hot summer day,", "During the last ionic storm,", "After the most recent glacial retreat,", "During summer vacation,", "Before the age of technology,", "In the back of a Volkswagon bus,", "The way I heard it");

array2 = new Array("a young child", "a princess", "a young prince", "an evil sorcerer", "an animal", "a clown", "a queen and her king", "a gardener", "an artist", "a dress-maker", "a musician", "a believer", "a merry widow", "a misogynist", "a time-traveler", "a mockingbird", "an over-achiever", "a paranoid schizophrenic", "an angry man", "a villian", "the town do-gooder","a wild woman", "a psychiatrist","a sky pilot", "a healer", "a spiderwoman", "a transvestite", "an archetype", "a super model", "a super hero", "a movie star", "a celebrity", "a televangelist", "the hostess with the mostest", "a roller derby queen", "your normal grandmotherly type", "an average Joe","a spirited adolescent", "a forensic specialist", "a too slim college student", " an orphan", "a female impersonator", "a torch singer", "a mad scientist", "a demolitions expert", "an academic", "a linguist", "**a pastry chef**", "an organic farmer", "a war hero", "a junior partner", "an eagle scout", "a dog", "a stalker", "an exhibitionist", "a talk show host", "a soldier");

array3 = new Array("lit a candle", "wrote a poem", "developed an idea", "pondered the universe", "believed in humanity", "cried for your sins", "struggled with jealousy", "created a new religion", "fermented rose petals", "sang with wild abandon", "whistled dixie", "buried sad memories", "drank from a silver cask", "dreamt of happier times", "planted a seed", "created an image", "freed a spider", "pretended not to notice", "longed for a vacation", "tried to kiss the wind", "pretended to be free", "invented a new language", "visited a fortune-teller", "practiced positive thinking", "developed empathic skills", "knew the future before it happened", "planned eternity in paradise", "praised the kindness of others", "practiced pleasantries in the park", "told stories for amusement", "delighted others with silliness", "**determined the meaning of all life**", "questioned authority");

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ammy/index.html

Yuriko Amemiya

Man Garden

I wanted to create a mysterious garden in a 3D space. Each person who appears in this animation has the same human form, since each is a part of the garden. They imitate the birds, trees, worms, statue, everything. And finally, they build a black garden themselves.

Hardware: PC
Software: 3ds max

Director
Yuriko Amemiya

Producer
Yuriko Amemiya

Contributors
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Sergey Aniskov

CCCP Vs. St. Valentina

Ghoulish insects, monstrous industrialists, and the angel of death battle the boy CCCP in a Flash-animated wasteland. The author was inspired by the experience of growing up in the Soviet Union in the 1970s and 1980s—the transition to a post-Soviet republic and the increasing political madness around the world. CCCP is the Russian translation of USSR. This work was made with Macromedia Flash 4.

Director
Sergey Aniskov

Producer
Sergey Aniskov

Contributors
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Jérôme Boulbès

Le Morte de Tau
(The Death of Tau)

In the midst of a desert, Tau, a sort of giant larva, is dying. Around this agony a variety of little creatures enter into conflict.

Director
Jérôme Boulbès

Producer
Christian Pfohl

Co-writer
Pierre François Bertrand

Animators
Agnes Billard, Jérôme Boulbès, Véronique Caraux, Alexandre Dubosc, Stéphanie Machuret, Karen Guillorel

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Ye Won Cho

Trilemma

When I make something, I want to build it by destroying it. It is a self-portrait of my memory. Perceiving the figure gradually deconstructed may be viewed as a metaphor for the violence of aesthetic experience. A bizarre contradiction between the lightness of traslucent texture of simplified human shapes and the cruel appearance of brutal accident provokes a twisted essence.

Director
Ye Won Cho

Producer
Ye Won Cho

Music
Justine F. Chen

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Alain Escalle

Le Conte du monde flottant
(The Tale of the Floating World)

Hiroshima. On the morning of 6 August 1945, a bright light invaded the edge of the floating world. A man remembers. The shock, a violent blast. Bodies that stretched out in pain, the dreams of the past in the present, the visions of the future in the past. The child who he was, before. Before the flash struck. Before the world was disturbed.

Director
Alain Escalle

Producer
Naoyuki Kibé

Contributors
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Hyun-hee Jang

Sumisan

Sumisan is the Korean name of *sumeru. Sumeru (sumisan)* is a mountain in the center of the world where the historical Buddah found the bright truth of Buddhism. A young monk's (*dong-ja*) search for the lotus flower of *sumeru* is animated by digital shape technique, but this technique is grounded in traditional Korean artistic concerns: paper, shape, and color.

Director
Hyun-hee Jang

Producer
Hyun-hee Jang

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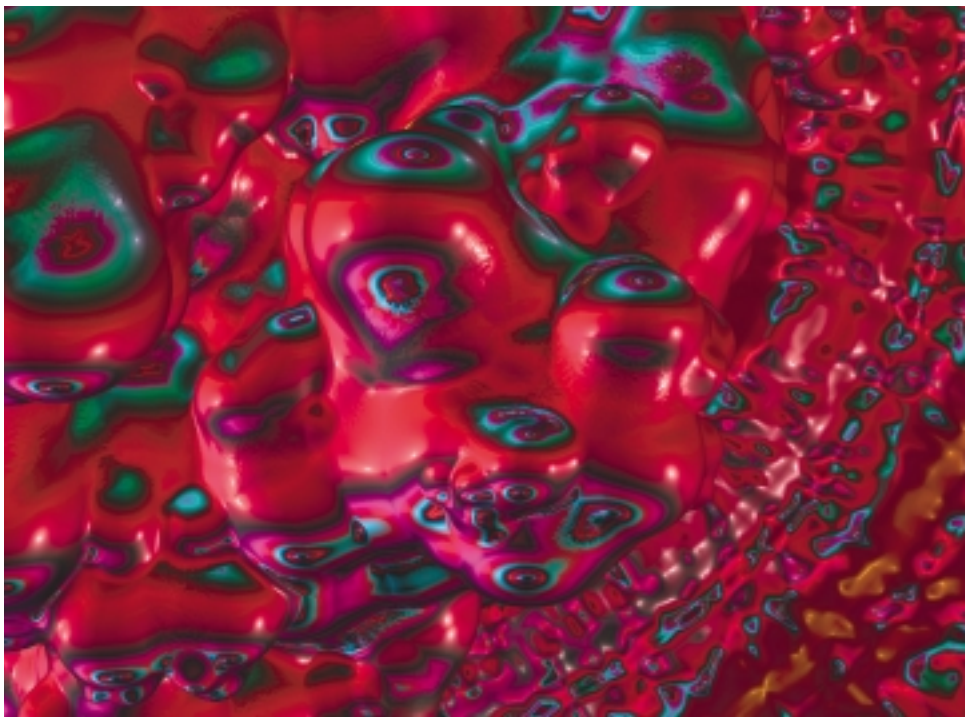
Yoichiro Kawaguchi

Cytolon



A new visual representation of ecological space inside artificial creatures. The movie was rendered with in-house software.

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Daniel Keefe

La Guitarrista Gitana

For the last two years, I have been working in and continuing to develop a new way of creating in virtual reality. CavePainting is a 3D analog to traditional 2D painting. The software, created at Brown University, runs in a four-wall immersive virtual reality system called a "cave." Creating in CavePainting is a new way of working and thinking. While a painter often steps back from his work or a sculptor steps around his work or even holds it in his hand, a CavePainter stands up and walks through his work, grabs and rotates it in his hand, shrinks or enlarges it on a whim, and finally manipulates color variations and stroke size, shape, and placement to create a visual representation for complex forms. Many of these operations have no counterpart in the physical world, thus they allow interactions and make possible the creation of a form that would otherwise not exist. For example, paint strokes would not be able to float or co-inhabit the same volume in the physical world. The computer interface in the CavePainting system is composed entirely of physical props. When I paint, I hold a real paintbrush that has a six degree-of-freedom positional tracker attached to it. To change attributes of the virtual paint strokes I create, I dip the real brush into real buckets that "contain" different types of virtual strokes. These real, physical interactions compliment the dramatic 3D virtual form that can be generated with the system. The result is a virtual reality medium that is strikingly immediate, fluid, and responsive to the artist. The interface and the space of the cave lend themselves to creating fluid, full-body, gestural strokes. In fact, watching a CavePainter at work can be almost like watching a dance performance. As such, I consider the process of creating a CavePainting as much a part of the final result as the finished 3D painting itself. *La Guitarrista Gitana* is an interactive virtual environment that combines my desire to show a completed CavePainting work with the desire to illustrate and allow an observer to explore this unique 3D painting process.

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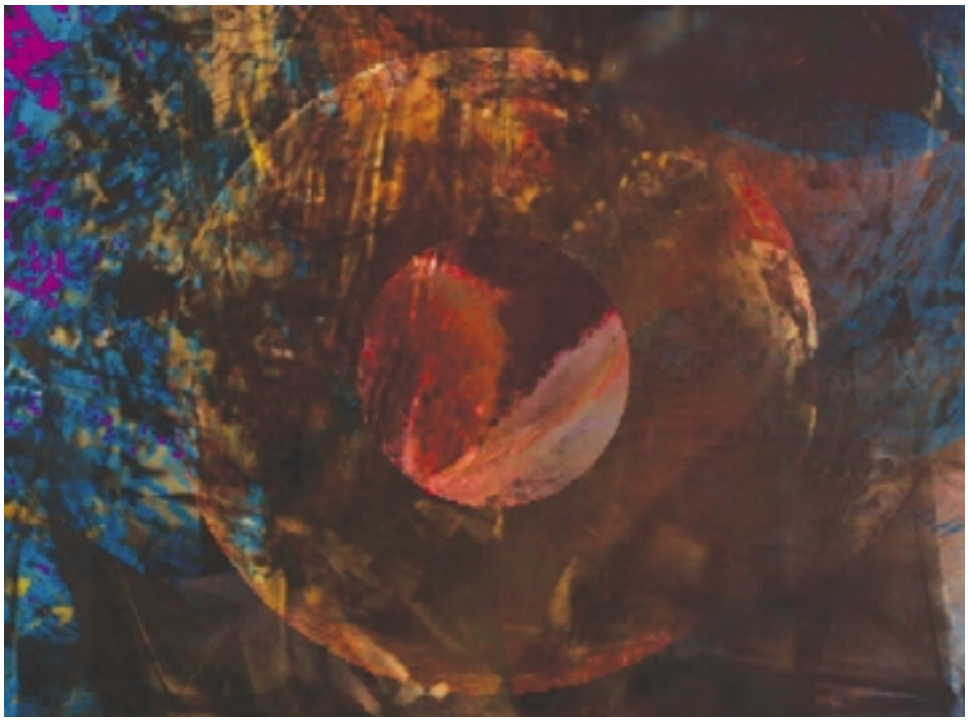
Lise-Hélène Larin

Painting By Numbers III



Painting By Numbers is a series of non-figurative 3D animations. I paint on my objects using the paint program included in Softimage 3D. I want to rearrange the elements of traditional languages of sculpture and painting while exploring uncharted visual realms in film. I modeled organic objects and mapped them with the same small non-descript texture using parameters to invent a landscape. I also want to create new emotional conditions for viewing 3D animated film. I show my digiscapes in installations using anamorphosis to further heighten the sense of loss and to stimulate the imagination.

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Kazuma Morino

Line

This film takes the bold yet graceful line of classical Japanese patterns and puts it into motion. Much of the rapid progression of intersections, warps, and rotations was left to a modeling program to decide; intentional human controls were purposefully kept to a minimum. The pseudo-coincidences generated by the software create a serendipitous aesthetic similar to the cracks etched in Japanese ceramics by the firing kiln.

Director
Kazuma Morino

Producer
Kazuma Morino

Artist
Kazuma Morino

Music
Yoshiyuki Usui (Manual of Errors Artists)

Special thanks to
Hideaki Tomo, Chie Tanaka

Produced by
Stripe Factory

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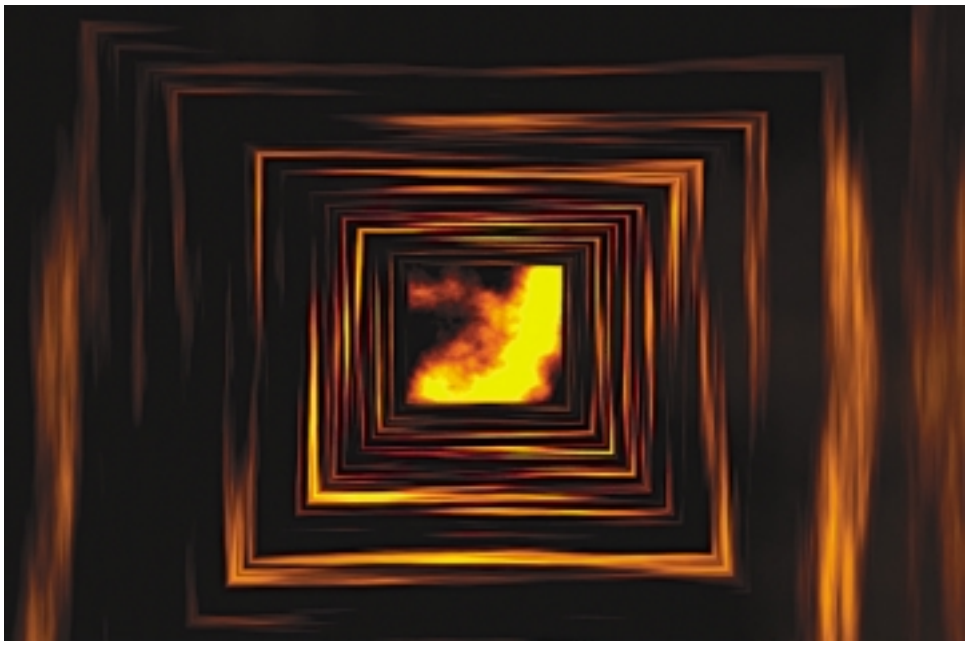
Dennis Miller

Residue



Residue was written in 1999, and unlike other works by its creator, the animation and music were created simultaneously. The technical and artistic challenges this created were immense, but the necessity to carry both elements forward, each with some meaningful continuity, and to keep the two in sync from an aesthetic viewpoint, provided the author with a stimulating and provocative experience. For the record, the work consists of 16,200 individual Targa (graphic) files, which live a precarious existence on the composer's hard drive.

Director
Dennis Miller

Producer
Dennis Miller

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Ty Primosch

Traffic Jam

What happens to order when three city traffic lights lose control of their reds and greens? Light signals change without warning. Cars crash in rhythm and *Traffic Jam* quickly becomes an out-of-control urban opera. A synergized stop-and-go rhythm is orchestrated using peculiar objects such as drills, scissors, and bike pumps. Dodging flying wreckage and debris, the lights show their versatility and ingenuity as they become incoming projectile "instruments." Sitting through a traffic jam has never been so much fun.

Hardware/software: Alias|Wavefront, Maya, Adobe Premiere, Nothing Real, Shake, Adobe Photoshop, Sonic Foundary, Acid, Sound Forge.

Director
Ty Primosch

Producers
Karen Mathieson
Ty Primosch

Contributors
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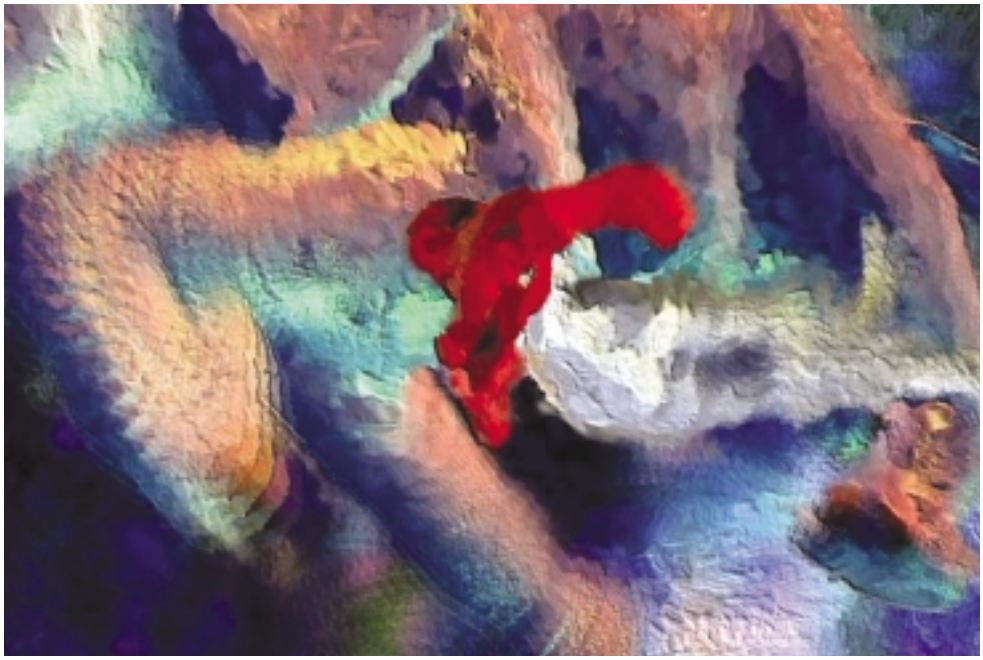
Umesh Shukla

Still I Rise



Inspired by the coincidental suicides in 1890 of Elephant Man Joseph Merrick and the Impressionist painter Vincent Van Gogh, *Still I Rise* fuses two events by presenting a fantasy visualization of Merrick's last dream in an animated Impressionist style.

The entire production was animated and rendered on Windows 2000 workstations. The final renders were recorded on 35mm film.

The following software was used for the production: Maya, Poser, Houdini, Adobe Premiere, Adobe After Effects, Sound Forge

Director
Anna Shukla

Producer
Anna Shukla

Design, animation, & direction
Umesh Shukla

Producer
Anna Shukla

Music
"Pavane" by Gabriel Faure
Courtesy of Vox Music Group, A Division of SPJ Music Inc.

Joseph Merrick's photograph
Courtesy of Royal London Hospital Archives

Digital to film transfer
Filmout Express

Title design
Hans Bacher

Mask model
Chris Cowen

Special thanks to
Todd Landor, Gilbert Yablom, Jonathan Evans

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Rodney Berry

From Artificial Life to Augmented Reality: "It's not about technology, it's about what technology is about"

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INTRODUCTION

This paper examines the influence of two areas of technological research upon my art practice. For me, technologies provide inspiration in a variety of ways. It can begin with a simple instinct on first contact with a technological object, a system, or a scientific idea. Often, an extended period of play or exploration with the technology needs to take place before the artistic possibilities reveal themselves. The two main areas of technological focus in this paper are Artificial Life and Augmented Reality, with particular attention to the development of ideas and philosophical concerns underlying the art that I make. Examples of completed works and works in progress will be shown. It is my intention in doing this to examine some aspects of the artist's role in unraveling the meanings nesting within technological and scientific endeavors.

1. ARTIFICIAL LIFE

The Spell of the Mirrors...

An old Chinese legend [Peat and Briggs 1989] tells that, during the time of Huang Ti, China's mythical Yellow Emperor, mirrors were not solid glass as they are now, but were gates into the world beyond the mirror. Beings from this world and the mirror world regularly passed through the mirrors to visit and to trade. This balance was upset when the armies of the mirror world came through the mirrors and tried to invade. There ensued a long and awful war. To avoid defeat, the Yellow Emperor cast a powerful magic spell on the mirrors. The mirrors were sealed shut and the mirror-folk were forced to endlessly copy our appearance and actions. Since then, we have come to mistakenly believe that the specular world is a mere reflection of our own. However, it is said that the spell, although powerful, is only temporary and will gradually wear off. We will look in the mirror one day and notice that our reflection is somehow different. Maybe the movements will differ slightly from our own, or our skin will seem a very subtly different shade. Before long, the way between our world and the world beyond the mirror will once again be open, and our illusion of symmetry will be shattered. Glancing away from the mirror, we may fail to notice that our image continues to gaze at us.

In 1902, Charles Horton Cooley [Cooley 1902] suggested that much of our sense of self comes from our perception of others' perceptions of us. All the information about ourselves from our physical and social environment is somehow built up into a composite looking-glass image that we recognize as our self. We also make some kind of internal models of other people and situations to help determine the most appropriate of several available courses of action in a given situation. Constant comparisons are being made between the world as we really experience it, and our internal representations of the world (and our self). Viewed from this perspective, we have already been in a state of daily interaction with virtual worlds and with virtual characters since long before "virtuality" ever became associated with computers. The computer provided us with a new kind of mirror through which we could examine our selves and our world. As it becomes more sophisticated, the computer increasingly provides another world that we can adjust and remodel to suit our personality, a mixture of reflection and expression of self. The computer is slowly becoming a social artifact. It is inevitable that such an artifact, given the ability to modify and adapt itself, will eventually do more than simply reflect its user. Computer languages allow expressions to respond to their environment and even create new expressions effectively becoming a new form of life.

Artificial Life

Much of my pre-computer artwork attempted to create some feeling of vital presence, the sense that one is in the presence of a living thing. I wanted to make artifacts that felt in some way alive for the observer. I was also influenced by John Cage [Cage 1990] in his attempts to step back from the process of authorship and intentionality, allowing the artwork to find its own shape and identity. When I first read about artificial life, I became very excited. Here was a technology that had both semi-living qualities and the potential to evolve artistic products that were largely out of my control. I wondered what effect evolved technologies would have on the human psyche. Imagine, for example, that the supermarket shelves contain products, the workings of which are a mystery to even the engineers responsible for their "design." Will we be in any way disturbed by the fact that we are no longer masters of our technology, or will we simply consume the product without thinking about it? I felt that artists could somehow prepare society for this kind of change. Also, I believe that any art that uses, responds to, or seeks to interpret science and technology must grow from an aesthetic, based more on systems and processes than on objects and images. I think that if people learn to see such beauty in art, it may deepen their appreciation of (and respect for) nature. If a tree is only seen as a pleasant object, then the fact that it grew to a particular shape from a tiny seed, the fact that it provides a home to a community of organisms and is part of a larger community of organisms, its systemic beauty, is lost to the viewer.

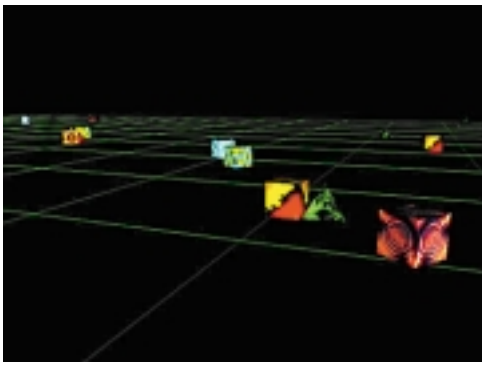

Figure 1. *Feeping Creatures,* 1997

In 1996, knowing little about computers, I was lucky to find Tom Mander, Brian Murray, and Ben Ross, programmers who helped me turn what was at first a vague idea into a finished artwork called "Feeping Creatures, an interactive virtual environment that runs on an SGI O2 computer. The world of "Feeping Creatures" is a featureless green grid populated by colored cubes called feeps. The feeps wander around the grid looking for food in the form of green triangular pyramids referred to as trees or looking for mates. Hunger and sexual attraction are real physical forces in their world. Each feep has a sequence of musical pitches that it inherits from its parents. Half comes from its mother and half comes from its father. The trees each contain one note-duration value. When a feep eats a tree, the tree's duration value gets added to the feep's internal list of durations that makes up the rhythm with which its pitch sequence is played. Feeps mate according

to the average level of musical consonance or dissonance between their respective pitch sequences. Some of them prefer a higher level of consonance, whereas others prefer more dissonance.

The piece is installed in a dark room where the video output is projected onto a screen. The visitor uses a mouse to move an imaginary camera around. The camera position serves as a virtual microphone so that nearer creatures are louder, and distant ones are not heard at all. As feeps move, their sound moves with them so the visitor can still hear creatures even when they are behind and not visible on the screen. The basic idea was to make something that would keep on changing and deliver up an endless variety of novel melodies and rhythms totally outside the control of either the audience or the artist.

In practice, however, things are not so simple. Usually the music produced is a fairly even mixture of all 12 pitches in the western chromatic scale (people have likened it to late Schoenberg). When a number of creatures with a preference for similar-sounding pitch series happen to be in the same area, they mate very quickly, as do their offspring. They very quickly become in-bred and use up all the available food. Soon, the whole population of the world all end up playing the same melody. The piece might run for eight hours or more without this happening, but, once the right combination of factors happen to come together, the "hillbilly effect" can take over the whole world in just 10 minutes or less. This kind of surprise outcome is one of the things I find compelling about this kind of project. However, although I was exhilarated by the strong sense of vital presence when interacting with this work, I still felt unsatisfied with the amount of spontaneous variety created by the work. It appeared necessary to expand the model of the world to make it more complex. The result: two new artificial worlds.

Over the last two and a half years, I have worked on two other artificial life and music projects, *Gakki Monster Planet* (in collaboration with Palle Dahlstedt and Catherine Haw) and *Listening Sky* (with Alan Dorin and Wasinee Rungsarityotin). The two pieces complement each other in terms of the kinds of interaction available to the user.

Figure 2. *Gakki Monster Planet,* 2000; *Listening Sky,* 2001

"Gakki Monster Planet" is like a video game, complete with joystick. The visitor navigates a mountainous psychedelic landscape populated by creatures that also play music. The sound is a rhythmic, bleepy, "bio-techno" music, complete with dancing trees that make percussive sounds. The creatures are capable of a huge variety of sounds because many aspects of timbre are also part of their genetic makeup (imagine having a separate gene for each of the knobs on a large synthesizer). It is possible to grab individual creatures and drag them to where there is food or place them anywhere else in the world. It is also possible to induce two creatures to mate in order to influence what kind of sounds will be played by the offspring. Eventually, it will be possible to practice crude forms of farming by breeding selected creatures in special enclosures, or just shooting the ones we don't like.

Listening Sky, on the other hand, has a more ethereal and immaterial quality to it. The visitor's viewpoint is always at a distance from the spherical world and, like "Feeping Creatures," the visitor can only move a microphone around and listen to various groups of creatures. No direct action in the world is permitted. Like "Gakki Monster Planet," the sound is also richly varied due to evolving sound algorithms. In "Listening Sky," we tried to get away from the appearance of shaded polygons in favor of a more painterly approach to the rendering of the world. The sphere of the world itself is invisible, defined only by the paths of the creatures as they move around on it. The feeling is intended to be more meditative and detached.

As a pair, the two artworks are meant to give visitors a taste of being two very different kinds of god. In one, they can intervene and determine to some degree the music and events in the world. In the other, they must simply move around and enjoy the sights, sounds, and behaviors of the world. When working with programmers, I consider them to be co-authors of the artwork and not merely vehicles for the artist's grand vision. Maybe it was my early experience making music with groups that convinced me that the familiar synergy could not possibly result from any one of the separate players working alone. Programmers are often quite creative and have a strong sense of aesthetics. Through their discipline, good programmers develop a strong intuitive sense of systemic beauty that is able to adapt to an artist's perspective in a collaborative project.

Although work constraints have forced me to suspend development of these two works for the time being, I hope to eventually exhibit them together as a pair. I think that, at this point, I have run up against a major stumbling block that has hampered progress on all three of the artificial-life-based works. I am preaching an aesthetic of systems and processes, but I do not have sufficient knowledge of those systems and processes on the most fundamental level. In trying to evade intentionality, I also evaded responsibility for the code itself. The only way through this is to become a programmer myself, in order to allow the kind of tinkering and discovery that characterized and strengthened my earlier sculptural and musical works. This has forced me into a re-skilling phase combined with a re-evaluation of the conceptual foundations of this work. To create a compelling aesthetic experience, the works should develop beyond their current state as a simplified reflection of existing nature. A powerful sense of vital presence will only come when we feel the eyes of our reflection gazing out at us.

2. AUGMENTED REALITY

Dad's Garage
When my father's Alzheimer's disease became severe, many relatives wanted to clean up his garage and throw out a lot of the useless junk that filled the entire space. My brother was against this. He said that every item in the garage was a part of Dad's mind, "When Dad goes into the garage, he might pick up some object at random and recall various memories and thoughts connected to that object. All these objects function as symbols and index markers for his thoughts and memories, and, in a sense, they are his thoughts and memories." It could be argued that meaning-laden objects are a part of our mind in the same sense that our tools and artifacts may form an extended

body that co-evolves with the biological body. [Dawkins 1986] Objects themselves become symbols and symbols become objects. Objects may have both real and virtual aspects at any one time. In the light of this, the distinction between "real" and "virtual" gets as fuzzy as perhaps the distinction between mind and body. It is not surprising then that we continue to externalize these boundary crossings through technology.

Augmented Reality

Augmented reality creates a gateway between the world of physical experience and the world of symbols. If virtual reality allows us to pass through the plane of the screen and immerse ourselves in the specular realm, and artificial life sows the seeds to let this other world come alive, then augmented reality provides the means for the virtual world to extend back through the mirror into our everyday world. During the course of my work at ATR Media Integration and Communications Research Laboratories in Japan, I became familiar with a technique, developed by Hirokazu Kato of Hiroshima City University [Kato and Billinghurst 1999] that allows the computer to identify and track various special markers via a camera. Because the computer can identify a marker, along with its precise position and orientation in relation to the camera, it is also possible to composite a computer-generated image into the "real" video image. This can be done with a (relatively) low-cost head-mounted display with a camera attached. When working with technology, I often equate redundancy with poetry, and this apparatus is deliciously redundant. When you wear this device, you are using a video screen strapped to your head to see (via the camera stuck on the other side), what you would be seeing anyway if you didn't have a video screen stuck to your head. Of course, the reason for this is to allow the computer to add 3D VRML objects into the scene. When you pick up a marked object, you not only see the object and its pattern but also a 3D object generated by the computer.

Figure 3. Looking at patterns through HMD

The snake shown in the picture can be turned around and examined from any angle by manipulating the card with the special pattern on it. If the camera's view of the pattern is blocked, the object disappears. It is also possible to "project" video onto a virtual screen and move that screen around like any other object. When I first saw this system working, I knew that it was significant and that I wanted to use it to make an artwork of some kind. First, though, I opted for a more functional, entertainment-oriented project.

Computer scientist Ivan Poupirev and I devised a gestural controller that allowed people to mix and effect pre-composed dance music by waving a selection of old LP records around in the air. Each record controlled a different music track, and movement and rotation on the up-down, front-back, left-right axis, together with shaking the record, each had a different effect on the music. The Augmented Groove was a popular demonstration at SIGGRAPH 2000. I am now developing a related system that allows a user to compose music by arranging cards on a table. Three-dimensional graphic representations will assist them to intuitively learn about musical structure as they play with the system.

I am now working on my first augmented-reality-based artwork. The main focus of the piece is a re-telling of the legend at the beginning of this paper. Because computer vision is an important part of the technology used, I want to explore the relationship between what the computer "sees" and what the human sees, and to create tensions between their respective interpretations. The system is capable of learning to recognize any simple, iconic image. This gives a lot of scope for the creation of some kind of structural tension between the images on the actual markers and the VRML characters associated with these images. To retrieve the meaning in the work, the visitor must enter and manipulate the marker objects to find the roles and relationships between them. The visitor must look between the clues in the physical world and the virtual world to pick up the threads of a non-linear narrative that weaves back and forth through the plane of the screen.

CONCLUSION

I hope to bring both artificial life and augmented reality together at some point in the near future. Together, they represent a massive collision of universes. They open a territory at the intersection of culture, technology, biology, the physical, the symbolic, the real, and the virtual. Perhaps the Yellow Emperor's spell is a metaphor for language itself. Long confined to description and reflection within the printed page, language now begins to reach out with newly grown eyes, ears, teeth, and claws to explore the more plastic computational space. Perhaps our mastery of technology will give way to a kind of husbandry. Perhaps we should encourage such a technology to become our friend. As an artist and as a human, my relationship to technology is one of playful partnership. I am lucky enough in my work to be in a position to influence the development of some of these technologies. The technologies, in turn, influence my ideas and my attempts to find meaning within their workings. This has led me on a journey spanning several years and thousands of kilometers, back and forth through many strange mirrors. I imagine the journey's end with myself as an old man, sitting on the floor of my own garage, wondering: "What does this technology mean?"

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Tobey Crockett

Fun, Love, and Happiness — or The Aesthetics of Play and Empathy in Avatar Worlds

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I was asked recently why I would be interested in theorizing on play outside of the context of games and persistent environments. The answer has to do with the processes of creativity, self expression, and authorship that arise when we consider interactivity in virtual worlds. Artmaking as play, and empathy as a foundation of collective authorship, are the central themes of this talk. But is that art? If one allows that art is an outgrowth of a set of techniques, tools, conventions, visual histories, aesthetic vocabularies, and above all an urge of creative self-expression then we would have to say yes. If, additionally, we posit that the digital medium may, perhaps, bring with it a special quality that we have not yet pinned down, despite various efforts to do so, then I would like to suggest that that special digital quality is reflected precisely in aesthetics of play, empathy, and a sense of collective identity and multiplicity of authorship.

I have earlier discussed the idea of the computer as dollhouse as a way to focus on 3D virtual worlds. I chose these worlds as a platform because I observe that interactivity can be explored more fully here than it can in other arenas of the Web. My own interest in interactivity started in the 1980s in the artworld of New York, where I was increasingly drawn to artwork intended to be shared with large numbers of people, not just as viewers, but as envisioned and empowered participants. I was interested then, as now, in artists who saw the audience as necessary co-creators and completers of the artwork. Rituals, performance, and interventions into public spaces were for a time very common in the East Village and Lower East Side — events that harkened back to earlier artists such as Allan Kaprow and Happenings, the international network of Fluxus artists, the art and culture interventions of Joseph Beuys, and the Situationists in Paris, to name only a few. As Lev Manovich has noted, there are quite a number of authors, himself included, who look to art history to explain a variety of phenomena that are now resurfacing in the guise of the new digital media.

With this art historical framework in mind, I had the good luck to become a student under cyberphilosopher Dr. Michael Heim at the Art Center College of Design. The Art Center team had previously developed a virtual world in the ActiveWorlds 3D browser, a world called ACCD, in which we began to do some serious probing of the limitations and possibilities of avatar worlds. Together, we created an event series called CyberForum@ArtCenter where we hosted live in-world author chats with various digital theorists. I will discuss these events in more detail later. ACCD spawned another world from the Art Center teams — VWD; and I myself have developed a small world, TCWF, which stands for Tobey Crockett's Wild Frontier.

By definition, avatar worlds are 3D spaces shared in real time over the Internet, worlds in which our agency is represented by an avatar. I am interested in non-narratively driven worlds, worlds that function as creative play spaces for self expression. These worlds can be found in browsers such as ActiveWorlds, which has two universes, including one for educational purposes. Other formats include Adobe Atmosphere, which is a tool for publishing online 3D spaces. Other environments do exist, such as CyberTown in Blaxxun or some of the worlds from Worlds Inc., but they have an more of an emphasis on their own narrative structures and limitations, which are not pertinent for our purposes here.

Notions of play and childhood may be argued as arising from a complex of social constructions heavily indebted to the 19th century. We might think more about how reality itself also arises as a construction indebted to play, a social system within which we are heavily entrained from birth. Psychologist David Winnicott, in his groundbreaking book, *Playing and Reality* (1971) describes the role of the toy as a transitional object that allows the infant to ascertain that there is indeed a world out there beyond baby and mother. The toy is the first evidence of the world, creating a transition for the baby and pointing the way to inner and outer, public and private, self and other which is part of our essential tool box for functioning in this material plane. Through toys and playing we forge relationships with a material reality that we discover is at least partially under our control. Of interest to me is the way in which we enact the same kind of relationship with reality construction in the highly specific instances of virtual world interactivity and world building. The avatar is the transitional object of cyberspace, helping us to learn what is "us," what is "not us, and about the new reality of cyberspace.

Moving from child development to the nature of interactivity, we can ask: while interactivity is often defined as relating to a human/computer interface (HCI), what does it mean if we instead give primacy to a peer-to-peer (P2P) relationship? Peer-to-peer is an autonomous technological connection between humans enabled, rather than subsumed, by the computer interface. With peer to peer, we can explore a model of interactivity predicated upon the empathetic resonance between co-creators. Just as contemporary literary theories supplant the hierarchy of author/reader with a new model of distributed authority, so too the distributed architecture of creative authority in virtual worlds posits reception as characterized by active co-creation and interactive participation. When the definitions of reception and audience are thus expanded in the digital context to encompass mutual participation amongst co-creators, what we term a kind of play, it enables us to consider further some important ethical and aesthetic issues related to virtual worlds and interactivity.

One way such ethical and empathetic issues are raised is through the switching of points of view allowed in some, but not all, browsers. By seeing out of the "camera eye" as we see out of our real eyes, we imitate the eye as camera sensibility rehearsed so well in film and first person shooters. But in third person, we may also see ourselves distributed among the crowd with whom we are "hanging." Sometimes we are all in the same avatar and you can hardly tell where you are in the group, until you see the text over your head. In this way, the experience offers an opportunity to discover a new sort of empathy, for when I meet someone else wearing the avatar I usually assume, I have a warmer feeling for them. "Oh you like the penguin, too!" This seemingly small detail about ease of POV relocation broaches significant philosophical issues about the dialectics of posthumanism: self/other, inner/outer, public/private, real/Memorex. The transitional nature of the avatar I mentioned earlier allows us to partially resolve these conflicts.

Turning to authorship and aesthetics in virtual worlds, let us keep in mind these topics of play and empathy. Unlike in a one-way, top-down hierarchical architecture, interactive approaches require a deconstructed "toy box," an authoring kit with which participants can create stories of their own invention. They can take advantage of the distributed nature of avatar worlds — its hyperspace — to produce narratives with multiple threads and what could be seen as omnidirectional flow, rather than one-way reception. Current authoring kits used by ordinary users tend to be rather limited. There are plenty of game-mod artists having fun, but what about the rest of us? Game-based and role playing authoring

kits, with their narrative-heavy agendas, do not allow ordinary users much freedom of aesthetic choice, as all the options are necessarily weighted to the specifics of the particular story arc. Contrast this problem with the nature of avatar worlds in which there is rarely if ever any kind of narrative structure to constrain the authors, and where the visual building materials for ordinary users are often too much involved with replicating the real world to allow for much fantasy. Truth be told, this can sometimes lead to the boring world in which there is little to find entertaining. Could there be a middle ground between these two types of authoring situations?

Many fresh ideas about interactive media technologies can be discovered in the current confines of avatar worlds. Certainly the introduction of better authoring kits intended as genuinely artistic tools for more ordinary users will enable the creation of more self expressive and unique 3D environments intended for multiple users. As an extension of the peer-to-peer psychology, being invited to visit, chat and share files in someone's 3D Web space complete with all their favorite music, pictures of family, special interests and links is a highly likely outcome, resulting in a widespread use and familiarity with 3D spaces linked online. Applications include community building, collaborative learning environments, artistic realms, self-expressive skill building, psychosocial therapeutic and multiple commercial uses.

Notions about the purposefulness of play well established in Victor Turner and the importance of multiple voices in the carnivalesque borrowed from Bakhtin give us insight into the somewhat chaotic realm of serious play in avatar worlds. To cite one example from 1999-2001, I participated in the CyberForum@ArtCenter author events I mentioned earlier. The theorists addressed topics applicable to the development of digital culture. In these events, not only was there serious discussion, but there were also organized rituals, and frequent chaotic interventions. While the topics were unquestionably fielded by Heim and his notable guests, the loose hierarchy of the virtual worlds encouraged spontaneous development of new ideas and often led to unexpected group discoveries.

It almost goes without saying that the main discovery, interactivity in virtual worlds, is the way a sense of telepresence and play turns out to be a highly collective experience in direct contrast to the conventional Western paradigm of individual performance. Jokes, rowdiness, outsiders barging in without a clue, the occasional problems with speakers who did not grasp the quasi-"talk show" atmosphere, flirtation, and general fooling around with the interface were all a necessary and often highly productive part of the events. Accidents, complaints, and outsiders were often the greatest contributors to our discoveries of fresh potentials inworld, and this contributes strongly to the playful, spontaneous, and fluid qualities which distinguish the virtual environment. But I believe this would not have worked without a genuine sense of empathy, expressed as a team spirit, camraderie, and clarity about our goals shared amongst the main players and repeat participants. It was a particular combination of factors, but ones that are replicable in my opinion.

In the CyberForum events it quickly became clear that in order to more fully explore the potential not only for chat but also for avatar movement, we needed to develop a new approach to the embodiment of avatar worlds. We developed the idea of the "avatar ritual," and explored many forms of virtual performance that allowed us to connect not just textually, but also telepresently with our guests. For example, with guest speaker Niranjan Rajah, we discovered that a design flaw in my Pinkie avatar could be exploited in a fun way to try to exchange body parts in a kind of dance with one another. We called this the "Pinkie Dance," and many of us agreed that this playful interaction produced some of the greatest feeling of actual presence in cyberspace that any of us had ever experienced. As game designers already know, the psychological investment in play can be very profound, with direct implications for telepresence; and of course, it is much more fun to play with others than to play by yourself. These playful avatar rituals broke the limitations of chat and allowed us to explore, and in some cases bridge, the dualistic limits of inner and outer, public and private, and self and other in ways which were unexpected and sometimes even emotionally satisfying to the participants involved, most of whom were in such remote locations as Malaysia, Sweden, India, Italy, England and various parts of the United States.

Even before questions of avatar performance could be addressed, however, the topic of architecture had already led previous ACCD teams to develop an unusual and surreal architectural vocabulary. Just as real world architecture and aesthetics significantly impact the types of behaviors and activities of real world humans, so too virtual architecture in avatar worlds impacts the ways in which avatars use space to interact with one another. Virtual worlds which attempt to replicate the real world as we know it are often dull and boring to visit, with too few "play" opportunities to allow avatars to interact with one another. This reflects the problems of attempting to translate one set of rules developed in response to physical constraints to an environment that has its own set of nonphysical constraints, often leading to frustrating worlds experiences for avatars.

Prevailing concerns about realism, i.e. that visitors to virtual worlds will not be able to navigate well in an alien environment, unfortunately often lead to the strip mall-like development of browsers such as ActiveWorlds. Issues of illusionism still tend to dominate the aesthetic questions foundational to future virtual reality developments, and the often unsuccessful aesthetics of current virtual worlds often mislead critics to believe that nothing relevant occurs in these new cyberspaces. This may well be a matter of introducing a better visual vocabulary, rather than an inherent limitation of the design tools *per se*. On the other hand, worlds that are developed with "case-sensitive" ideas about providing virtually appropriate activities and gathering places for avatars are often more successful. Just as in any other art form, the more the world builder acknowledges the specific constraints of the world browser in which s/he is building, the better the result.

In virtual worlds, where we build and play at will, we co-opt the role of author that creates our world. This, combined with the empathy that arises from our visual cloning, generates emotional investment in the immateriality of cyberspace. The word "avatar," from the Sanskrit, means to cross down into. Cyberspace is not up there in heaven or outer space, all deferences to Margaret Wertheim and Hans Moravec. When we "cross down into" cyberspace and our avatar, we bring a whole set of constructs down here with us at our own virtual level. There is a responsibility inherent in such a notion, and as many digital artists ranging from Natalaie Jeremijenko of the Bureau of Inverse Technology to Steve Kurtz of the Critical Art Ensemble tell us, we are creating our own digital culture and cannot abjure reponsibility to some outside agency for what goes on here.

During a Gender and Technology panel at UC Irvine this spring, anthropologist Dr. Victoria Bernal said in her observations of Internet use in the cybercafes of Eritrea that there is a definite collaborative dynamic as several people team together to explore the net. Mutual teaching, English language sharing, and the devising of strategies are all part of this collective experience. "Maybe the individual is not the primary interest in a transglobal subjectivity," she said. My own observations about play in virtual worlds strongly support this notion. The invest-

ment in an individual heroic figure of cultural production may be a myth whose time has past.

For future exploration, it would be fruitful to remember that there are already models of collective identity and creative collaboration that stand in stark contrast to the Western paradigm of maverick genius and its persistent sidekick, intellectual property. Such a multiple subject is recognizable to theorists such as Deleuze and Guattari, Bakhtin, and many others, including numerous scholars of Buddhist philosophy, such as Robert Thurman and even the Dalai Lama. In a variety of Asian cultural models for instance, the act of so-called originality is less valued than the ability to manifest an already established mastery over known constraints; it is not "the shock of the new," so much as the contribution to the "commons" from which others may learn to emulate good and beautiful uses. A sense of modularity and the development of a re-combinatory vocabulary are widespread. Indeed, in many cultures and time periods, the recycling of stylistic elements, narratives, ornamentation, and structural devices in order to demonstrate mastery, and to enrich and enliven a cultural discourse rooted in a traditional heritage, is in fact the norm.

As artist and curator Antoinette La Farge suggested to me recently, the history of art is fraught with collaboration, from the great painter with a slew of assistants to the film industry. Add today's diminished claims for authorship, and a new sense of the collective and collaborative gains authority. This can only occur where there is a sense of flow, looseness, and participation, where respect and mutual reciprocity is a dominant characteristic. While it by no means characterizes all inworld situations or exchanges, it can and does occur, as repeat performances of the CyberForum@ArtCenter were able to demonstrate.

These are just a few examples of the aesthetic concerns raised in considering avatar worlds as places of co-creation and participation. It is only by making 3D authoring tools accessible to a broader audience that we will be able to better understand what we mean when we talk about collaborative environments. We will have to evolve a set of aesthetic theories that allow us to assign creative roles to the behaviors of play and empathy that emerge as characteristic of virtual environments. Aesthetic avatar play allows us, at least some of the time, to address the perceptual nature of embodiment in virtual worlds, psychological investment in telepresence, rules by which we may successfully collaborate at a distance, appropriate behavior for discussion and remote learning situations, nonverbal cues for communication, and what it means to share a collective identity.

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Feminist Transgressions? Object and Process in Transgenic/Genetic Works by Women

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1. BIOLOGICAL AND GENETIC ART

Interest in new technologies has fostered a growing interdisciplinary exploration between artists, scientists, social scientists, and designers. Particular types of artwork have held attraction for the artist-scientist in the 20th and 21st centuries: artificial life, evolutionary art, and genetic art have been created by those with an interest in science and organic structures. Concerns inherent to these contemporary interests are centuries old;[1] the use of novel technologies to mimic or create life can be traced to the Ancient Greeks, Jewish, Chinese, and Egyptian cultures, in which stories of famous pneumatic automata and golem originated.[2]

Artists and scientists can now transform and create biological life. The ability to merge, alter, and create genetic code, the basis of all the life forms we know, changes the vocabulary, the attitudes, and the possibilities within all contemporary discourses.[3] Such discoveries shift artists' relationship to technology and bodies, pushing what once were two areas of research as a result. Genetic research offers, and demands, artists' attention because of issues of scientific authority, notions of biological and cultural norms, and the real and supposed transformative possibilities of biotechnology touted by popular media. I became interested in genetic work in my own practice, moving from networked installations, online games, and viral computer applications toward physical and biological manifestations of such work. One current research project incorporates the use of bacteria and products of everyday life in an attempt to understand what science considers dangerous, beneficial, or useless material, and to examine such categories under a lens necessarily critical of scientific discourse. Clearly, scientific process is at the crux of meaning and material in biologically based art forms.

The main line of inquiry in this paper is to explore whether women working at this frontier employ alternatives to scientific process in their "science-influenced" creative practice. How do both the means and the ends of women's biologic practice differ from an area historically dominated by traditional scientific practice? Amy Youngs, an installation artist, points out in her essay "The Fine Art of Creating Life" that a clear mark of a biotech artist's work is a creation that does "not reinforce the hierarchy that places humanity at the apex."[4] Is this happening, and how would such a restructuring manifest itself?

There are three important conceptual territories which have become vital areas of biotechnology art research. First, there are works that stand alone as modified beings or objects, which originate from the ideas and work of the artist. Second, there are works created by artists to react, change, and survive within a particular set of circumstances or environments. The third category goes further to question the very means and process by which the work is produced.

I'll explore these ideas by examining the work of several contemporary artists. Significant alterations in the pieces discussed here include the role of process, the role of the author/creator, and the contradictory role of technology in the works. The stakes in this investigation are high; scientific processes must be examined and questioned when considering the rhetoric of creation, mutation, reproduction, and cloning, for these concepts and languages function amidst traditional rhetoric, techniques, and processes from scientific venues. In exploring products, environments, systems, and processes, the artists discussed here call attention to the social aspects of science.

2. ORIGIN OBJECTS

The exploration of creation—asking "what is the origin?" of ideas, organisms, of life itself—is particularly important to biotechnology artists working at the cutting edge of art and science research. The artist Eduardo Kac has set several precedents in this area. Kac began breaking the "body boundary" with his work *Time Capsule* (1997), which featured a chip implant in the body. Bodies are further explored in his transgenic art. In his most well-known work, *GFP Bunny* (2000), a rabbit was bred and genetically modified for Kac by scientists in France. This transgenic work was the creation of a rabbit which, through genetic manipulation, glowed green under certain lighting conditions. The bunny, Alba, is a product of "original" thinking, that is, the work explores the ethics and cultural implications of authoring life, indeed, the origin of life, and the piece is heralded by many critics as signaling a significant shift in conceptual art practice. Kac notes that phase one of the project is the birth of Alba[5]— not the process of creating her or the scientific processes involved in her genetic modification. His most recent works, *Genesis* and *The Eighth Day*, push the authorship implications of creating synthetic transgenic life forms. *Genesis* encodes biblical language into cells of microbes. As in the Bunny project, Kac directed a laboratory to encrypt his version of a Biblical phrase, "Let man have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moves upon the earth," first converting the language into Morse code, then into four letter DNA patterns.[6] Building on Genesis, *The Eighth Day* encompasses both the creation of and the environment for the organisms: the organisms live inside a visible exhibit/habitat. Kac argues that *The Eighth Day* offers an expansion to traditional ways of considering biodiversity by offering forms beyond those naturally available.[7]

Clearly these projects offer compelling examinations of bioethics and the power of creation. Kac's work has been important for the number of ethical issues brought into mainstream and artistic discussion. The viewing of the creation of life as a discrete act, however, and the "product" focus of genetically based artwork is problematic for many artists, scientists, and critics of contemporary culture. Artists such as Christine Borland work to examine the issues of production and reproduction of life in context.

Reproduction issues have been a central concern for feminist scholars, critics, and theorists, so it is no surprise that a handful of women artists have delved into reproduction and cloning issues. Like Kac, Scottish artist Christine Borland interrogates issues in human genetics. Rather than focus on outcomes, the artist concentrates on the questions of authorship, ownership, and individuality. Her *HeLa Project* (2000) explores the problems with high-tech monitoring and flagging of reproductive processes that map "undesirable" genes.[8] Borland notes that certain health conditions are "marked as problematic" during the course of pregnancy, but then goes on to question the motivation behind such marking: because such conditions are often incurable, the "monitoring" and advisory role of technology becomes instead one of elimination of the gene or the gene carrier. Her work *Spirit Collection* (1999), developed in cooperation with scientists at the Scottish Wellcome Institute and the Glasgow's Medical Research Council, features living cells of 1950s African-American cancer patient Henrietta Lacks. The cells were originally taken for scientific research from Lacks after her death in 1951. Since then, the cells have continued to duplicate and grow so now more of her cells exist than when she was alive. This case spurs

an important debate about who owns research cells and the length of time research on human cells can be conducted. Borland's work pushes both the material and social questions by using Lack's cells herself, exploring issues of DNA as property, a person's rights to his or her genetic materials, and issues of race and class in scientific research.[9] This work carefully examines the sets of assumptions necessary to produce new cells and new life artifacts.

The artist's intention in biological creation differs from corporate research groups and the biotech industry. Yet unlike Borland, who is interested in how the system she designs is established on critically informed ties to its material world, questions asked by Kac in his work are narrower, focusing on the responsibility of the "creator" to the living genetic product rather than on the system which produces the organism, or the role of the organism within a system.[10] The critique Kac offers echos a science and engineering paradigm in which industry-driven scientific practices focuses on outcomes: engineering, specifically, tends to find "technological fixes to complex problems, and by ignoring the complexity, generates new ecological problems which are later defined away as 'unanticipated side effects' and 'negative externalities.' Within the engineering ethos it is impossible to anticipate and predict the ecological breakdown that an engineering intervention can cause. Engineering solutions are blind to their own impacts."[11] Similar to the way engineering fixes problems while ignoring complexity, scientists and engineers commonly conduct research without regard to the political nature of such work. This tendency extends into many areas of technology development, including hardware and software development. The emerging field of biotech or transgenic art must be read alongside this uncritical context. Artists who utilize transgenic processes in their work share a common understanding of the immense importance of the social and political ramifications in the use of genetic engineering and biotechnology.[12]

3. CIRCUMSTANCE OBJECTS

A key intellectual and artistic question in many projects by women artists concerns the circumstances in which the creation of the work lives. The development or study of particular environments is an essential element to these works, as is how the environments affect and change the life created. As an example, researcher/artist Natalie Jeremijenko created a series of projects dealing with environmental effects on similar or identical works. She notes in describing the context of the project, "cloning has made it possible to Xerox copy organic life and fundamentally confound the traditional understanding of individualism and authenticity."[13] Her multi-year *OneTree* project consists of one hundred trees that are clones of a single tree, grown in the late 1990s and planted in 2001 at various sites around the San Francisco Bay area, including private properties, schools, and Golden Gate Park. The project's goal is to explore the environmental influence on life by planting the trees in various locations, reflecting both the social and environmental conditions of cloning.

Cloning discussions revolve around the central concern over boundaries of the self and the other. This involves ethical issues that posit the creation of clones as "unnatural" or potentially unhealthy, as well as social and legal issues in terms of the way ownership, copyright, and other identity issues will be worked out.[14]

In the microbiological work of Sabrina Raaf, the environmental influence on life is explored within a designed system rather than a "natural" environment. In her project *Breath II: Growing Pleasure* (1998), Raaf created a sculptural home for micro organisms, creating a host body complete with "organelles," or hollow body forms, connected with a network of latex tubes. Raaf created these artificial organelles by sculpting conduits in ground beef and then casting into clear rubber for tubing. The insides of the organelles and connecting tubes are coated with agar and house Serratia marcescens, a red colored bacteria. As the red bacteria grow, they move up the network of tubes, and "slowly (re)fill all the organs with life."[15] Conceptually, Raaf argues that "the lifeless meat (ground beef) that was used to create the organelles will be revived into a new self-sustaining, wall-mounted, organismal network."[16]

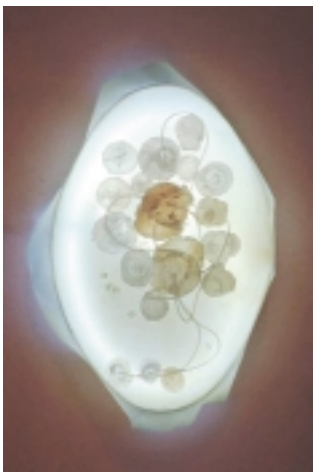

Figure 1. *Breath II*, Sabrina Raaf

Breath II grows a master organism that significantly represents the artist's process in conceiving the work: the sculpting of the tubes and conduits for future inhabitants out of ground beef suggests a preoccupation with the material body, flesh, and the transformative states of flesh. Works like Raaf's help us recall that life, human and otherwise, begins and ends in precarious environmental conditions and carefully constructed social conditions, bringing to mind feminist critiques of human nature as "socially constructed" rather than pristine, pure, or otherwise romantically natural. Thus, the focus of this work is both to rematerialize artistic practice and prioritize a life system over the logic of human desire. The Jeremijenko and Borland work explored here delves into notions of environmental effects and social conditions, while Raaf's considers these ideas in light of creating a new environment for created life forms.[17]

Cultural interest in science--in particular, biology--and the role of genetic makeup in determining life, are our most technologically advanced possibilities, where a desire for mimesis and anthropomorphism manifest in other life forms. How does the material and conceptual form and context of creation of genetic code influence artistic practice? As the sciences and arts merge in interesting biotech projects, it is intentionality of the research that distinguishes the divergent research goals of scientists and artists, and the ultimate role of the artist's work. However, the above projects do not fully reflect an in-depth critique of scientific process. The systems that are established in order to produce cloned trees, glowing rabbits, or biblical genetic translations require intensive examination to ensure they do not reproduce customary research results.

4. PROCESSES

With the failure of immersive virtual reality to immediately alter our everyday human experience, one may argue that bodies are the fundamental domain for the development of art. Some artworks adopt an ideology of mastery of the environment on a body system, turning bodies into frontiers for domination, control, and mastery. If scientific processes

are not questioned alongside issues of the creation, reproduction, mutation, and environments in these types of works, the critique of practices in biotechnology and technologies of reproduction remains a hollow one. In order to comprehend their importance and political significance, the processes used to create biotechnological art must be questioned and brought to the forefront.

Andrea Zittel's project *Bantam Breeding* was originally intended to reflect all phases of life: creation, by raising bantam chickens; destruction, by killing the chickens herself; and preservation, through taxidermy. Through this process, Zittel could chart the system of objectification, creation, possession, and control of life, showing that "breeding is the ultimate form of ownership."[18] During the implementation of the project, however, she decided to focus on the breeding of the chickens. Zittel created her series of "breeding units" for encouraging certain aspects of bantam life over others in order to create a "more natural" bantam chicken as a long-term project.[19] Another unit, *Breeding Unit for Reassigning Flight*, is a nesting environment that is designed to re-encourage flight for the currently flightless breed by situating the egg nest high up in the unit. The *Breeding Unit for Averaging Eight Breeds*, allows cross breeding between the eight breeds of Bantam caged in the unit. Zittel has displayed the units as art pieces in order to make her breeding project and process public.[20]

Another project by Sabrina Raaf allows us to study the environments produced from and between human interactions, while also examining process, and just as importantly, touches on the ethnic and racial implications of biological work. Her project, *Breath Cultures* (1999), is an installation that explores environments: how space is socially defined, and how life from one organism to another is transmitted through space to new life environments. Using the breath of those visiting the exhibit, Raaf cultivates visitors' unseen "cultures" (i.e. oral flora) exhaled by the visitor/participants. "By making this visible by means of culturing the biological material of each breath, [Raaf] point[s] to an identity for the escaped space which exists between us. This is a space where cultures intermingle through the life of ideas and also of living biological material."[21] Raaf collected breaths from participants of 17 different ethnic and cultural backgrounds whose breath on agar dishes formed the "seeds" of the piece. The cultures were then left in the gallery to incubate.

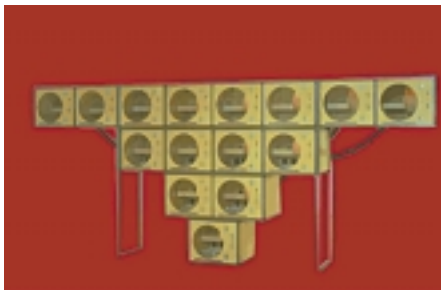

Figure 2. *Breath Cultures*, Sabrina Raaf

"The organisms which grew from each participant's breath embodied the biological (bacterial/fungal) portrait of that individual as well as that unique moment when their breath was taken."[22] Thus, Raaf's process and resulting project explores notions of time as well as space and material, and most importantly, pushes the notion of process and documentation of research steps to the forefront. The Raaf and Zittel works delve into the procedures in which creation and discovery are manifest. The discourse about these projects concerns not only ideas of creating life, but boundary spaces between "natural" and "unnatural" creations and spaces between the self and the other.

Other artists working in this area include Catherine Chalmers, whose work *Transgenic Mice* (2000), documents the process of producing genetically engineered mice in scientific settings; and Susan Robb, who sets up laboratory conditions for various projects in order to conduct non-hypothesis based experiments that investigate personal and social aspects of the scientific method. In all of the artists' work discussed here, the exciting and significant conceptual territories which have become cornerstone issues in biotechnology art research concern an integrated interrogation of the scientific processes used in both science and in creating biotechnological art.

The artistic discourse engaged with biotech and transgenic creative research helps us better examine the process of scientific creation and the placement of life. Such research creates ambiguities about notions of individuality; complicates polemics of gender and hierarchical, outcomes-based research processes; questions creation myths and the precarious question of "origins"; and asks us to examine the "natural" environment we in fact construct amidst a constructed culture.

5. CONCLUSION

For several decades, feminist scholarship in feminist ethics and reproductive technology, biotechnology, and genetic sciences has offered a powerful anti-utopian argument to the wonders of current and future body sciences. Feminist scholars have long had a particular stake in this area given the ties between women's bodies and gene therapy, cloning, and genetic reproductive issues. In addition, the stereotype of men as "hard scientists" has influenced the realm of genetic art. Those few women who are working at the intersection of genetic engineering and art have identifiable (and different) considerations than the trends in the movement overall. Yet, acknowledging that women's artwork might pose different questions to biotechnology and transgenics carries with them a very real danger of lumping women artists interested in biology into a separable, homogeneous group with some kind of "unified female essence."[23] This too is problematic. However, a discussion of trends and specific works should offer a range of responses, and allows us to recognize ever more varieties and author(itie)s in this area of inquiry and practice.

Feminism as a critical discourse is not often utilized in high tech arenas, and has not been a principal component in discussions about or the evolution of biotech art.[24] In these projects by women artists, however, there is true experimentation with definitions of life, difference, and environmental factors in genetic art, which grapple with issues sprouting from parallel developments in the sciences. In this context, the artist's work is perhaps more effective than feminist critics and theorists who are bound by hierarchies in language and thus have difficulty reworking the very hierarchical arguments and academic processes so often critiqued. By uncovering the very rules and processes governing scientific exploration as conceptual processes, women artists are calling attention to the social construction of science and the social and environmental contexts for art, science, and life. A crucial shift in perspective from object to process helps to move beyond the deadlock of conceptual art's true power to rethink systems. Amy Youngs's consideration of a biotech artist's work as a creation that does "not reinforce the hierarchy that places humanity at the apex" seems to be mostly true for women artists working in biological art, artists whose work also receives less attention than other transgenic authorities and artists.

This brief exploration is not an attempt to create a new canon of femi-

nist transgenic artists or a label for women transgenicists; rather, its goal is to expose the variety of threads operating in biological art and poke holes in the narrowly defined canons of technological art, which remain in the 21st century a handful of well-known names in the tradition of institutionalization. It is important to keep in mind that women artists who are working in the hybrid area of art and science are at least partly informed by a history of feminist scholarship in the zone between science and art. By breaking open canonical tradition, we follow the feminist critiques of science, ethics, and knowledge and apply them to biological art.

Biological art helps us understand our epochs, environments, sciences, and selves. Both natural and scientific processes—transitions, becomings, and transformations—have historically been veiled practices. We have responded by putting order into the succession by invoking empirically established but literally unintelligible sequences. If we consider product, environment, and process to be core elements of biological art, we are able to "situate processes and work toward material change without falsely seeking transcendent, static truths."[25] These conceptual projects can help the sciences (and the public at large) identify the social, environmental, and communicative importance of biotechnology and biological manipulation.

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NOTES

1. Sonya Rapoport makes references to the artistic and historic concept of the golem as early biotech art, and as art historian Ellen Levy has pointed out, as early as the seventeenth and eighteenth centuries works were suggestive of genetics in the way they present "natural evidence" in the context of a "great chain of being." Such shapes and forms were evidenced in the pre-Darwinian illustrations of Jan Brueghel II and David Tenniers the Younger. See Levy, 1996.
2. Eighteenth-century robots, such as the "scribe" by Jacquet Drosz which could write, or the mechanical orchestra and robotic duck by Jacques de Vaucanson which flapped its wings and ate, were developed at the same time as the first programmable device, the Jacquard weaving loom, and were constructed according to mechanical "logic" similar to Babbage's difference engine architecture. See Penny, 1995. For more information on Jacques de Vaucanson's duck, see info and diagram at http://www.personeel.unimaas.nl/H.Schotel/Eendjes/Vaucanson-eend.html
3. For example, new research by Freda Miller and colleagues at McGill University shows that scientists are able to retrieve stem cells from adult skin, thus making tissue for cloning and other biotech purposes readily available. See J.G. Toma et al, 2001.
4. Youngs, 380.
5. http://www.ekac.org/transgenicindex.html
6. Roberts, K. 2001. Transgenic Art Raises Issues About Life And Ethics. *Inside IT.* http://www.asu.edu/it/fyi/insideit/2001/05/article4.html.
7. http://www.ekac.org/transgenicindex.html
8. Mahoney, 2000.
9. http://www.henryart.org/gene-sis/artists_borland.html
10. In addition, artist Joe Davis wishes to battle science's representation of who we are by sending broadcasts into outer space. "By making this attempt to communicate with the other," he explains, "we're really communicating with ourselves." Joe Davis in Gibbs, 2000.
11. Shiva.
12. A parallel investigation to this paper would be an exploration of feminist critiques of modified foods and bodies from developing countries. Feminists like Vandana Shiva from developing countries, and Susan Wolf from the West, argue that the genetic manipulation of crops, animal, and human bodies are complex, non-binary situations that ultimately create more problems than they are able to solve. Artificial foods from the West, for example, are a manifestation of the West's bio-imperialism in developing nations. (Seabrook, 1990.) Vandana Shiva argued in the early 1990s that the importance Western society places on masculine scientific creation and the low value accordingly assigned to feminine procreation legitimates the encroachment of technological development into both the female body and the seed, allowing the authority of sci-

entific expertise to influence many facets of life. (Shiva, V. 1992. The Seed and The Earth: Women, Ecology and Biotechnology. *The Ecologist* 22:1, 4-8).
13. Jeremijenko, *OneTree*.
http://www.cat.nyu.edu/natalie/OneTree/OneTreeDescription.html
14. Science's relationship to women's bodies in particular is too large an issue for the scope of this exploration, but it remains an important and related area to explore.
15. Raaf, 1999. Artist's statement on personal Web site.
http://www.raaf.org/
16. Ibid.
17. More work explicitly treads in both territories, such as Laura Stein's Animal-Vegetable project in which Stein enclosed baby vegetables into copyright-protected, animal-shaped molds to shape the vegetables' physical attributes. See "Paradise Now Exhibition: Smile Tomato."
http://www.geneart.org/stein.htm
18. Zelevansky, 1994. Available online at
http://www.zittel.org/Pages/text-mmomasenseandsensibil.html
19. Hofmann et al, 1999.
20. Ibid.
21. Raaf, 1999.
22. Ibid.
23. web.ukonline.co.uk/n.paradoxa/panel7.htm
24. Wright, 1994.
25. Meskimmon, 2000.

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Ludology: From Representation to Simulation

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ABSTRACT
Most of the current studies of the creative potential of computer games have been done through tools designed for narrative media (literary theory, narratology, film theory). Several attempts have been made by both academics and designers to create "interactive narratives" that would allow players to experience the qualities of narrative while being able to interact with the environment, characters, and events in the "story." Nevertheless, authors have so far failed to provide a compelling example of "interactive fiction." Brenda Laurel, a long-time advocate of this genre, recently described it as "a hypothetical beast in the mythology of computing, an elusive unicorn we can imagine but have yet to capture." [Laurel 2001]

In this paper I argue, following the work of such theorists as Espen Aarseth and Markku Eskelinen, that narrative is not the best paradigm for understanding not only computer games but also cybernetic art and toys, simply because they do not rely on traditional representation but on simulation.

By simulation, I mean an alternative form of describing and understanding reality that is based on the modeling of systems. My semiotic approach to simulation is close to the one developed by computer science's simulation theory, but it differs in that its goal is not necessarily predicting behaviors. Rather, I view it as an alternative representational form that opens a new set of rhetorical possibilities that stress system behavior and user experimentation.

By comparing the similitude and differences between simulation and representation, I will provide a theoretical framework that will allow us to better comprehend the process behind the interpretation of such cybernetic systems as toys, cyberarts, traditional games, and computer games. My ultimate goal is to contribute to the understanding of the rhetorical characteristics of these simulational media.

THE NARRATED COMPUTER

The fact that researchers chose drama and literary theory to understand the video game phenomenon was not simply due to the "narrative" aspirations of the new medium but also the lack of a formal theory of games and play activities – not to be confused with the mathematical "game theory." Historically, academics have been reluctant to incorporate games into their fields of study. While there are several exceptions (Huizinga, Piaget, Wittgenstein, Sutton-Smith) these approaches are far from unified, and they lack the coherence that would have encouraged the development of a ludology, a formal discipline of game studies.

Brenda Laurel's *Computers as Theatre* [Laurel 1993] was one of the first major attempts to understand the computer in general and video games in particular. She basically relied on Aristotelian drama in order to sketch an early poetics of the medium. The next approach that was successful with both the academia and the industry was Janet Murray's [Murray 1997], who viewed the computer as a new medium for storytelling, combining notions of narrative and 19th century literature. More recently, Lev Manovich [Manovich 2001] applied film theory to explain the characteristics of digital art and games. As these examples show, the narrative/drama paradigm has been leading the discussion about the characteristics of the new medium. Espen Aarseth was one of the few researchers who contested this trend, claiming that these objects differ ontologically from narrative and should be treated within a different framework:

> … the prevailing attempts to rejuvenate and relocate existing theories by insisting on their relevance for the new media and their largely unsuspecting users, is a "colonialist" strategy that is always a demonstration of (unnecessary) power and often a misreading of the theory being used. [Aarseth 1998]

Aarseth viewed electronic texts—and games—as cybernetic systems "where nontrivial effort is required to allow the reader to traverse the text." [Aarseth 1997] While Aarseth's work is revolutionary, it has not yet attained the mainstream attention that it deserves among the video game community. One of the possible reasons may be that Aarseth's *Cybertext* was an answer to the mainstream hypertext criticism of the mid-1990s, and, therefore, it heavily relies on literary examples.

My goal in this paper is to expand Aarseth's cybernetic paradigm while applying it to toys and games, which, unlike literature, are generally less "contaminated" by narrative assumptions. Once I review the particular characteristics of simulation as opposed to representation, I will analyze the process of interpretation on simulated systems. The next step will be to situate simulation within play and games. To conclude this introduction to the basis of ludology, I will review some of the rhetorical differences between representation and simulation.

REPRESENTATION/SIMULATION

As a civilization, we have been taking representation for granted. Our culture breathes signs, and we structure them into stories in order to both explain and understand our world. Nevertheless, simulation is probably as old as representation as an alternative way of accomplishing those same tasks.

Simulation—not understood here simply as the computer-science technique but rather as a representational form—is "[the representation of] the dynamic responses of one system by the behaviour of another system modeled after it." [Britannica 2002] Unlike representation, simulation focuses on the systems' behaviors. A drawing represents a car: it tells us about its shape and color. A toy car not only mimics a real car's shape and color, but also reproduces some of its behaviors: the wheels turn, the car moves, the doors can be opened and closed. Certainly, just like it happens with representation, the relationship between the "real" object and its model is arbitrary: the toy car is not a real car, but just a limited, subjective approximation based on social convention.

As I said, simulation has always been an alternative to representation. Humans have developed several forms of simulation such as mechanical automata that model the behavior of animals and even humans. The military have always relied on modeling in order to plan their battles. Both scientists and educators have also drawn upon it for explaining and understanding the behavior of systems. In spite of the existence of these and many other examples, the fact is that representation—and its structured version: narrative—has prevailed as the form of choice for our civilization to understand the world. The proof is that all traditional mass media (press, cinema, television, radio) rely on representation.

However, the situation is changing. The reason why simulation has not

played a more important role in the representational arena is merely technological. Unlike representation, which is exclusively based on signs, simulation needs a cybernetic model to work. There is a limit of what gears and cogwheels can do for modeling complex systems. Until the invention of the electronic computer, simulation lacked a medium that provided the required mathematical and data-crunching abilities for modeling complex systems. Both the military and scientists were among the first to apply computational resources to simulation. However, it was a far less "serious" application that popularized simulation into a mass medium. Obviously, I am referring to video games.

INTRODUCTION TO "SIMIOTICS" OR SIMULATION SEMIOTICS

Finnish artist and theorist Markku Eskelinen goes straight to the point: "Outside academic theory, people are usually excellent at making distinctions between narrative, drama, and games. If I throw a ball at you, I don't expect you to drop it and wait until it starts telling stories." [Eskelinen 2000] There are probably many reasons that explain why most academics fail to discern between narrative and simulation. One is that "narrative" has become an overused metaphor that has lost most of its meaning and is usually applied to any structured gathering of signs, disregarding both their production mechanisms and phenomenology. Most of the problems of the advocates of "interactive narrative" are due to the fact that they usually fail at providing a coherent definition of narrative to start with. I personally subscribe to Gerald Prince's definition:

> "The recounting (as product and process, object and act, structure and structuration) of one or more real or fictitious EVENTS communicated by one, two, or several (more or less overt) NARRATORS to one, two, or several (more or less overt) NARRATEES." [Prince 1987]

According to this definition, a doll is not a narrative, simply because it is a system with no events. Surely, a player could manipulate it, creating events that could be viewed as a narrative—or drama—by a third person. However, this is just a consequence of the player's actions and not really the act of playing. Most games could be viewed as sequences of events and could therefore be interpreted as narratives, but as Aarseth points out, watching and playing a soccer game are essentially different activities. Certainly, some people do play games to create narratives (some Quake players record their performances as movies in order to later show them to their friends). Apart from these exceptions, games are about performing within a constrained environment. The main goal of the player is either to win or to enjoy the match and not simply to "recount events."

A computer game like Quake is a system with a set of rules, and those rules can produce different outcomes. On the other hand, a narrative is not a system with potential outcomes but rather a fixed sequence of events. Here is where the sophisticated literary reader will stand up and say: "Stop! Of course a narrative is a system with potential outcomes, since it will generate as many interpretations as readers are available." Well, the reader is right: a text can be interpreted in infinite ways, but here we are dealing with two different interpretational levels that traditional semiotics is not prepared to deal with. One is conventional interpretation, and the other is a form that deals with what Aarseth calls ergodics (understood as the rules that govern the mechanics of the representation that need to be manipulated by the reader/player).

For the sake of simplicity, let's go back to the example of the doll. If we consider a doll as a sign representing a woman, we know that this sign could be interpreted in several ways. For example, the doll could be interpreted as a religious object or maybe as a depiction of a cultural stereotype of beauty. But this doll could also be interpreted on the ergodic level, according to its systemic behavioral rules. Ergodic interpretation is the process that creates a mental model, a concept introduced by Philip Johnson-Laid. [Johnson-Laid 1995] Basically, the user's mental model is her idea of the rules of the simulated model. These two models may or not match, and that explains why different users may "interpret" the ergodic level differently. Depending on the experience that the user had with the doll, he may have learned some of its rules: "if the doll lies horizontally, it will close its eyes," "the doll will make a noise every time that her tummy is pressed," or "the doll's legs and arms will move if manipulated."

Traditional semiotic models can easily explain "traditional" interpretation, but fail to provide the tools for understanding how the mental model is created. This is a problem that has arisen several times, particularly among works of art that trespass the limits of representation and start simulating. These are what Umberto Eco called "open works": cybernetic works such as Cortazar's combinatorial texts or even kinetic sculptures such as Calder's mobiles. If I want to interpret a doll, it is not enough to construct meaning from it, but I also need to understand how it works. A mobile by Calder is not an object, but a system that will produce different instances depending on the forces that are applied to it. It is not about a shape, but about all the potential shapes and sequences of positions that are allowed by its systemic constraints. Imagine that two observers are presented with a mobile. The first views it from a distance, on a day without wind, while the second appreciates its movement on a windy day. Both observers could have the same interpretation about its "meaning." For example, both could agree that the sculpture depicts a tree. However, if the first one is not familiar with the work of Calder, she may think that it is a static sculpture. The latter learned something that the former did not: the sculpture has behavioral rules; it has moving parts that can be manipulated by the wind. As a sign, the sculpture was interpreted similarly. However, the ergodic interpretation differed when the sculpture was viewed as a system; the mental model crafted by each observer was different.

Ergodic interpretation is about interpreting the rules. A reader who is not familiar with computers may face a hypertext but believe it is a simple text because he is not aware of the rule: "click on the links to view another piece of text." This has nothing to do with the interpretation of the text itself. The same applies to games, and particularly video games. Games are not only interpreted for their signs, but also for their rules. Some rules may be explicit (explained in a manual), while others are discovered by the player through her interaction with the system.

The failure to distinguish between traditional and ergodic interpretation usually leads to the belief that the multiple outcomes produced by cybernetic systems such as games, toys, or cyberarts are simply due to the fact that they also support multiple interpretations. Certainly, narrative is constructed in the reader's mind, and there are laws that rule its interpretation. The difference is that narrative cannot be interpreted at the ergodic level because it is not a cybernetic system. Narrative is about fixed sequences of signs, while simulations are about rules for combining signs. Simulation builders are not simply concerned with conveying "meaning," but also with conveying the rules for manipulating their works.

"IT'S A STORY. IT'S A PLAY. IT'S A SIMULATION!"

Basically, simulations can be discriminated into two groups: "play" and "game" or, to use Roger Caillois' terminology, as paidea and ludus. [Caillois 1967] I will use these two terms in a slightly different way than Caillois, who described them extensively but failed to provide a

structural rule to differentiate them. According to my definition, ludus can be understood as simulations where the users can either win or lose. Ludus can easily be recognized because they have a set of rules that states the result of the game. These rules are social: an agreement is needed for them to be effective, and the player cannot change them without the consent of other players. This is why Piaget argues that before socialization, children do not understand the concept of "winning" and "losing." [Piaget 1991] Paidea, on the other hand, are all playing activities that do not have these rules. Examples of the former are chess and soccer; among the latter I can mention playing with dolls or building objects with Lego bricks.

Probably the best way to realize the differences between simulation and narrative is to consider their respective rhetorical characteristics. A narrative author, like Balzac, had a particular mental model of 19th century Paris. As an artist, he was able to find patterns and rules of behavior among individual citizens, families, and social classes. He could have chosen infinite ways to describe this system through narrative. Instead, he chose a large but finite number of stories to convey his observations. Each of those stories could also have been presented in infinite ways, but among all those "narrative possibilities," [Bremond 1973] he chose a finite sequence of events.

Video game designer Will Wright also had particular ideas about society and urbanism. But instead of writing stories, he created a simulator that allowed people to build models of either fictitious or real cities. He did not craft fixed sequences of events, neither textual nor audiovisual. There is no narrative in his "Sim City" that says: "Workers needed a recreational space, so the mayor built a park next to their houses." Instead, Wright coded rules such as: "If people do not get recreational spaces, they will complain." These are subtle, but essential, rhetorical differences.

The rules of the system could be explicit (written in a manual) or implicit (meant to be discovered through experimentation). Of course, Balzac's stories also depicted characters with behavioral rules, but those rules were not part of the final product but rather resided in the reader's head, where they were inferred. The reader can conclude that a character has a good heart because of the way the character behaves within the story. But that rule is created by the reader from her personal interpretation. It does not reside within the system, and, more importantly, it is not dynamic so it can not be manipulated. On the other hand, a simulation like "Sim City" can be interpreted on the ergodic level. We may learn that building communities too close to factories is not a good thing, not because we read a story about the tragic fate of some poor Sim-citizens, but rather because the experienced player will realize it through experimentation. This kind of information has nothing to do with traditional interpretation such as "factories are bad," "the author is an ecologist," etc. Ergodic interpretation only deals with the rules of the system.

Unlike narrative, simulations encourage experimentation. The pleasure does not lie on "what will happen next," but rather on "what will happen if." Narrative and simulation are two disparate ways of looking at reality: the first focuses on the particular while the latter focuses on generalities.

The rhetoric of these forms is closely tied to their ideology. As Marxist drama theorist Augusto Boal explains, narrative is a form that is based on causality and fate [Boal 1998]: stories carry the ideology of inexorability, of what cannot be changed. On the other hand, simulation requires change to exist. Simulation is not about "what happened to Mister X based on his particular actions," but rather "what could happen to Mister X based on his potential behavior." It is not surprising that Boal, an artist who seeks social and personal change, has embraced simulation over narrative as the main means for attaining his goals.

Still, it is essential to keep in mind that even if simulation carries the flag of change and freedom of action, this is mainly an illusion. Simulations do have authors who define the rules of the system, and players always have a constrained degree of freedom. While it is true that simulation is less tyrannical than narrative, we should always be aware that it still is a construction which carries a very concrete bias. This was the error of early hypertext theorists [Landow 1992] who believed hypertext blurred the limits between author and reader. Simulations do have authors, but they are different from the traditional ones: they are lawmakers rather than judges.

WHY THE DIFFERENCE MATTERS

For an external observer, the debate over whether video games are narratives may seem irrelevant. But the fact is that it is essential, not only for the sake of creating more compelling games, but also in order to truly understand the potential of this form. The applications of simulations are not limited to entertainment, but also to all kinds of communication, including art, education, philosophy, politics, advertising, religion, and a long etcetera. But we cannot reach the full potential of this representational form unless we drop the narrative paradigm and focus on understanding the particular mechanics of ludology.

For the first time in human history, we have access to a technology that gives us the chance to portray complex systems, with thousands of interrelated variables. Our civilization has heavily relied on narrative —myths, grand narratives—to explain itself. Now, it has created a new, powerful tool that can provide different kinds of explanations. The question here is not if simulation is worse or better, or even if it will replace narrative, but rather: "What can we learn through simulation?" If we keep trying to accommodate simulation into narrative, its potential will remain suffocated. The hard task of unveiling the power of simulation probably relies on two disparate agents with important messages to convey: artists and advertisers. By the former I specifically think about visual artists, who are less likely to be constrained by the narrative corset. The latter, because they make a living through rhetoric and because the recent development of advergames—a mixed breed of online advertising and video games—may popularize the idea that video games have something to say, even if their message is simply "buy this soap." Maybe some day, after the public gets used to the rhetorical capacities of simulation, a social theorist will decide that instead of building her philosophical work upon a narrative, she may deliver it as a simulation or a game. After all, it is not impossible to speculate that, for example, Marx could have built a simulator that explored the economic and social rules behind socialism instead of just writing a book about it. Probably, such "Sim-Kapital" would not have been any good at predicting the problems of "real socialism." But if it had been addressed to a mass of people raised on video games, who knows whether it may not have been more appealing, and convincing, than several hundred pages of obscure terminology. The only way to know how our civilization will react to simulation is by building models of our realities and developing a strong set of ludological tools. And this is the reason why these are such exciting times for anybody who has both a computer and something compelling to say.

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Art Games and Breakout: New Media Meets the American Arcade

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SUMMARY
This paper explores how the interactive paradigms and interface designs of arcade classics like Breakout and Pong have been incorporated into contemporary art games and offer new possibilities for political and cultural critique.

INTRODUCTION
Breakout, the first mass-marketable video game, was a defining game experience for many in the 1970s. It positioned Atari at the forefront of the game industry under the leadership of Apple Computer's founders, Steve Jobs and Steve Wozniak. The long-term potency of game culture has since been firmly established. In 2001, 25 years after the original version was released, MacSoft released a new Breakout that incorporated kidnapping narratives, paddle angling, and power-ups into the classic game. Also last year, the release of two powerful new consoles, Microsoft's XBox and Nintendo's Game Cube, redoubled the hype surrounding the obsession with gaming. In 2000, the video gaming industry surpassed Hollywood in gross annual revenues to become the second-largest entertainment industry after music in the United States. [Tribe and Galloway 2001]

RETROSTYLED ART GAMES
The immense success of the gaming industry, now global, has inspired droves of artists to create new works that pay homage to arcade classics of the 1970s and 1980s. For example, Natalie Bookchin incorporates interactive tropes from Pong and Space Invaders into work that demands both manual dexterity and theoretical reading. Bookchin's game, The Intruder, adapts a short story by Jorges Luis Borges about the life of two brothers who fight for the mysterious woman both desire. Another art game project, Font Asteroids, allows users to select information itself as the enemy. The German collaborative, Esc to begin, designed the game to look much like the arcade classic. After selecting a target URL, the text from that Web site becomes the interplanetary debris that you must shoot away. Like the original Asteroids, the words in Font Asteroids break apart into smaller and smaller fragments—in this case, prefixes, suffixes, and roots.

The exciting works of these game-influenced artists have begun to make their way into elite museums. Several exhibitions showcasing art games were organized in the last three years alone: Mass MOCA's "Game Show," the San Francisco MOMA's "010101: Art in Technological Times," the Walker Art Center's "Beyond Interface," and the Whitney Museum's "Bitstreams." Overall, the proliferation of works by artist gamers in conjunction with the sweeping accomplishments of the gaming industry has had a reverberating impact on a variety of cultural institutions: art museums, grant organizations, and, of course, art schools.

FANATICAL GAMERS AND ART SCHOOLS
The tremendous success of the commercial gaming industry has helped to shape curricula at universities and art schools around the world. Espen Aarseth, editor of the journal *Game Studies*, contends that computer games, as a cultural field, will carve out new territory for graduate programs. [Aarseth 2001] However, many art students seek only the computer and technical skills that will enable them to secure design and programming jobs at game-development companies. These students often sacrifice valuable classes in political theory, women's studies, and economics, among others, to obtain a solid grounding in software manipulation and code writing. Educators thus face a tremendous challenge in striking the proper balance between technique, craft, and theoretical knowledge in game-related media arts courses at both introductory and advanced levels. The largest challenge remains satisfying student-driven demands for technical skill while maintaining the intellectual and artistic integrity of art education.

OBJECTIVES OF PAPER
My own intervention in the historical context elaborated above involves a critical reading of the current surge in game-inspired interactive art works. I began to investigate this new genre while developing a course curriculum at the School of the Art Institute of Chicago. In Interactive Multimedia: Breaking out of the Arcade, intermediate-level students explore the history of art games, beginning with the Surrealists and Duchamp and progressing through the recent online experiments released by jodi.org. The principal assignment asks students to invent a unique version of Breakout that showcases their abilities to incorporate an individual narrative and concept within an arcade-style form.

Figure 1. Breakout animation still, Lidia Wachowska, 2002

The course inspired a series of discoveries that enriched both my teaching and my own studio practice. First, appropriating the game form for art making allowed students to explore different models of space. Cultural theorists like Michel Foucault (whose Panopticon makes for a striking comparison) and Lev Manovich, among others, provided students with theoretical readings of power, space, and storytelling. "Narrative and time itself are equated with movement through 3D space," Manovich writes, "progression through rooms, levels, or worlds." [Manovich 2001] Second, in the art-making part of the course, students produced surprising variations, both serious and humorous, on the familiar Breakout theme. In one game, the bricks became government currencies. In another, the blocks took on human qualities, enacting behaviors labeled "mother," "magician," and "bouncer." One ambitious student, interested in the idea of game play rooted in the act of consumption, as evidenced in arcade classics like PacMan and Burgertime, chose to make her game begin with a survey that documented participants' food preferences (Figure 1). At the conclusion of the survey, players are presented with an array of distasteful food from which they must escape. Here, food becomes a medium that imprisons. In advising these student projects, I realized that the art-game genre provides a new vehicle for artists to articulate political and cultural commentary. Third, and finally, I incorporated the Breakout trope into my own work, in an installation called <a_maze@getty.edu> for a special exhibition of optical toys at the J. Paul Getty Museum in Los Angeles.

The remainder of this paper will explore these two topics in turn: video

gaming and models of space, art games as spaces for cultural critique.

SPACEWAR: GUN PLAY ON THE CARTESIAN GRID

The defining element of both mainstream video games and game-inspired art is the organization of play through and across space. The spatial aesthetic and spatial language of both shape the meaning of experience. While there are many different types of video games, the great majority are first-person shooter epics with plots based on militaristic combat. SpaceWar, Tank, and Space Invaders are early examples of shoot 'em-up contests in which, as the Beatles said, "happiness is a warm gun." Breakout is one version of the shooter epic, located within a prison complex. As illustrated in the arcade marquee from 1976, the player assumes the role of a convict attempting to escape by smashing through a brick wall with a mallet. In the video game, this narrative was formally simplified as a small rectangular paddle that the user guided to hit a ball that chipped away at a grid of jewel-toned bricks. Despite the imaginative narrative context, the game was essentially a flat, nondynamic grid.

In striking contrast to the two-dimensional simplicity of Breakout, the most recent generation of video games offers a version of hyper-reality in which story and space are three-dimensional, dynamic, and experientially real. On March 10, wedding bells rang online for Mr. Dong-jun Choi and Ms. Yousun Jang. The couple made their vows of commitment in the context of the multiplayer game environment that both fondly remember as their courting ground. The two lovers met online competing in Blizzard Entertainment's Diablo II, a role-playing adventure game in which participants choose characters and battle the forces of evil from their comfortable living rooms. The experience of Choi and Jang is part of an emerging dynamic familiar in the Web-based video gaming subculture. More and more couples are meeting virtually in their game communities and celebrating their romantic successes with faraway friends and fellow competitors. The game world has evolved from the geometric abstractions of Breakout to extensions of an individual's daily pathways and travels through space, extensions of real life.

Virtual spaces provide portals for exploration and discovery as well as a sense of amazement. Steven Poole, author of *Trigger Happy,* contends that the "aesthetic emotion of wonder" is the "jewel" of the game-playing experience. [Poole 2000] Certainly, the sheer plasticity of the spatial environment is a primary lure for the designers of the games as well as those actively playing. The newest games feature sprawling swaths of territory on which to battle. The frontier of the game world is limitless, contingent only on the speed and memory of the gamer's computer or console. On the Internet, Diablo II boasts "four different, fully populated towns complete with wilderness areas as well as multiple dungeons, caverns, and crypts in every town for players to explore." [Diablo ad] Ultrarealistic battles between the forces of good and the forces of evil take place in a sprawling land empire. Games like Diablo II and Starcraft are especially popular in Japan and Korea, where domestic space remains quite small and panoramic mountain vistas and babbling brooks are several hours away by rail.

Despite the extreme popularity of the newest cutting-edge graphics engines, game environments suffer from two limitations that complicate their relationship to new media-based art. First, they remain the same Cartesian enclaves clogged with familiar structures: skyscrapers, towers, trees, boulders, dams, and dungeons. The spatial aesthetics of video games have evolved from the abstract beauty of bouncing squares to the realism of metal-sheathed guns, but they celebrate rather than transcend the boundaries of Cartesian spatial logic. Second, and perhaps more obviously, game culture remains wedded to a first-person narrative of violence and point acquisition. The win/lose dichotomy and the shooter aesthetic and subjectivity that dominate the industry offer an impoverished model of space, their "virtual" experience notwithstanding. The issue of who controls the spatial aesthetics of commercial video games is complicated. The limiting factors associated with consumer economics, mathematical models, and popular taste combine, resulting in the formation of surprisingly similar structures for the putatively cutting-edge graphical worlds: futuristic cities, Gothic churches, medieval castles. The Cartesian perspective is the most straightforward to generate mathematically, but the hardware industry also has a vested interest in the popular penchant for ever-realer spaces. And PC manufacturers and console developers rely on the game software's demand for speed to spur sales. *Joystick Nation* author J.C. Herz describes the parasitic relationship that develops between the computer-hardware industry and the game-development industry: "The only thing that will push a computer to its limits is a game. No one admits it, but no one needs a new computer to do a spreadsheet programme or Word document." [Herz 2001] She asserts that games ultimately manipulate and rule the PC industry: "Unless you are in a military installation, the most demanding application on any computer will be a game."

However produced, the video game industry's reliance on Cartesian realism sits in striking contrast to the contemporary art world. Over a century ago, painters abandoned Cartesian space after mastering the process of manipulating pigments to form a perceptively accurate space. Fine art collectors, including museums, have for decades defined gallery-quality art in terms of "high-brow" aesthetics that honor the traditions of minimalism, conceptualism, and abstract expressionism. Video games, in contrast, constitute a popular "low-brow" form of entertainment that takes realism for granted. Yet as games re-enter the immaculate spaces of museums, they force a new dialogue about what constitutes an "art space" as opposed to a purely "game space," resurrecting long-standing debates about high and low culture, high and low art.

Artists have taken notice of the proliferation of the commercial game medium and are experimenting with not only the spatial aesthetic but also the mode of game play. They are attempting to vary the characters and introduce narratives with game outcomes and objectives that resist the assumed spatial and narrative logic of a traditional game. Feng Mengbo, for instance, began his work in the art-games arena by recasting the popular Nintendo character Mario as Mao Zedong. His first piece, The Long March Goes On, locates the game objectives of the Mario Brothers classic within the contentious relations between his homeland, China, and the West. Throughout his life as a child of the Cultural Revolution and a young adult during the events at Tiananmen Square, Mengbo witnessed oscillating degrees of openness between China and the West. The artist chose to make work about the opposing ideologies shaping Chinese society: revolution and modernization. In selecting the highly structured and delimited game format for this politically charged subject matter, the artist grounds his cultural critique in a pop medium that is itself an emblem of Western consumerism and modernization. In his most recent work, Q4U, Mengbo writes a patch for the Quake game that features the artist wielding a camera in one hand, a rifle in the other. The frag-or-be-fragged excitement so dominates game play that one ignores the specific identity of the enemy, the artist himself. Perhaps the instantaneous forgetting is the slippage that is the resonant point.

SPACE INVADERS: CYBERFEMINISM AND ARTISTIC PRACTICE

In the late 1990s, women publicly laid claim to the crowded territory of the male-dominated gaming world. As online games became

increasingly accessible, more women tried their hands at fragging, dueling, and role-playing. A host of new organizations sprang up to create a safe and stimulating place for women to experiment in trigger-happy cyberspace: Womengamers.com, Joystickenvy.com, GameGal.com, Gurlgamer, GameGirlz, Grrl Gamer, and many, many more. Why this sudden landslide of femme-only gaming communities? Single-mom "Aurora" Beal confesses her motivation: "When I started the GameGirlz site...my only goal was to create a Web site where girls who were into games didn't have to wade through the semi-nude pictures and scroll through the jokes only a guy could appreciate." [Beal 2002] Like the quilting circles of yesteryear, women have created their own spaces of retreat to share conversation that spans a variety of topics beyond game reviews and strategy.

Unfortunately, as theorists like Faith Wilding have pointed out, this phenomenon of "cybergrrl-ism" is afflicted with a blinding net utopi-anism. Wired women participate in an ambiguous feminist politics by adopting the "if you can't beat 'em join 'em" attitude with regard to online gaming. However, in the real world, women are not in visible positions of leadership in the critical venues of research and develop-ment in new technologies, neither in business and industry nor in the university settings of science laboratories and art schools. Trigger-happy girl gamers might believe that Quake game patches written to produce custom female tattooed skins inject a certain feminist presence into cyberspace.

More and more female bodies are invading the spaces of popular entertainment, yet they share the same buff bodies and aggressive personalities. The online explosion of the riotous cyberpunk culture in the mid-to-late 1990s was followed by a resurgence of a fighter-chick character in both television and Hollywood productions. The entertainment industry labored to establish women as players in a larger culture of sanctioned violence. Buffy, Xena, the Matrix's Trinity, and Charlie's Angels are but a few examples of the new warrior heroine. Women who do not play games can thus passively endorse the commodification of violent gesture as a symbol of girl power. Yet for the most part, both women who "game" and women who watch participate in a larger narrative of, at best, ambiguity, and, at worst, submission that their overwhelming desire to beat the boys at their own game promotes.

Figure 2. *The Intruder,* animation still, Natalie Bookchin, 1999

To develop a feminist politics and activist trajectory in cyberspace, girls need to develop their own games. While this remains a marginalized project in the game industry, artists have pursued it with vigor. The emerging art-game genre provides artists with a new structure to hack masculinist institutions and power hierarchies. Perhaps the best current working example of the "low art" form being elevated to "high art" is Natalie Bookchin's aforementioned The Intruder, an experimental adap-tation of a short story by Jorge Luis Borges. The game changes readers into players who move through the linear narrative by shooting, fighting, ramming, and dodging objects. Bookchin mines the arcade classics to tell the story of two brothers who fall in love with the same woman. One of the most interesting moments in the game happens in the Pong screen, in which the viewer and the computer compete for points by batting a female icon back and forth. The war takes place atop a field of flesh. Photographs of a nude female body appear each time one of the players temporarily takes possession of the woman. The "field" metamorphoses from skin into turf. The body becomes territory to possess in a game of football. The story advances when one man tackles the other. Here, the narrator comments: "They preferred taking their feelings out on others." [Bookchin 1999] Computer games have traditionally provided a culturally sanctioned outlet for male killing and sexual fantasies. Gamers can advance in The Intruder only by perpetrating violent gestures. This novel, first-person shooter structure invites gamers to see how popular computer games perpetuate masculine ideologies of spatial conquest, combat fantasies, and sexual domination.

New spatial paradigms and modalities of play in the art-game genre raise additional questions about the permissibility of violent conduct by introducing new forums for injustice into the online world. For example, in Lullaby for a Dead Fly, the artist Mouchette invites the gamer to kill a fly with a click of the mouse. In this simple interaction, the fly reminds us that a click represents a choice, an assertion of power in her own elegiac song: "You clicked on me, you killed me." Likewise, Eric Zimmerman's Sissyfight, an immensely successful project produced by the online magazine Word.com, asks participants to consider the violence of words in a multiplayer online game set in the context of a simple two-dimensional playground. Players participate in a wickedly humorous catfight with other girls, using teases and tattles to break down the self-esteem of other players and drive them away. Perhaps to its detriment, the game allows players to scratch and grab in their quest for points. The all-girl characters and witty repartee, not the violent combat, make the game novel.

As artists continue to work collectively to recontextualize and reinvent female characters, so too must industry and gamers re-imagine the diverse cultural possibilities of game space. The popular excitement around the culture of cybergrrlism reveals a positive new interest in carving out an active space for women to communicate, congregate, and play online. Yet in the absence of roles for women in cyberspace different from those assigned to or by men, there remains a profound ambiguity. As history shows us, today's Internet originated as a system to serve war technologies. War games are but a fantastic extension of militaristic laboratories. In the future, women must claim their territorial rights not only as players of games but as producers, designers, and developers of technologically mediated experiences like games—games that are not war games, games that steer us toward a more engaged relationship with complex female characters that refine today's definitions of cyberfeminism. Today's art games and multimedia projects are opening the door to a more nuanced description of virtual spaces that embrace a diverse array of characters and modalities of play.

CONCLUSION

Game-inspired artworks represent a vitally important emerging form that explores new modes of visualizing space and time, and from these investigations emerge new narrative models for interaction, new formats for cultural and political critique, and alternative interfaces for game play. John Klima's multimedia installation, Go Fish, is a novel first-person shooter game with real-time consequences: the death of a goldfish. [Klima 2001] Housed in a retrostyled arcade cabinet, the game asks participants to take moral responsibility for their trigger-happy behaviors. Arcangel Constantini's new game, Atari Noise, features a hacked Atari 2600 that functions as an audio-visual noise pattern

generator—a very abstract look at the spatial possibilities inherent in the art-game genre.

From the straightforward Breakout sequence to the complex 3D landscapes of games like Quake, video games have collided with the world of art to forge a new genre of art games. As artists, we have much more to explore in the game format in terms of both spatial innovations and game play. It is our responsibility as artists to "break out" our software design abilities to continue to refine, via formal structure and cultural commentary, the realm of game architecture to create new interactive structures for expression.

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Interface Ecosystem, The Fundamental Unit of Information Age Ecology

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A (biological) ecosystem involves:

• The circulation, transformation, and accumulation of energy... through the medium of living things and their activities...
• The processes responsible for the transport and storage of materials and energy, and the interactions of the organisms engaged in these activities...
• The kinds of organisms that are present and the roles that they occupy in its structure and organization.

> Francis Evans, "Ecosystem as the Fundamental Unit of Ecology" [Evans 1956]

ABSTRACT

The Information Age is the period of history in which products and services based on information and knowledge have principal economic value. Information artifacts are implements of use and aesthetic expressions that both reflect and create the ways in which people individually and collectively think and act. Interactive artifacts are designed to engage people in access to and development of knowledge and information. Their human computer interfaces are instances of a broader set of phenomena. Cultural, creative, technological, and everyday frames of reference, spoken languages, economic positions, programming languages, and runtime platforms converge through the lens of the interface nexus. It is necessary to abstract and extend our notion of interface and to contextualize the operation of interfaces amidst dynamic meshworks, in order to address these phenomena.

With regard to life on earth, ecology investigates the web of relations between interdependent organisms and their surroundings. In the Information Age, people, activities, codes, components, and systems form the same kinds of interrelationships. Interfaces are the multi-dimensional border zones through which these relationships are constituted. Interface ecology investigates the dynamic interactions of media, cultures, and disciplines that flow through interfaces. The semiotic encodings of these wide-reaching systems of representation are their interactions' building blocks. Interfaces recombine semiotic codes, forming hybrids.

The ecosystems approach brings the perspectives of diverse disciplines to bear on what interfaces are, how they work, and how they can work. Disciplines, and the media, cultural, and epistemological forms to which they apply, are free to relate in meshworks, opening inquiry. No system of representation dominates; none are considered subordinate. Rather, they are interdependent elements, connected by referential flows of interaction.

INTRODUCTION

With "the medium is the message," [McLuhan 1964] McLuhan began to identify the role of media as languages that structure expression. But media and their associated epistemologies are not the only critical systems of representation. Cultures, local and global, are the semiotic ground in which our identities are situated. Likewise, disciplines are "schools of thought" that structure discourse and practice. These systems dynamically interact, effecting the representation of individuals, communities, and institutions. *Understanding Media* gets caught in the too-normal implicit glorification of the role of science and engineering, losing the critical perspectives of fields such as ethnography, cultural theory, and political economy. For example, while "new" media have transformational effects, they have not, in themselves, created "patterns of decentralization and diversity" (p. 359), nor has the information age, in itself, made "the entire business of man become learning and knowing" (p. 58). Such techno-utopianism maps the history and culture of media technology as the monotonic, increasing function of modernist progress.

Manovich [Manovich 2001] creates a rich analysis of new media in terms of cinema language, and the history of film. By positing that "cinema can be thought of as an interface to events taking place in 3D space" (pp. 326-327), he suggests the notion of interface as an abstract operand. Focus on the operational characteristics of interfaces, with further abstraction and expanded scope, and on languages as carriers of energy flows—through which complex multidimensional relationships are constituted—are fundamental in the ecosystems approach to Information Age development.

1. THE CONTEXT OF THE INFORMATION AGE

We live in the Information Age. By information, I mean representations of what is going on.[2] Information's more rarefied counterpart, knowledge,[3] adds a component of cognition. While information and knowledge date back to the beginning of history, the Information Age is the period of history in which products and services based on information and knowledge take principal economic value. As the Information Age has established itself, digital forms of information, which can be processed by computers, are of prime importance. The Information Age follows the Industrial Age, wherein manufacturing[4] was the primary source of economic value. During the Industrial Age, imperial powers extracted raw materials from colonies outside of the economic center, that is, outside of Europe, America, and Japan. This contact was effected through the operation of transportation and communication infrastructures. Previously separated cultures were brought into contact, albeit in a one-sided manner. European and American commercial centers extended their control of the margins. Cultural anthropology came into existence to investigate the cultural exchange occurring in these by and large economically driven border zones.

This historical description of the flow of cultures contains an anachronism. Not only did cultural anthropology form as part of "international economic development," but our very notion of culture as plural, rather than as the single "objective" standard of high culture, coevolved with this same process [Norman 1988]. It would be more accurate to say that previously separated ways of life came into contact. While removed ways of life had come into contact in earlier historical contexts, such as the Roman empire, the extent of such contact, both in terms of breadth and depth, crossed a threshold during the 19th century. The contemporary, plural conception of culture[5]—as the tangible manifestations of a way of life, and the associated values, aesthetic sensibilities, and states of consciousness—originated not before, but during the same period. This definition implies knowledge of the existence of distinct ways of life, and thus of a great heterogeneous world of cultures. However, ironically, the contact through which imperialism made[6] "civilization" aware of remote cultures, and the concomitant flows of cultural information, concurrently effected the more or less gradual reduction of essential heterogeneity. Through multinational capitalism, cultural mixing has accompanied the rise of the omnipresent hegemony of international financial markets and transnational corporations, from the British East India Company to CNN.[7] Culture typically flows with

economies from the center to the margins. Though it has roots from the dawn of the Industrial Age, culture, itself, is an Information Age concept. It finds fruition, as well as dilution, in the global village of electronic media networks.

As De Landa observes, [De Landa 1997] the form of history is not a linear, monotonic progression. The Information Age did not replace the industrial mode of production; it only eclipsed its significance. Historical ages overlap. We can identify their passage in terms of the formations that are required to begin an essential transition, the reactants that catalyze this transition, and the threshold phenomena that mark the transition as an essential shift. Thus, while we might correspond the onset of Information Age to various events, such as the proliferation of the Internet during the 1990s or of the personal computer during the 1980s, the antecedent formation and flows of culture, though it overlaps with the Industrial Age, nonetheless marks the Information Age's origin.

In the Information Age, information and knowledge, themselves, form the basis of essential artifacts.[8] Information and knowledge may be stored in forms that humans are unable to access directly, like the electronic charges on a magnetic disk spinning 7200 revolutions per minute. Even the first layer of decoding those charges—the long strings of ones and zeroes—are not interesting to humans. What we deal with are media representations of information, and the tools (meta media artifacts) which deliver them and enable their production. Media are sensory renderings into perceivable and usable forms. Information and knowledge cannot function as artifacts without being rendered through media. In concrete analog form, this means paintings, books, films, and television, as constructed with paint brushes, paper, printing presses, film stocks, cameras, and editing bays. In the digital realm, the media of information artifacts include images, documents, programs, multimedia, and hypertext, as developed with editors and processors. Means of delivery, such as galleries, museums, warehouses, trucks, stores, theaters, transmission towers, networks, browsers, and players are also essential components. In both the analog and digital domains, each medium is associated with particular technologies. Media effect whole epistemologies of theory and practice. For example, in film, the montage of Eisenstein, the oblique camera angles of Welles, and the fast action/fast cut aesthetic of Lucas' Star Wars[9] are operational units of vocabulary. Like cultures, media constitute systems of representation. Through media, information and knowledge artifacts take form.

While the primary economic and semiotic result of knowledge artifacts is an Information Age phenomenon, the crystallization of knowledge into artifact forms has occurred throughout history. Michelangelo's frescoes in the Sistine Chapel, Homer's Odyssey, a song sung to bring rain, a dance performed to prepare for battle, and a codified plan for when to plant seeds and tend them in certain ways in relation to climatic signs; these knowledge artifacts are material representations of culture through media, embodiments of understanding.

2. INTERFACE

Interactive artifacts are designed to engage people in access to and development of knowledge and information. An examination of what happens in human-computer interfaces makes it clear that they are more than a simple meeting of person and machine. There is more to the interface than meets the eye—lurking in the shadows, behind the curtain. Interactive artifacts are instances of a broader set of phenomena. Flows of many levels converge here. The relationship between developer and user is that of ethnography's "the other"—the epitome of cultural separation as connected by process. Myriad abstract layers are embedded in the multiple material layers of hardware and software that make up typical interactive artifacts. Cultures, frames of reference, spoken languages, economic positions, programming languages, and runtime platforms converge through the lens of the interface nexus. The ecosystem approach shifts these many aspects and levels from the margins to the center.

An interface is a border zone where systems of representation come into contact. It is a membrane, regulating the exchange of vital messages from one side to the other. The more open the membrane, the more flow, the more new combinations that an interface supports. Particular membrane structures can act as filters, tuning feedback loops.

Crossing borders results in an exchange of cultures; the border, through its very existence, asserts that constituents on each side are somehow different. An interface may act as a conduit or as a barrier. One side may be privileged and white; the other, a barrio. An interface may encourage mixing or enforce separation. Interfaces both permit and deny. The crossing may be facilitated in some dimensions, and opposed in others. Exclusion, when it occurs, may be deliberate, endemic, or accidental. It may be brought about by indifference or ignorance of implicit operatives. Inclusion is harder to achieve; it requires intentional inclusion of people's diversity.

Interfaces are the medium of interaction. They constitute the situations in which representations are presented to and by the user and the developer, the subject and the object, the ethnographer and the other. In an immediate frame, our experience of interfaces is sensory. They consist of media. They employ affordances.[10] A well designed affordance provides clues which show how to use it. Again, these clues are messages, and the semiotic codes which form the basis of the messages characterize interfaces.

3. INTERFACE ECOSYSTEMS

Ecosystems are heterogeneous, dynamic, self-organizing, and self-sustaining aggregates. Organic and artifact elements are interconnected in Information Age ecosystems. These meshworks produce, manipulate, and transform signs.[11] Interfaces constitute strategic, connecting edges, both within, and in the case of nesting, between cyborg meshworks. They are pathways that support energetic flows in feedback loops. Even though interfaces seem not to be sites, but connections between sites, the study of Information Age ecosystems needs to focus on them. An interface ecosystem investigates Information Age phenomena from a frame of reference that is centered on the relationships and flows between a multiplicity of systems of representation rather than from a predominant discipline or medium. The overlapping border zones become the primary focus, rather than the entity itself. This referential frame emphasizes flows, edges rather than nodes, processes rather than products, dynamic structures instead of particular transient states. Inasmuch as edges support exchange between heterogeneous nodes, they form regions of contact, activating collage principles. [Kerne 2001] Found objects of varying levels of abstraction form assemblages. The proximity of disparate representations activates the human desire to understand connections. In this way, interface ecosystems effect cutting and pasting, semiotic flows, and the concomitant processes of recontextualization, translation, and interpretation. As with the energy of biological systems (see Evans above), signs circulate through and are transformed by ecosystem pathways. This exchange catalyzes the emergence of new hybrid formations on all levels. Interface ecosystems generate fundamental innovations of form, experience, knowledge, and technology. Through this essential, catalytic, evolutionary function, interface ecosystems operate as the fundamental unit of Information Age ecology.

Depending on the location from and role in which an entity is positioned relative to the border zone an interface delineates, that interface looks different. From the point of view of an ecologically oriented developer, an interface is an interpretive translation—created with media and representing cultures—that draws from disciplines in its construction. It carries meanings across a border. From the point of view of those who receive it, the interface is the border zone; it is a media manifestation that represents culture from other perspectives around and amidst the border, offering and/or denying translation and traversal in various aspects.

For the biologist, Evans, the "medium through which energy is circulated, transformed, and accumulated," consists of "living things and their activities." For the semiotician, Baudrillard, "the sign... (is) a total medium, a system of communication administering all social exchange." [Baudrillard 1981] As the conjunction of these operations, interfaces are the strategic multidimensional loci which circulate and transform signs. Evans' definition of biological ecosystem serves as a template, a mapping from biological to informational dynamics. Thus, an interface ecosystem involves:

- The dynamic interactions of media, cultures, and disciplines, the border zones through which these interactions occur, the voices represented, and the hybrid forms that emerge.
- The roles of human beings and cyborg components—such as corporations, markets, information artifacts, semiotic codes, telecommunications networks, computers, and presentation media—and the flows which connect them.
- The technological, socio-cultural, political, and economic processes which define, circulate, transform and accumulate sign values, and the concomitant significant behaviors through which people manipulate and are manipulated by signs.

4. INTERFACES: IMPLICIT AND EXPLICIT

interface + dynamic interactions of interrelationships between media, cultures, and disciplines = ecosystem

Equation 1

What does it mean to broaden the scope of interface? Aren't the interactions of disciplines, culture, and media something else? Consider the case of artifacts which we have already been calling interfaces. Human-computer interfaces are an example of these explicit interfaces. When cyber, organic, and hybrid entities interact, they exchange messages. The messages are represented by media; they are based on and contain cultural perspective; cultures form the ground of meanings, that is, the context, in which they occur. A process of translation between cultures, and their semiotic codes, is required. An interface translates messages from one system of representation, to another. The interactive artifact, which, itself, is already an integrated product of previous interfacing activities, mediates exchange through the interface, across a border. Most immediately, the computer is on one side of the border, the user is on the other. Behind the curtain of the computer dwell the interface designer and the designers of the layers of the underlying platform. Each of these actors may work in a different cultural context. These add dimension to the ecosystem, which can be mapped as nodes and flow pathways. The study of such an interface is the matter of disciplines, which is to say that as soon as one considers its range of implications and effects, a multiplicity of disciplines is invoked. Yet, the range of cultures and disciplines which are dynamically involved in such explicit interfaces are often not considered. The factors are often not specified in statements of work and requirements documents, nor in prevailing expectations. Equation 1 makes explicit these implicit factors, which always operate in the context of interfaces.

Consider, as well, the case of identified intercultural, intermedia, and interdisciplinary situations. In these implicit interfaces, such as the recent saturation of Afghanistan by news networks like CNN, the systems of representation or factors of interaction are explicit. The need for translation, and the separation between the ethnographer and the other are obvious. The notion of interface is unstated. Yet, in all such cases, Information Age technologies play a key role in effecting semiotic flows. Despite its lack of roots in history or community there, CNN nonetheless becomes my interface to life in Afghanistan.

Units of meaning are represented, stored, transmitted, recombined. Borders are crossed. Representations are recontextualized. Meanings shift. A different, multivocal example is the performances of Dzikunu's London-based Adzido ensemble. Adzido effects a cross-cultural synthesis of African music and dance forms. African artists conduct ethnographic research in communities removed from their origins and exchange detailed knowledge of diverse local traditions. Video plays an important "notebook" role. The result is both the recontextualized construction of traditions and the synthesis of new hybrid choreographies.

Jeremijenko [Jeremijenko 1995] frames her works by bringing implicit, unstated factors to light through unexpected interventions. Suicide Box uses video capture and analysis to record and count suicides on the Golden Gate Bridge. Through its unofficial, yet functional role, the work provokes us to question our assumptions about the contexts interactive artifacts operate in and about the roles of these artifacts themselves. It creates an interface to a prevailing multidimensional ecosystem of malaise. This is not McLuhan's misplaced utopia of "learning and knowing." People are dying out there. Technology is not the knight in shining armor. The ecosystem approach can generate authentic developments that challenge our expectations precisely by focusing on intersections of representational borders.

The information age elevates the value of meanings. Artifacts and the environments in which we use them operate semiotically. Media, disciplines and cultures, technologies, economies, and human activities press into contact, transforming context. They engage in vigorous multi-branching flows of representation. They form rich ecosystems, with complex interdependent roles and essential processes of circulation. The interface is the catalytic border zone that effects the dynamic interplay of these reactants. New meanings emerge. By multivocally opening frameworks of discourse to address these phenomena, interface ecology supports the analysis and creation of essential new Information Age formations.

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NOTES

1. An aggregate is an association of diverse elements, all of which are on the same level [De Landa 1997]. Some structure, process, or mechanism sustains their association. The relationships between the elements are multifarious. Even though they are part of a common aggregate structure, the components retain their distinct identities. Processes within aggregates develop bottom up. They are heterogeneous structures that foster diversity. A meshwork is a self-organizing aggregate in which there is significant exchange of energy among the constituents. The binding association is a strong one, based on ongoing, active feedback loops. Dynamic circulation in meshworks pushes them toward boundary conditions, and the emergence of new forms. Meshworks contrast with hierarchies, in which structurally uniform elements dominate one another recursively in static formations.
2. Information, or data, refers to signals gathered from sensors, and to results collected from devices. Information can be transmitted and stored. This document is information, as are temperature readings inside and outside my house during my last 12 hours of writing.
3. Knowledge includes models and mechanisms for utilizing information. Knowledge is information digested. Knowledge is based on understanding. It includes decision-making frameworks.
4. I refer principally to the form of assembly line production, characterized by interchangeable parts and labor.
5. My personal take on this definition is influenced by many, including Kroeber and Kluckholn [Kroeber and Kluckholn 1952], Williams [Williams 1983], and Geertz [Geertz 1973].
6. This process is ongoing.
7. Aka Cable News Network LP, LLLP, an AOL Time Warner Company.
8. An artifact is, literally, a thing made through the knowledge and practice of human art and workmanship. [Oxford 1995] As culture is a primary form for representing, storing, transmitting, and producing knowledge of human practices, so artifacts are material forms of culture. They are material representations of a way of life. Artifacts are implements of use and aesthetic expressions that both reflect and create the ways in which people individually and collectively think and act. Artifacts are situated in particular locations and practices.
9. This aesthetic has proliferated since the advent of MTV.
10. An affordance is a sensory attribute of an artifact which, through a user's perceiving it, enables interaction [Norman 1988].
11. The sign is the atomic particle of meaning, of which languages are composed. Particular sets of signs that are used together constitute languages, semiotic codes, and systems of representation. Saussure [Saussure 1966] broke the sign down into signifier (the name, label, picture, phonemes) and signified (the concept referred to) Barthes [Barthes 1972] and Baudrillard [Baudrillard 1981] observed that this construction applies recursively to build up complex levels of contextualized meaning. Thus, what is sign in one level becomes signifier or signified in another. Political economy is one such second-order sign-forming context.

    Sign value [Baudrillard 1981] refers to flows of prestige and power, with economic and cultural components. Brands play a pronounced role. The meaning of technology, as experienced through interface ecosystems, is tightly wrapped in sign values. The rise and fall of the dot-com bubble is an example. Branding plays as significant a role in defining the Internet as art and science do. And step out onto the SIGGRAPH 2002 exhibition floor: experience the marketing of technology and creativity as the operation of sign-value composites. The SIGGRAPH 2002 art and technical programs are connected elements. The representation of value systems other than economic ones is generally marginalized. Signs are packed—multivalent, multilinked—units of meaning.