NOTES TOWARD A HISTORY OF IMAGE-PROCESSED VIDEO

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Ed.'s note: *This is the first in a series of articles about "image processing" as it developed as a genre of video art. It is a step toward a more comprehensive history that will consider the overlapping activities of artists and toolmakers, and the broader social context in which that activity has occurred. Future articles will cover Steina and Woody Vasulka, Ralph Hocking, Sherry Miller, and the Experimental Television Center, Nam June Paik, and others.*

Video wallpaper ... special effects ... computer art ... high-tech video ... image synthesis ... image manipulation ... image processing.... These are some of the terms that have been used to describe a type of video produced by artists who have been experimenting since the late 1960s with an assortment of electronic imaging tools. None of these terms are particularly useful: either they are too general, or too specific, or else they fall prey to the kind of value judgements and myths associated with "mindless," "impersonal" technology.

Even the most common term, "image processing," is problematic. While in the commercial sector image processing usually refers to signal-processing methods such as time-base correction, in the video art world "image processing" has become at once a genre and a catch-all for every technical process in the book. It encompasses the synthesis and manipulation of the video signal in a way that often alters the image quite drastically. It includes not only the alteration of camera-generated images through processes such as colorizing, keying, switching, fading, and sequencing, but combining those operations on synthesized—that is, cameraless—imagery as well. It has come to refer to everything from the most basic analog processing techniques to sophisticated digital computer graphics and effects. Ralph Hocking and Sherry Miller once aptly summed up the difficulty that many artists have in describing what they do: "I know what it is, but I don't know what to call it. I'm tired of saying, 'It's like using electrons to paint with.'"[1]

And yet despite the term's breadth, "image processing" conjures up a number of very specific—and often pejorative—stereotypes: densely layered "psychedelic" images composed of soft, undulating forms in which highly saturated colors give a painterly effect, or geometric abstractions that undergo a series of visual permutations. For many of the people who use these tools, such characterizations are superficial and belie the range of concerns that fall within the image-processing umbrella. "Whenever anyone sees a color change or an image manipulated, they call it 'image processing,'" said Barbara Buckner, one of the many video artists who eschew the label. "But there are many works that straddle different genres. People tend to group everything into this one label since it's convenient, but actually it says very little. It's like calling something silly; you're not really saying anything."[2]

If the label is both conceptually and technically inadequate, it seems to have stuck for lack of a better one. But what has effectively become a separate aesthetic genre began as a microcosm of the activism of the 1960s—the alternative television movement. The lines that are now drawn between what have become categories within video—documentary, image processing, performance, and installation—were virtually non-existent then. As Steina Vasulka has recalled:

> You have to understand those early years, they were so unbelievably intense.... This was the "'60s revolution." We didn't have the division in the early times. We all knew we were interested in different things, like video synthesis and electronic video, which was definitely different from community access-type video, but we didn't see ourselves in opposite camps. We were all struggling together and we were all using the same tools.[3]

Johanna Gill has observed that the desire to use communications tools to change, quite literally, the world took a number of forms—the most direct being to work with community and oppositional political groups.[4] The goals of the alternative media groups were articulated in the first issue of *Radical Software,* the publication founded in 1970 by Beryl Korot and Phyllis Gershuny that until 1974 was the mouthpiece of the movement.

> Power is no longer expressed in land, labor, and capital, but by access to information and the means to disseminate it. As long as the most powerful tools (not weapons) remain in the hands of those who would hoard them, no alternative cultural vision can succeed. Unless we design and implement alternate information structures which transcend and reconfigure the existing ones, other alternative systems and life styles will be no more than products of the existing processes.... Our species will survive neither by totally rejecting nor unconditionally embracing technology—but by humanizing it; by allowing people access to the informational tools they need to shape and reassert control over their lives.[5]

The rejection of television did not manifest itself in direct social action alone. In fact, low-cost portable video equipment was so new that using it for any purpose at all was considered radical. As part of a new kind of "media ecology," video environments (the precursor of the "installation") were created. Some were interactive situations designed to expose and circumvent the one-way delivery of commercial television. Others—inspired by Marshall McLuhan and Norbert Wiener's work in cybernetics—reflected the utopian desire to use technology to meld "man" and environment. The idealism in this excerpt from Juan Downey's article "Technology and Beyond" is typical of what David Antin has called "cyberscat," the futuristic jargon spoken not only by Downey, but Frank Gillette, Paul Ryan, Paik, and many, many others.

> Cybernetic technology operating in synchrony with our nervous systems is the alternative life for a disoriented humanity.... The process of reweaving ourselves into natural energy patterns is Invisible Architecture, an attitude of total communication in which ultra-developed minds will be telepathically cellular to an electromagnetic whole.[6]

Alternative television also meant creating images that *looked* different from standard TV. Thus, "image processing" as we now know it grew out of an intensive period of experimentation that for some, in a vague way, was seen *visually* to subvert the system that brought the Vietnam War home every night. There were other motives, of course: the swirling colors and distorted forms conjured up the experiences associated with hallucinogenic drugs, suggesting that "new realities" could be electronically synthesized. And for some, the interest had more to do with the modernist notion of exploring the essential properties of the new medium.

Although the various groups and individuals considered themselves part of one "movement," their goals proved to be quite contradictory in practice. In New York, the differences began to rigidify when the New York State Council on the Arts (NYSCA) started funding video in 1970-71, and applicants felt compelled to formalize their interests. Because the Council could not then (and cannot now) award funds directly to individuals, there was a scramble to form non-profit organizations in order to benefit from the available funding. According to Gerd Stern, though, NYSCA opted for a pluralist approach in its earliest funding. There was a rapidly increasing number of alternative media groups and unaffiliated artists. Lines were drawn between those developing techniques of working with synthesis and abstract images and the advocates of video as a revolutionary communications tool.[7]

If lines were drawn among groups, however, they still had one thing in common: all were operating outside the mainstream gallery structure. If one looks at exhibitions at galleries like Castelli and Sonnabend, for example, it becomes very clear that only those artists who already had a track record in another medium were showing video there. Names like Richard Serra, Keith Sonnier, Lynda Benglis, Nancy Holt, Vito Acconci, Bruce Nauman, and William Wegman didn't appear on the pages of *Radical Software;* they did appear in *Artforum.* The way many of these artists used television came out of conceptualism. Aiming to circumvent the art market, some worked in various reproducible or non-buyable media such as video, artists' books, photography, and performance. Of course, it didn't work; conceptualism was handily coopted. The point is, though, that the only video activity ever really taken seriously in the art world was the work of established figures.[8]

There are a number of reasons for this which I do not propose to address here. However, one thing is certain: while various people were experimenting with the manipulation of the video signal with the intent of "exploring the medium's inherent properties," the rules had changed. The whole idea of a modernist practice was being dismantled. The work was thus dismissed not so much because it was inherently "bad," but because the ideas informing it had become exhausted. No one in art circles wanted to hear about—let alone look at—video that seemed to be based on the conventions of modern painting. Robert Pincus-Witten argued that point in 1974 at "Open Circuits: An International Conference on the Future of Television."

> It appears that the generation of artists who created the first tools of "tech-art" had to nourish themselves on the myth of futurity while refusing to acknowledge the bad art they produced. Their art was deficient precisely because it ws linked to and perpetuated the outmoded clichés of Modernist Pictorialism—a vocabulary of Lissajous patterns—swirling oscillations endemic to electronic art—synthesized to the most familiar expressionist color plays and surrealist juxtapositions of deep vista or anatomical disembodiment and discontinuity.... The important work, then, of the first generation was the very creation of the tool, the video synthesizer.[9]

With the exception of Nam June Paik's well-known collaboration with engineer Shuya Abe, the history of video as it is presently constituted has virtually ignored the "important work" of that first generation. And it was—and still is—important, for the development of *relatively* accessible and inexpensive tools depended on the expertise of the people who could design and build them. It was rare to find both artist and engineer in one person. Hence, as Woody Vasulka has observed: "There were symbiotic relationships. The '60s uncovered outcasts, individuals. It brought together technical people and artists who were disaffected."[10]

What follows then, is a brief review, based primarily on interviews and published sources, of what some of those tools are as well as profiles of the people who built them. In some instances, foggy memories and lack of documentation have made it difficult to verify certain facts. Where I have been obliged to use my own best guess, I have footnoted the discrepancies.

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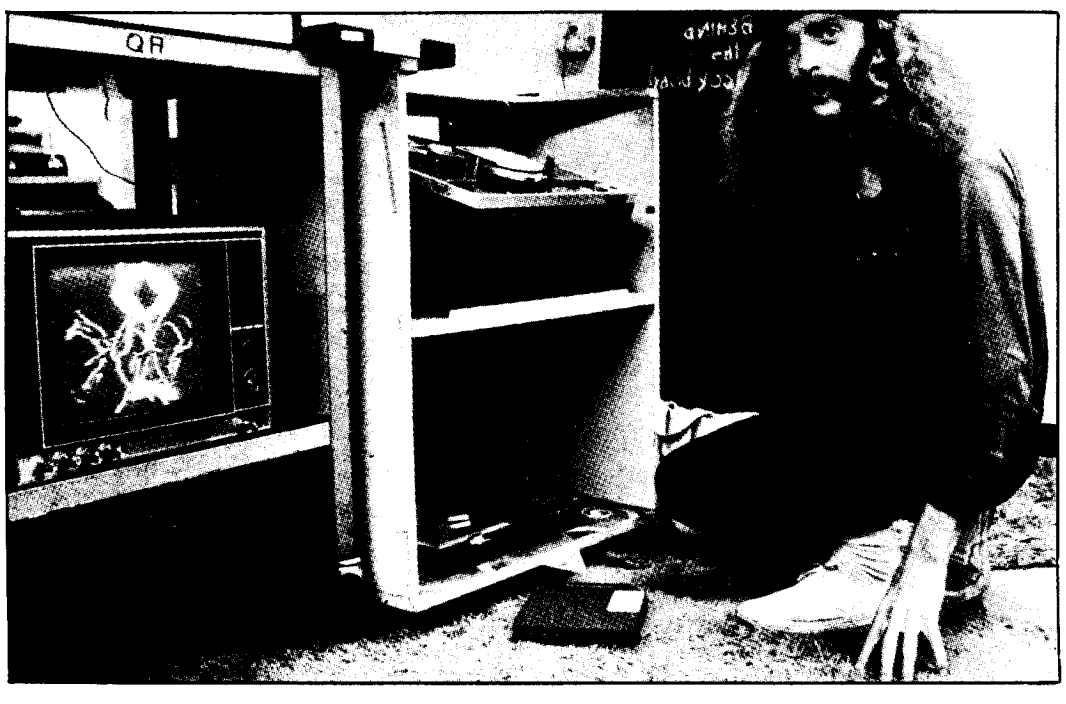
Three basic types of video-imaging tools were developed for artists' use in the late '60s and early '70s: raster manipulation devices, colorizers and mixers, and synthesizers.[11] Both raster manipulation devices and colorizers and mixers function

LUCINDA FURLONG, a videomaker and video critic, is working on a history of "image processed" video.



Left: Stephen Beck, c. 1972. Right: Dan Sandin, from *How TV Works.*

by performing some operation on an incoming signal; synthesizers generate signals internally.

Raster manipulation devices allow one to interfere with the video signal as it is displayed on a monitor during the scanning process. Scanning refers to the continuous, regular, and repeated movement of a beam of electrons across the video screen—or raster—horizontally from left to right and from top to bottom. The flow of electrons is controlled by a magnetic field which "pulls" the image both horizontally and vertically to produce a normal image. One can distort the image by applying additional magnetic force, the crudest way being simply to hold a magnet in front of the monitor. A slightly more controllable method is to modify a TV set by the permanent addition of extra magnetic coils. Probably the most familiar examples of magnetic distortion are Nam June Paik's wobbling images of Richard Nixon and Marshal McLuhan. The "Wobbulator"—one of Paik's prepared TV sets—was later named after the effect. Another raster manipulation device is the Rutt/Etra Scan Processor, a more sophisticated version of the Wobbulator that allows greater flexibility and control.[12] (Gary Hill's *Videograms,* for example, were produced using the Rutt/Etra.) Neither of these devices have a recordable output, and both are limited to black and white video.

The next type of imaging device involves processing the incoming signal. The results vary depending on the tool, but they include the following: colorizing, in which a chrominance (or color) signal is added to a black and white signal; mixing, which involves the superimposition of two or more images and resembles photographic double exposure; keying, basically a masking process which allows one to insert an image into specific areas of the frame; switching, in which two video inputs are displayed one after the other at variable rates; sequencing, a type of switching in which more than two inputs are switched; and fades and wipes, which are variations of switching and mixing.

While such processor tools require an external video input, video synthesizers do not. Video synthesizers have much in common with audio synthesizers, for both are descendants of analog computers. Just as audio synthesizers use oscillators to generate electronic waveforms such as sine, square, triangle, and ramp that become audible as tones, video synthesizers generate waveforms that become visible as patterns which can then be encoded with color, and, depending on the tool, subjected to the same operations that processors perform. Strictly speaking, the Paik/Abe Video Synthesizer which was completed in 1970 is not a synthesizer at all, but a mixer-colorizer. The Paik/Abe has seven inputs, which means that up to seven live cameras or recorded signals can be mixed and colorized.[13]

These first tools are very crude by the standards of the commercial industry. However, what they all share is a design approach in which the artist is afforded an enormous amount of flexibility. Unlike most commercial production devices—in which a specific button is pushed to achieve a specific effect—these tools were designed as interactive instruments whose possibilities could only be thoroughly known through use.

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I thought I was thinking up something new and original all by myself. I didn't know other people were doing the same thing.

—Eric Siegel

The genesis of the synthesizer goes pretty far back in my mind.... Almost exactly in parallel with Paik's development of the synthesizer, I was working on my own version of electronic graphic arts.

—Stephen Beck

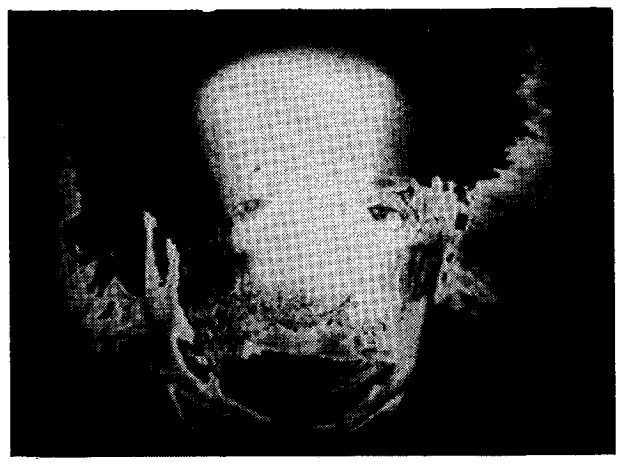
In my mind, the design was so completely obvious—and it still is to me—that I felt that these things were going to be popping up like grass all over the world.[14]

—Dan Sandin

Anybody who knew anything about electronics always became a "genius"—brilliant and a genius.

—Steina Vasulka

For artists who were just beginning to learn electronics in the late 1960s, there were many candidates for "genius" status—Eric Siegel, for instance, who by the age of 14 had built his first TV set. Born in Brooklyn in 1944, Siegel was a student at Samuel Gompers Vocational and Technical High School when he built a black and white TV camera which he completed at the age of 15.[15] According to Siegel, "I just wanted to gather up all the pieces to produce my own video, and in those days, there was no way of getting your hands on a TV camera for any amount of money, especially if you were a kid." In the early and mid-'60s, Siegel held various jobs designing and repairing closed-circuit TV equipment, all the while experimenting with video effects. In 1966, he went to London to work in the Educational TV Department at the University of London, Goldsmith's College. On his return, he rebuilt a two-inch videotape recorder from parts.



Both frames from *Einstein,* by Eric Siegel.

I was working for a man who owned an audio recording studio who got a whole bunch of Ampex 660 machines in parts—heads, drums, boards, and chassis. I fell in love with them, and he said, "Look, if you fix these, I'll give you all the other parts and you can build your own."

It took Siegel six months to complete the recorder. He was 22.

He continued his experimentation with the new machine, producing what he called "psychedelevision," distorted black and white images. He also began to collaborate with artists. In May 1968, he designed and built the special effects components for Serge Boutourline's *Televanilla,* an improvisational dance piece choreographed and performed by Susan Biurge. Also around 1968, Siegel met Stan VanderBeek, who had been experimenting with magnetic distortions of a color TV. According to VanderBeek:

... we [Siegel and VanderBeek] immediately became friends and started working together on his tape experiments. The idea was that I was an artist who knew a little about electronics and he was an engineer who knew a little about art. Actually, he didn't need much help, but at times, he needed a little encouragement. He usually didn't need any of that either. But we were both very broke and scavenging parts from discarded radios and all we ate was pizza.[16]

Siegel recalls that it was through Thomas Tadlock, who had been making light sculptures, that he met Howard Wise.[17] Wise's 57th St. gallery had specialized in kinetic and electronic art, and he was looking for work for an upcoming show. Siegel says that when Wise saw *Einstein,* it "really turned him on. He said: 'Is there any way you can make this in color?' And I said: 'Well, there is, but I need $200 to buy a color TV set to do it.'" Wise gave Siegel the money, and he set to work building the circuitry that would add color to a black and white video signal. This was accomplished through the use of a phase modulator, a device which measures the voltages of the incoming black and white signal and assigns them color frequencies accoding to the gray values that those voltages represent. Several months later, *Psychedelevision in Color* was installed at the now celebrated show, "TV as a Creative Medium," which ran from May 17-June 14, 1969.[18] The reworked tape took a photograph of Einstein and used video feedback and the colorizer to break down and distort the image, producing colorful oscillating patterns.

Siegel's first colorizer was a crude device that allowed for little control. Furthermore, the image could not be recorded directly, but had to be rescanned with a color camera—an expensive proposition at that time. Consequently, no tape exists from the original installation, but Siegel later remade *Einstein* and several other tapes which are now housed at Electronic Arts Intermix in New York—the not-for-profit distribution and production facility that Wise founded in 1971.

After the show, Siegel—on a trip to Sweden—began to work on a design for a video synthesizer. While there, he was offered $1,000 and his plane fare home by David Cort of the Videofreex—one of the first video collectives—to build them a colorizer for their work on an ill-fated series for CBS.[19] Siegel returned to the U.S. and designed a completely new set of circuits which—like the original modified TV set—took one modified black and white video input. However, using two phase modulators instead of one, the new colorizer provided more control. It also produced a recordable output.

While Siegel was working on the colorizer, Wise began talking about marketing it, but Siegel was more interested in developing the synthesizer. According to Wise, "He came home from Europe and said he had a new idea he wanted to work on, but that he didn't want to stay in New York."[20] As Siegel recalls, "I told him if he wanted to support me to do something, let me do the synthesizer." So with Wise's financial backing, Siegel went to San Francisco and built the prototype. Of the experience, Siegel—who, like many other early tool builders, is basically self-taught—said: "I never thought I'd see the end of it. It was one of those projects that was a little too big and it was a heavy trip because I was taking on a level of sophisticated electronics that was just a little bit above my head."

Although Siegel finished the synthesizer in 1970,[21] he and Wise differed on how it should be marketed. Wise explains: "I wanted to get a manufacturer to build it under license from us. But Eric was leery that someone would steal his design, and so he wanted to do it all himself." Siegel describes Wise's proposition as "not financially viable." The synthesizer was never manufactured, but Siegel did manage to market the colorizer. About 10 units were sold for approximately $2,400 each.[22]

In 1972, Siegel spent six months in India and produced a 30-minute black and white tape based on his experiences there. When he returned, he was uninterested in the direction he saw video taking. For despite the fact that he'd been active in the video scene, and had contributed articles to *Radical Software,* he felt that after India "everything was passé. I did not have the will or desire to make videotapes anymore, especially because it was becoming the 'in' thing. A whole sub-culture was forming and it turned me off." He eventually formed Siegel Electronics in San Diego, Calif., and has been designing and manufacturing equipment—including a processing amplifier and an image enhancer—since 1978.

Summarizing his development, Siegel commented:

It had to do with the timing.... It was a whole frame of mind that the country was in. What was going on that I was a part of was more than just technology. There was a human element, a human spirit. We were using the technology; it was our servant, not our god.... Basically my evolution has been from video artist back then to hardware manufacturer now. There are better things I'd rather be doing.

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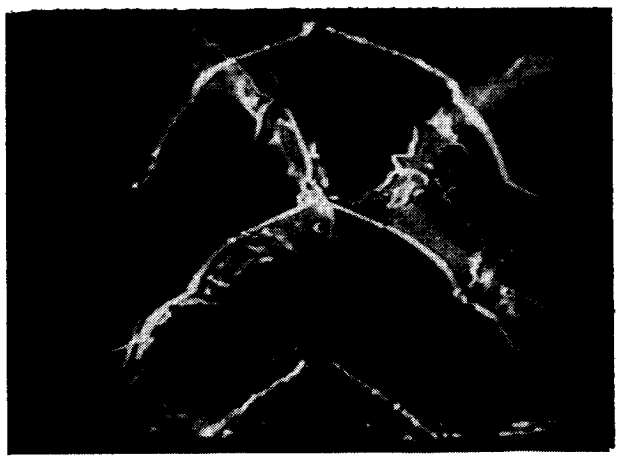
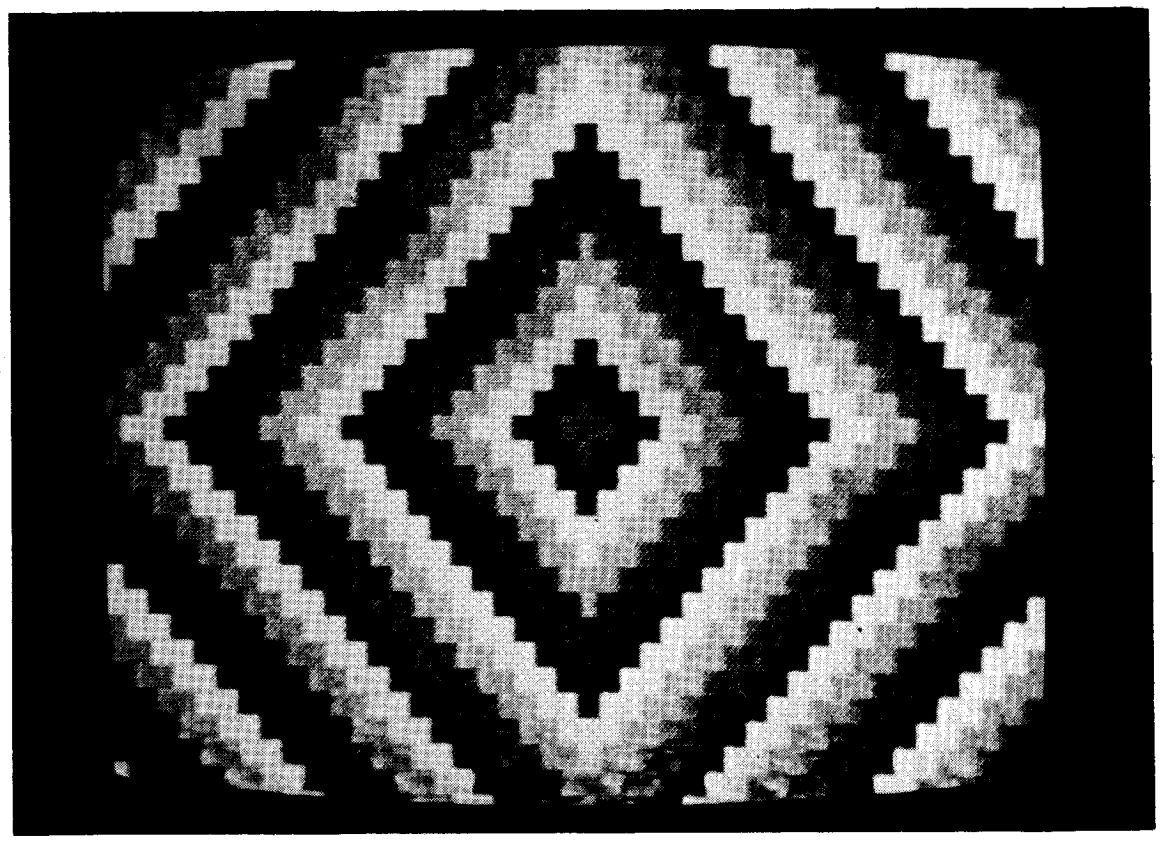
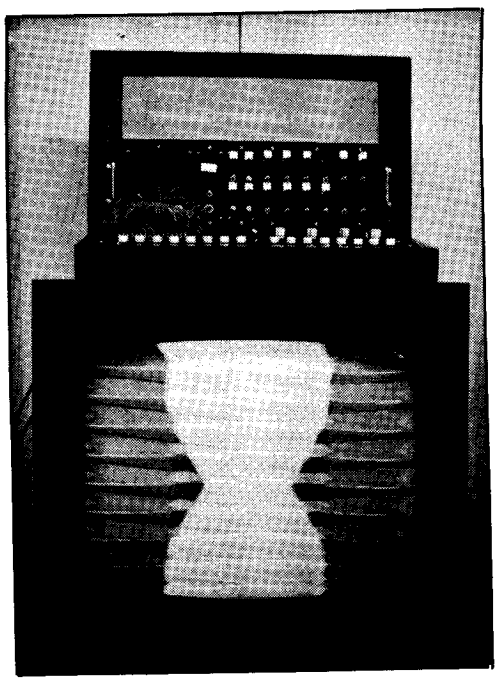
Although they have never met, Stephen Beck has much in

Left: from *Video Synthesis.* Right, from *Video Weavings,* both by Stephen Beck.







The Siegel Video Synthesizer. (Photo courtesy Howard Wise.)

common with Eric Siegel: a whiz kid who completed work on his Direct Video Synthesizer at the age of 21, Beck also went on to form his own company—the Berkeley-based Beck-Tech. After a childhood spent tinkering with radios and TV sets in Chicago, Beck studied electrical engineering at the University of Illinois at Champaign-Urbana from 1967-1970 Beck had also studied French horn and piano and while in college worked as a design assistant at the university's Electronic Music Studio.

During this time, Beck was using sound to generate graphic images on an oscilloscope, and in 1968, began thinking of ways he could control light more precisely. "I was obsessed with the visual world I wanted to project. I wanted to have an impact on TV," Beck recalls.[23] The Number 0 Video Synthesizer was his first attempt, an instrument he used in performances with composer and sound synthesist Salvatore Martirano.

It wasn't until 1970, though, that Beck was able to start building the Direct Video Synthesizer. At the invitation of Brice Howard, director of the National Center for Experiments in Television (NCET), Beck moved to San Francisco to be an artist-in-residence. The NCET (so named in 1969) had been set up in 1967 with funding from the Rockefeller Foundation as an experimental television workshop housed at PBS station KQED. Although workshops were also set up at WGBH, and in 1972, WNET, the NCET went farthest to abandon the conventions of TV.[24] While the emphasis was primarily on producing programming at the other two facilities, at KQED process was generally given priority over product.

With funding from the NEA, Beck completed his synthesizer in 1971,[25] and with Don Hallock, Bill Roarty, Willard Rosenquist, Bill Gwin, and Warner Jepson, produced a series of tapes called *Electronic Notebooks.* The tapes were designed both as documentation of their technical research and visual explorations as well as completed video works.

A number of goals informed Beck's design. One was the desire to have a performance instrument. The second, and most central, was the idea of synthesizing images without using a camera, which, Beck felt, would open up a whole new territory for television as an expressive medium. According to Beck, he spent two years "looking at everything I saw from behind the retina, behind the eyeball, from within, and finally arrived at a graphic model on which to base the synthesizer."[26] Calling his instrument an "electronic sculpting device," Beck designed circuits that would generate four specific "visual ingredients"—color, form, motion, and texture. He subsequently expanded the control possible by adding circuits that could provide greater contour and movement, as well as generate images of fire, air, and water.

As Beck saw it, the essential difference between his tool and a colorizer-mixer like the Paik/Abe was the difference between synthesis and fragmentation. The Direct Video Synthesizer was designed to produce non-objective, archetypal imagery, not to manipulate a representational camera image.[27] "Paik was always always trying to tear things apart, while I was trying to put things together," Beck commented.

In the fall of 1972, Beck and composer Warner Jepson went on the road with their audio and video synthesizers, giving concerts at schools such as Cooper Union, Harvard, the Rhode Island School of Design, and at the National Academy of Science. In 1974, Brice Howard—after having established satellite programs of the NCET at Southern Methodist University, the Rhode Island School of Design, and the University of Illinois at Edwardsville—left the Center. By 1976, the program had folded. Meanwhile, Beck had started work on a digital version of the synthesizer, which he called the Beck Video Weaver. To Beck, weaving was a structural metaphor for the television raster. By 1975, he had finished the digital circuits for the Weaver and incorporated them into the original synthesizer. He then produced a series of tapes called *Video Weavings.*

Of all the tool builders discussed here, Beck has been the most heavily documented in video literature to date, and he has received his share of opportunities to exhibit and broadcast his tapes. Like other tool designers, however, Beck eventually formed his own company and has been designing microcircuits and video games—one of which, appropriately, is called "Save the Whales." Says Beck,

> I was not disenchanted with the art world. I'm quite happy with the way I was received. It's unrealistic, though, to think you can live off being an artist. Out here, Silicon Valley was bursting [in the early- and mid-'70s] and anybody with two eyes could see that that's where it was happening.... To me, the video game is the synthesizer of the '80s.

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Of all the tools designed and built specifically for artists, none has achieved the level of actual use that the Sandin Image Processor (I.P.) has. While 25 units may not seem like much, it's impressive when one considers the way it is distributed. Sandin rejected the idea of marketing the device commercially, choosing instead to give the plans away to anyone who wished to make their own.

Sandin was doing graduate work in physics at the University of Wisconsin at Madison (earning an M.S. in 1967) when he realized he "wasn't being a good physicist anymore."

> I was also doing color photography, and I was interested in light shows and kinetic events. I was producing slides for those shows. I was involved in using optical and chemical processes to create images that I found interesting and it occurred to me that I could do it electronically.

While doing the light shows, Sandin became familiar with the Moog 2 audio synthesizer, and around 1968, began thinking about what the visual equivalent of the Moog might be. Sandin recalls an early conversation with a friend, Russell Dobson:

> We just considered the processing modules in the audio synthesizer, and what it would do to the image if you ran the signal through a module that had been modified to have sufficient bandwidth to handle video. And that pretty much specified what the analog synthesizer turned out to be.

It took several years to bring the idea to fruition, for despite his training, Sandin still had to teach himself electronic design. In the meantime, he became a faculty member at the University of Illinois Circle Campus in Chicago, teaching kinetic art and interactive sculpture.

He got involved with video in 1970 during the student protests that resulted from the Kent State killings. Because the art department was one of the few to shut down, it became the student "mediahouse," producing posters and videotaping political meetings which were shown live over closed-circuit TV. While running the equipment, Sandin recalls the intial fascination he had with video:

> There was something about the black and white image that I found very attractive and tactile. I remember I found myself stroking the TV screen and staring at the TV image. Afterwards, I took this 20,000 mile motorcycle trip around the country and it became clear that this old idea of this image synthesizer and my new attachment to video was something I could pull off.

Sandin received a $3,000 grant from the Illinois Arts Council to develop the new tool, and by 1973 he'd finished it.[28] The basic idea was to make an affordable instrument (presently about $4,000) that would combine many functions in one tool—i.e., keying, fading, colorizing. Like audio synthesizers, it would also be patch-programmable: how the different functions were combined depended on how an artist wanted to use it. Consequently, the I.P. is set up as a series of stacked metal boxes which can be reconfigured with cables to perform sequences of functions on incoming signals. Like Beck's synthesizer, the I.P. was also designed as a performance instrument, and its early use often involved events in which the I.P. was patched together with an audio synthesizer and "played." In January 1973, for example, after he had completed a black and white version of the I.P., Sandin performed in an event called "Inconsecration of New Space" with Phil Morton and Jim Wiseman, who had built his own Paik/Abe. In an article called "Imaging and the Machine," Diane Kirkpatrick describes the event:

> The newly completed black and white Image Processor took naturalistic images from film (fed through a film-chain), pre-recorded video tapes, and/or live camera input and subjected them to various electronic transformations. The Paik/Abe Synthesizer was used to colorize the images.[29]

By the end of 1973, Sandin had finished the color encoder modules, and with Phil Morton—who had established the video program at the Chicago Art Institute—began to document the I.P. so that others could build their own.

> Phil was the first person to make a copy, and at the time I designed it, I thought it would take someone with an electronics background to do it.... We had met at some event at the Art Institute, and when I told him I was working on a video synthesizer his eyes went wide open. He said: "You know, I've been trying to find someone who was going to do this...." So he was a great psychological and social support.

Sandin and Morton spent over a year redrawing the plans and making up a parts list for a kit that would be comprehensible to someone with only a rudimentary knowledge of electronics.

The performance capabilities of the I.P. were further enhanced when Tom DeFanti, a computer scientist who had developed Z-Grass—a user-friendly (i.e., the computer graphics language is greatly simplified), interactive, computer graphics system with a video output—joined Sandin at the Circle Campus. Together they set up the Circle Graphics Habitat—a facility in which students could interface Sandin's processor with DeFanti's system. The computer could then be used not only as a controller, but to generate images that could be fed into the processor. Sandin is now working with DeFanti and others to develop the Digital Image Processor (DIP), a general-purpose instrument that would interface with the Z-Grass computer to produce a wide range of digital image generation and processing functions.

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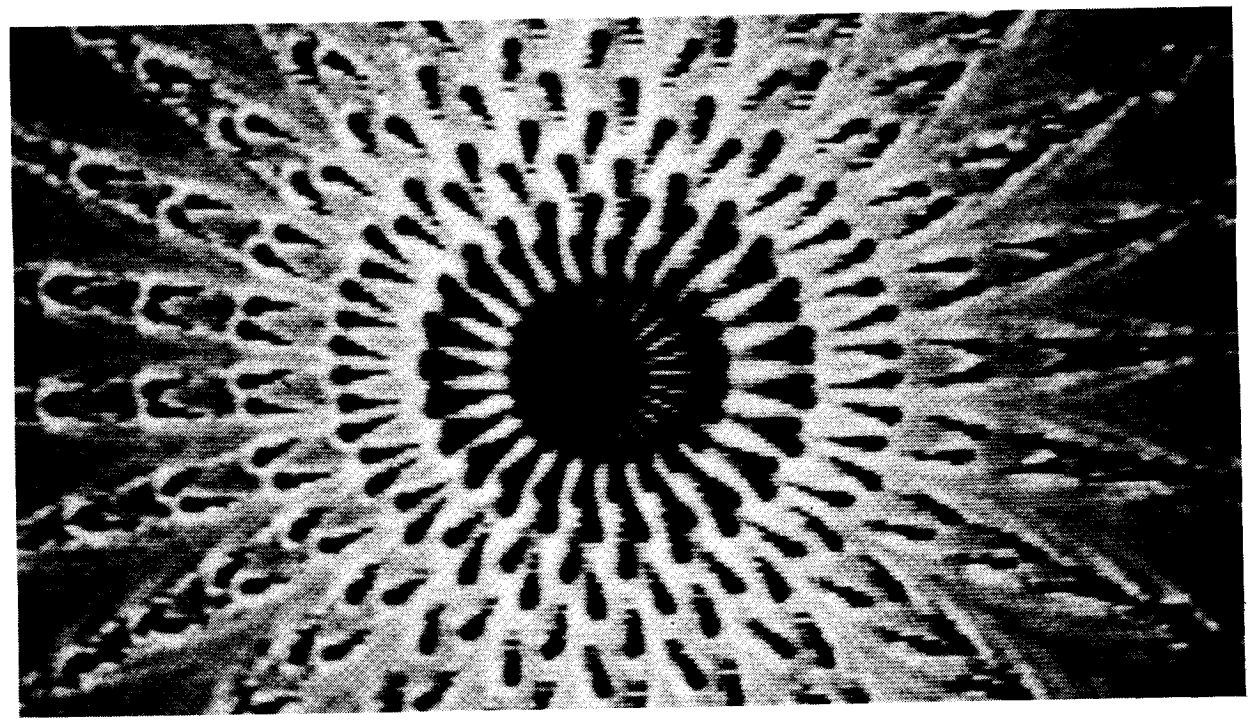
The story of Bill and Louise Etra's initial involvement with video is the story of countless others before and after them. "We sold our car and bought a portapak," Bill Etra recalls.

> We began experimenting with video feedback. Then, at some point, I stopped doing everything *but* video feedback, and started buying World War II surplus equipment—oscillators, function generators—and patched them together to distort the feedback.[30]

Bill Etra has all the credentials of the consummate '60s radical—a photographer for the New York underground newspaper, *Rat,* a Yippie, an excursion with Hog Farm, light shows for the Cockettes—"all the prerequisites for being crazed," as he put it. In the late '60s, he enrolled at New York University to study documentary filmmaking with George Stoney, and ended up teaching experimental video there. (One of his students was Barbara Buckner.) According to Bill Etra, Stoney managed to get some grant money for him, because "he thought that the experimental stuff wasn't what he liked, but it was interesting." A graphic artist, Louise Etra studied art education at City College, and together the Etras collaborated on tapes through the mid-'70s.



Detail from *Spiral 5,* by Dan Sandin, Tom DeFanti, and Mimi Shevitz.

In order to learn video better, Bill Etra apprenticed himself in 1972 to John Godfrey, engineer at WNET's TV Lab. In 1973, the Etras participated in WNET's residency program and produced *Video Wallpaper,* which—using oscillators and the Paik/Abe colorizer—consisted of "14 short studies in color and motion."[31] According to Bill Etra, the tape's title was a response to an article by Brice Howard in which he apparently inaugurated the use of the term as a negative description of much experimental video of the time.

After having built a raster manipulation device based on Paik's Wobbulator, Bill Etra approached Steve Rutt, an old high school friend, about the possibility of designing a device that would be more controllable, "a Paik/Abe [Wobbulator] that zoomed." As Rutt remembers Paik's device: "Paik had figured out how to make something move across the raster, but it wouldn't stay in the spot it had been moved to."[32]

With a $3,000 research and development grant from the TV Lab, they completed the prototype by the end of 1973 at a total cost of $13,000.[33] According to Bill Etra:

> We worked about 18 hours a day, seven days a week, and we thought it would be easy.... We made our own circuit boards, we did our own etching. But then we were in $10,000 debt. My portapak was in hock, we borrowed money from both our families.

Realizing the only way they could recoup their losses was to try to market the device, Rutt and Bill Etra developed two models. (The more expensive, commercial R/E 1 included a higher resolution display screen.) The venture proved to be disastrous: a company called Computer Image had patented

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As I am sure you (who are you) understand a work like developing and expanding the Image Processor requires much money and time. The'U' does not have much money for evolutionary work and getting of grants are almost as much work as holding down a job. Therefore, I have the feeling that if considerable monies were to be made with a copy of the Image Processor, I would like some of it.

Put in your own method of returning energy to me here: _____

_____ _____
_____ _____
_____ _____
_____ _____
_____ _____
_____ _____

Of course enforcing such a request is too difficult to be bothered with. But let it be known that I consider it to be morally binding.

Much Love, I DECIDED THAT I WOULD LIKE 1 good TAPE FROM EACH COPY OF THE I. P.

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another raster scan device and threatened a lawsuit. Both Rutt and Bill Etra say that the patent was invalid because the company had patented not the device but raster scan technology itself. Citing experiments that Ben Laposky had done in 1947 in Cherokee, Iowa—in which he filmed off an oscilloscope upon which Lissajous patterns had been produced—Rutt and Bill Etra claimed that Computer Image couldn't patent the technique. Furthermore, according to Rutt, the technical information upon which their design was based was readily available in contemporary electronics literature.

Although they were forced to obtain a licensing agreement in an out-of-court settlement, the fee was nominal, which meant that they could have continued marketing the device. But their financial burdens—already considerable—were so inflated by the legal fees accrued in fighting the Computer Image patent that Rutt and Etra discontinued their operation. In total, about 20 machines were built—all by hand—and marketed for about $7,000-8,000.[34]

After the raster scan debacle, Rutt continued his work in electronics, and now heads Rutt Video, a production and equipment design company in New York City. The Etras—having started researching the use of computers to interface with video, co-directed in 1974 and 1975 the International Computer Art Festival at The Kitchen. Both have since been extensively involved in the computer graphics/video field. Bill Etra—whose company, Visionary Image Products in the San Francisco area is developing a computer graphics video system—characterized the direction his involvement with video has taken.

I evolved from being interested in doing the artwork with the machines to the artwork being done in the design of the machine.... As a tool maker, what you have to suffer is the thought that whatever tools you make, the people who can devote themselves to their use—who don't devote themselves to building them—will be better at it than you are.

•

With the exception of Sandin—who found institutional support for both his tool building and tape production—all of these early toolbuilder/artists ultimately took their skills to the commercial sector. On hindsight, this is only logical, even though all of them had been active in the early video art scene. For despite the value of their work, how could they have been absorbed into the art world? Their product was not marketable as an art object.[35] There were so few people making video art that the tool market was too small. Moreover, the art world is not a network of support for electronics and communications research and development.

This first article has been based on somewhat artificial distinctions in that I have dealt only with people who actually built particular tools, some of which ultimately had little impact in terms of actual use. For instance, neither the Beck nor Siegel synthesizers were duplicated. There are, however, a number of key figures in the development of image processing as a genre—artists who have been instrumental in getting tools built and who have also contributed to the theoretical and institutional framework in which much of this activity has taken place. It is their work that will be examined in forthcoming articles.

NOTES

1. Ralph Hocking and Sherry Miller, in "Themes in Electronic Image Processing," exhibition catalogue (New York: The Kitchen, 1981).
2. Interview with the author, Feb. 9, 1983.
3. All quotes by Steina Vasulka are from an interview with the author, February 1982.
4. Johanna Gill, *Video: State of the Art* (New York: Rockefeller Foundation, 1976).
5. From inside cover of *Radical Software,* No. 1 (1970).
6. Juan Downey, "Technology and Beyond," *Radical Software,* Vol. 2, No. 5 (1973), p. 2. Antin characterized "cyberscat" as a "kind of enthusiastic welcoming prose peppered with fragments of communications theory and McLuhanesque media talk." See "Video: The Distinctive Properties of the Medium," in *Video Art,* exhibition catalogue (Philadelphia: Institute of Contemporary Art, 1974), reprinted as "Television: Video's Frightful Parent," *Artforum,* Vol. 14, No. 4 (December 1975). An abridged version appears in *Video Art: An Anthology,* compiled and edited by Beryl Korot and Ira Schneider (New York: Harcourt, Brace, Jovanovitch, 1976).
7. Gerd Stern, "Support of Television by Public Funding: The New York State Council on the Arts," in *The New Television,* edited by Douglas Davis and Allison Simmons (Cambridge, Mass.: The MIT Press, 1977), p. 147.
8. Even Nam June Paik, whose retrospective at the Whitney last year constituted official artworld approval, has never sold much of his work, and has never been represented by a major gallery. See Martha Gever's "Pomp and Circumstances: The Coronation of Nam June Paik," *Afterimage,* Vol. 10, No. 3 (October 1982), pp. 12-16.
9. Robert Pincus-Witten, "Panel Remarks," in *The New Television,* p. 70.
10. Interview with the author, March 19, 1983.
11. This typology is based on several unpublished papers by the Experimental Television Center, Owego, N.Y., and an article by Stephen Beck, "Image Processing and Synthesis," in *Video Art: An Anthology,* pp. 184-187.
12. For a more complete explanation of the Rutt/Etra's capabilities, see "Didactic Video: Organizational Models of the Electronic Image," by Woody Vasulka and Scott Nygren, *Afterimage,* Vol. 3, No. 4 (October 1975).
13. When the device was first used at WGBH in Boston and later, at WNET in New York, it was fed black and white signals that had been subjected to magnetic distortion from magnets or the Wobbulator. Also, at WNET, six external oscillators were used to generate signals that were also fed into the mixer-colorizer.
14. All quotes by Eric Siegel are from an interview with the author, March 15, 1983; Stephen Beck, "Video Synthesis," in *The New Television,* p. 48; all quotes by Dan Sandin are from an interview with the author, March 9, 1983.
15. Interview with Siegel. See also *Radical Software,* No. 1 (1970), p. 20, and the exhibition catalogue, *TV as a Creative Medium* (New York: Howard Wise Gallery, 1969).
16. Stan VanderBeek, *Radical Software.* No. 1.
17. Wise doesn't recall that it was Tadlock who introduced them, but according to Siegel, Tadlock was then completing his Archetron—a device commissioned by Dorothea Weitzner which produced kaleidoscopic images in a color monitor. The *Archetron* (meaning an electronic machine that produces archetypal images) was also included in the Wise show. According to John Margolies, it was also used as a "prophecy, meditation, and healing device in New Age Rituals at the Aquarian Republic, Inc.," in New York City. See "TV: The Next Medium," *Art in America,* Vol. 57, No. 5 (September-October 1969), p. 52.
18. In addition to Siegel and Tadlock, the show included: Serge Boutourline's *Telediscretion;* Frank Gillette and Ira Schneider's *Wipe Cycle;* Nam June Paik's *Participation TV;* Paik and Moorman's *TV Bra for Living Sculpture;* Earl Reiback's *Three Experiments within the TV Tube;* Paul Ryan's *Moebius Strip;* John Seery's *TV Time Capsule;* Aldo Tambellini's *Black Spiral;* and *Joe Weintraub's AC/TV (Audio Controlled Television).*
19. The Videofreex were hired by Michael Dann, director of programming at CBS to produce a pilot for a series called "Subject to Change." According to Michael Shamberg in *Guerrilla Television* (New York: Holt, Rinehart, and Winston, 1974), p. 12, the group spent months traveling around the country taping events and people like Fred Hampton and the Black Panthers in Chicago. When the composite tape was shown to Dann and a group from CBS, they were "so repelled that they stumbled out early in a nervous fit. Shortly, thereafter, CBS demanded all the tape back..." Afterwards, the group moved from New York City to a large house in upstate New York, where Siegel built the colorizer.
20. All quotes from Howard Wise are from an interview with the author, April 1, 1983.
21. Neither Siegel nor Wise could remember the exact date of completion, but both agree it was 1970.
22. That's the price quoted by Sammy Adwar, who sold the unit at his New York City equipment store. He said the Siegel Colorizer had been superceded by a similar device made by Bill Hearn.
23. Unless noted otherwise, quotes from Stephen Beck are from interviews with the author, February and April, 1983.
24. Gill, *op. cit.,* pp. 12-16.
25. This is the date given by Beck in "Video Synthesis," in *The New Television,* p. 48.
26. *Ibid.,* p. 51.
27. See also, Beck, "Videographics," in *Video Art: An Anthology,* pp. 20-21.
28. Sandin can't remember exactly when he started working on the Image Processor, but he says it was some time in late 1970 or 1971.
29. In *Chicago: The City and Its Artists: 1945-1978,* exhibition catalogue (Ann Arbor: University of Michigan, 1978), p. 40.
30. All quotes from Bill Etra are from an interview with the author, March 31, 1983.
31. *Video Art: An Anthology,* p. 42.
32. From an interview with the author, March 17, 1983.
33. Records at WNET show that they were authorized the money in January 1973. The date of completion is from *Video Art: An Anthology,* p. 42.
34. According to Rutt, 17 units were built, while Bill Etra says that the number is 22.
35. In the case of the Paik/Abe Video Synthesizer, this situation was carried to its extreme in the Whitney show where the device was treated as a piece of sculpture rather than a tool. See David Ross, "Nam June Paik's Videotapes," in *Nam June Paik* (New York: Whitney Museum, 1982), p. 105.

The Rutt/Etra Scan Processor, a raster manipulation device. (Photo: Barbara Buckner.)