

NOTES TOWARD A HISTORY OF IMAGE-PROCESSED VIDEO

STEINA AND WOODY VASULKA

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Ed.'s note: This is the second in a series of articles on image-processed video. The first article examined the contributions of Eric Siegel, Stephen Beck, Steve Rutt, Dan Sandin, and Bill and Louise Etra to the development of electronic imaging devices [see *Afterimage*, Vol. 11, Nos. 1 & 2 (Summer 1983), pp. 35-38]. Future articles will discuss the work of Ralph Hocking and Sherry Miller at the Experimental Television Center, Nam June Paik, Shalom Gorewitz, Barbara Buckner, Sara Hornbacher, Peer Bode, and others. The project is funded by a video writing grant from the New York State Council on the Arts Media Program.

Despite the fact that many video artists whose work is categorized as image-processed reject this term, it can be useful in describing work by people who not only use similar equipment but share an attitude which treats the video signal as a plastic medium. Beyond such generalizations, however, the designation can be misleading since, as a genre, "image-processed" conflates any and all tapes which contain manipulated and/or synthesized imagery. This acknowledges obvious technical similarities but doesn't account for the variety of approaches which produce works that can be more precisely interpreted. Of course, one interpretation doesn't necessarily preclude another, but an attempt must be made to get beyond the all too familiar responses to this work—that is, either total rejection or total embrace.

The intent of this project, then, is twofold. The first is to identify—without becoming dogmatic—some of the different approaches, some of the social and artistic contingencies, and how these are manifested in the work. The second—but by no means secondary—goal is to contribute to a broader history of video that emphasizes the parallel and overlapping activities of artists.

Probably the most common way image-processed work has been described is as an exploration of the basic property of video—the electronic signal. There are many examples of this fundamentally formalist characterization which, I think, provides a way to lend modernist credentials to an art form that has had a difficult time gaining acceptance—critical attention, funding, marketability—by traditional art institutions.

For example, in December 1971 the Whitney Museum's first video exhibition, assembled by the late film curator David Bienstock, consisted almost entirely of image-processed tapes. In the program notes, Bienstock wrote,

It was decided instead to limit the program to tapes which focus on the ability of videotape to create and generate its own intrinsic imagery, rather than its ability to record reality. This is done with special video synthesizers, colorizers, and by utilizing many of the unique electronic properties of the medium (emphasis added).¹

More recently, Sherry Miller, assistant director of the Experimental Television Center, wrote in *Exposure*,

Electronic image processing uses as art-making material those properties inherent in the medium of video. Artists work at a fundamental level with various parameters of the electronic signal, for example, frequency, amplitude, or phase, which actually define the resulting image and sound.²

Yet another recent example is the catalogue introduction to "The Electronic Gallery," an exhibition that included tapes by a number of people who use the Experimental Television Center. In it Maureen Turim writes,

The Center explores video as an artistic medium. To figure out, to give form to, to embody, to display the various properties that a video system can possess.³

Such generalizations pose a number of problems. It is highly questionable whether synthesized or manipulated video can claim to embody all the medium's "inherent properties." Couldn't one easily argue that video's instantaneity and potential for interactivity are also inherent? More important, I think, is another point Turim makes, "Ultimately, though, the works gain their communicative impact in reference to other concepts and issues."⁴

These quotes refer to any and all kinds of image-processed work. However, of all the prominent artists associated with this type of video, Steina and Woody Vasulka have been consistently associated with technological experimentation and all the ensuing formalist implications. Their work has been described as systemic, didactic, formal, and syntactic, and the Vasulkas—who are both very articulate—have encouraged such readings. Turim's comment may be worth considering, though, since the effects and meanings of their work

cannot be so neatly confined to these categories. As Shalom Gorewitz has remarked about some of the Vasulkas' multiple-monitor pieces that he saw at The Kitchen in the early 1970s,

They could talk about it being didactic and minimalist, but when you saw it streaming down a pyramid of monitors, it was so lush and exciting visually. It was an incredibly sensual experience to be presented with. . . . I wouldn't call [their work] minimal, and I wouldn't call it pure research, because there's a lot of pleasure on a sensual level when seeing it.⁵

Beyond being prolific and playing enthusiastic roles in pioneering electronic imaging, the Vasulkas—as founders of The Kitchen—were also major contributors to the development of an intellectual and institutional framework for video, and they have continued to nurture and promote video within a variety of contexts. I'll begin, then, with an account of their involvement in the early years of video and a discussion of how their work reflected—or in some cases, didn't reflect—attitudes dominant in the '60s about technology, art, and the "establishment."

Born in Iceland, Steina Fteinn Bjarnadóttir studied violin in Reykjavik and at the Music Conservatory in Prague from 1959 to 1962. She also played in the Icelandic Symphony Orchestra in 1964. In Prague she met Woody Vasulka, who was studying at the Academy of Performing Arts, Faculty of Film and Television. Woody Vasulka, following family tradition, had at first studied industrial engineering in Brno, Czechoslovakia, his birthplace. Privately, however, he was writing poetry and fiction and found that he had no use for engineering because it involved too much mathematics. Feeling more affinity with literary tradition, he studied documentary filmmaking. This interest developed out of his desire to work individually as he had as a writer, rather than in a group; documentaries could be produced by one or two people, whereas feature work involved many more. However, documentary had its limits too, and Woody found that film in general was "absolutely a closed medium to me. . . . I was exposed to all the narrative structures of film, but they weren't real to me. . . . I could never express myself in what was called the narrative cinema."⁶

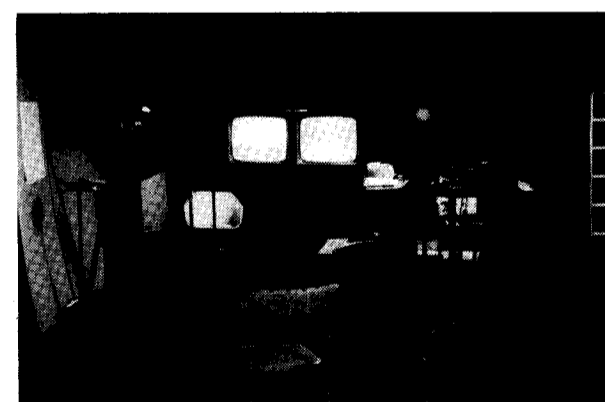
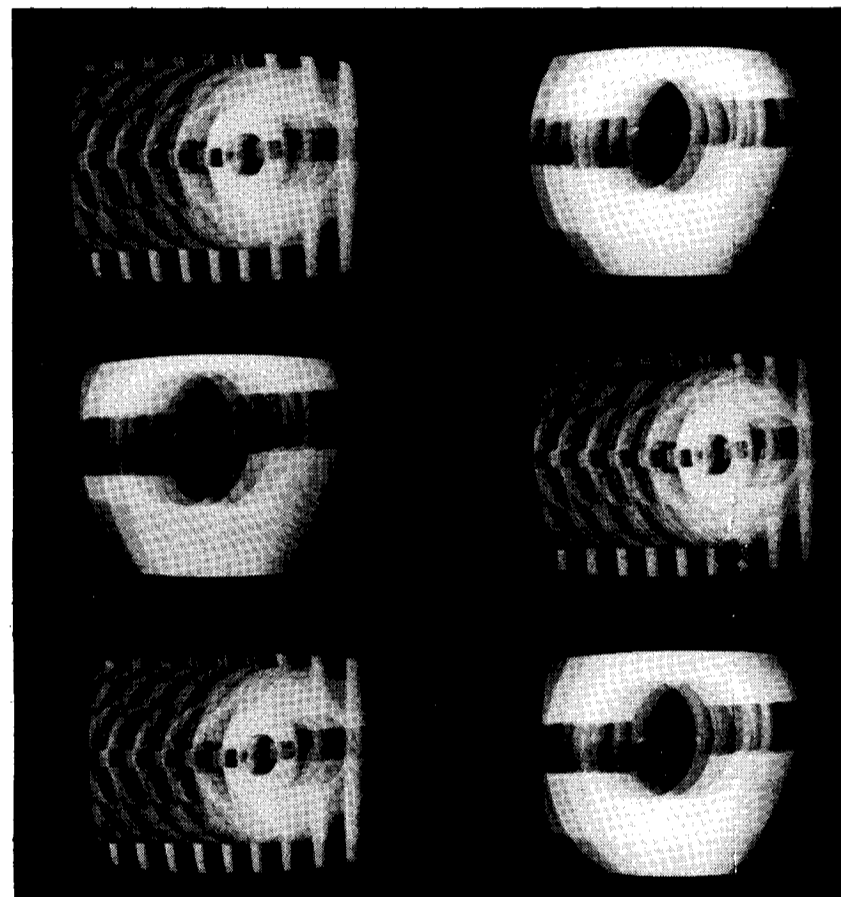
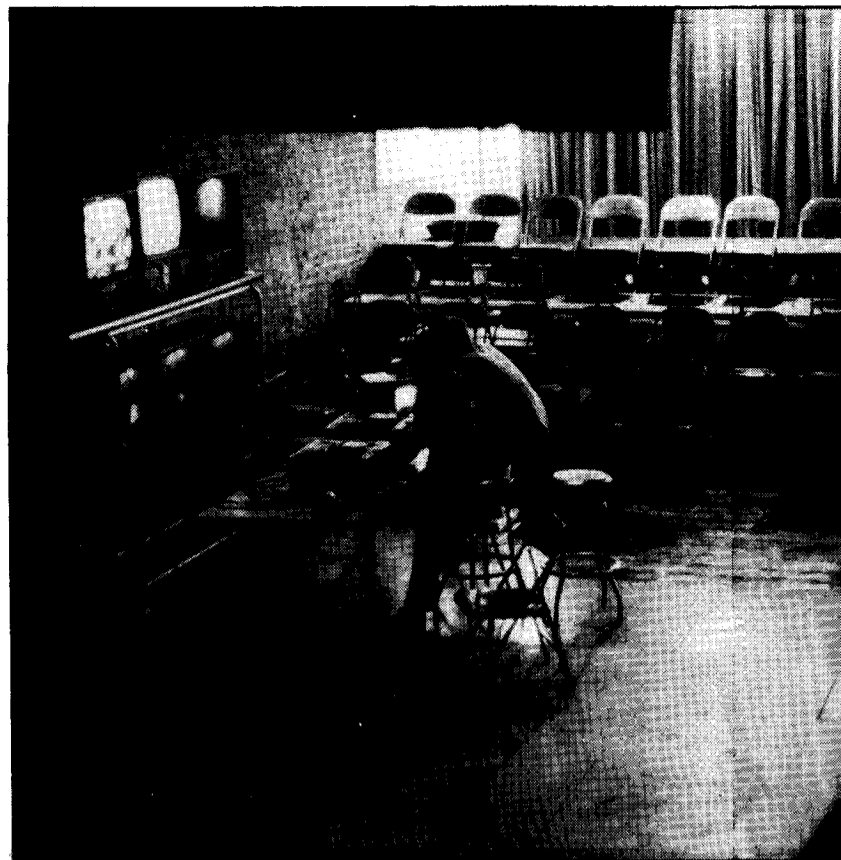
The Vasulkas' decision to emigrate to the United States was based on cultural rather than political considerations. As Woody explained, "I was never attracted to this kind of political system," but "one cannot live in the twentieth century and not deal with America directly."⁷ When the Vasulkas arrived in New York City in 1965, they had much to deal with, not least of all learning English. While they spent most of their time during their first two years in the U.S. getting oriented, there were many avant-garde activities going on with which they would later become involved. These activities—loosely labeled "intermedia"—grew out of intermingling music, dance, theater, and film communities.

In November 1965 *Village Voice* film critic Jonas Mekas proclaimed in his weekly column, "The medium of cinema is breaking out and taking over and is going blindly and by itself."⁸ In 1966, he wrote, "Suddenly, the intermedia shows are all over town."⁹ Light shows, slide shows, multiple film projections, light-motion art, sensoria—these were the activities of people like Jackie Cassen, Elaine Summers, Jud Yalkut, Aldo Tambellini, Stan VanDerBeek, Ed Emshwiller, Gerd Stern, Nam June Paik, and many others. Many, though certainly not all, of these events were inspired by Marshall McLuhan's influential media theories. Because of the widespread impact and popularization of McLuhan's writing, it may be helpful to briefly review his arguments.

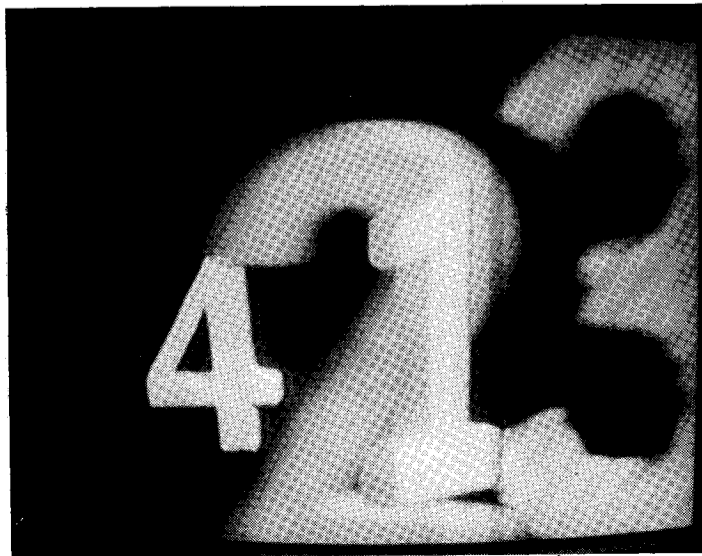
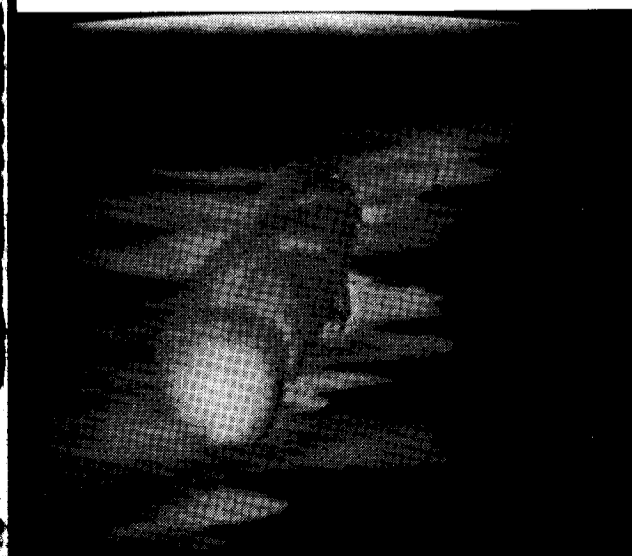
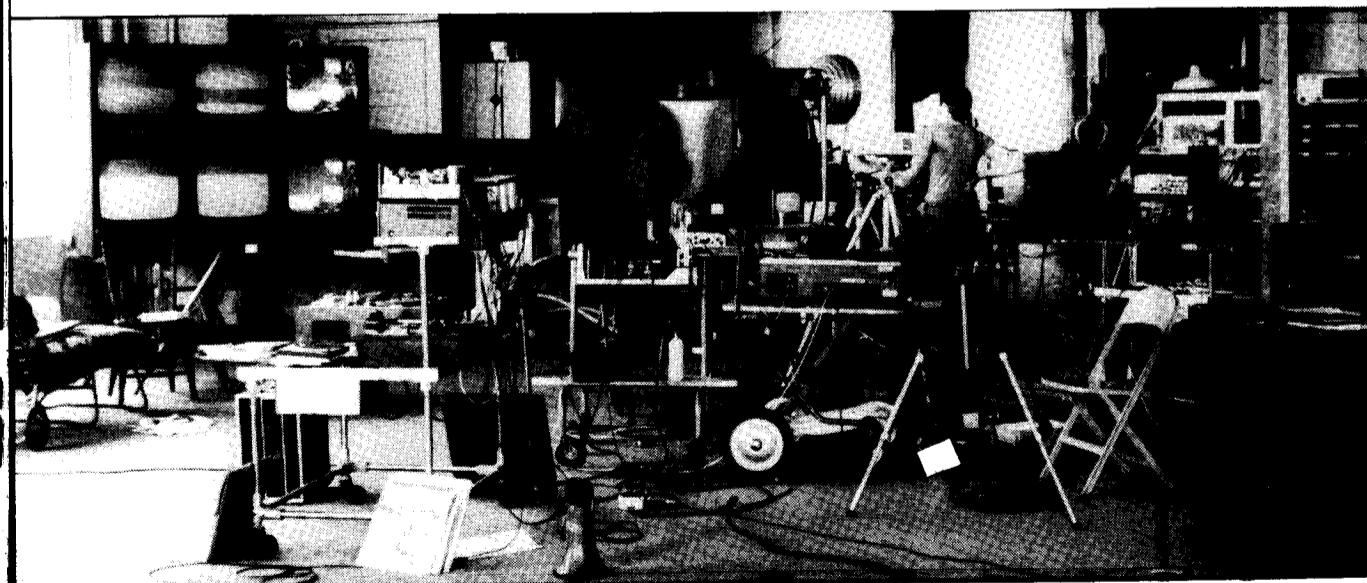
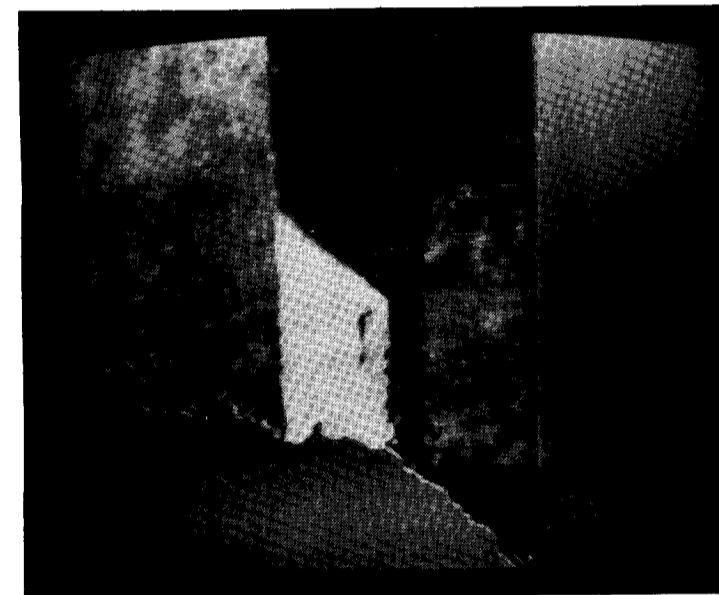
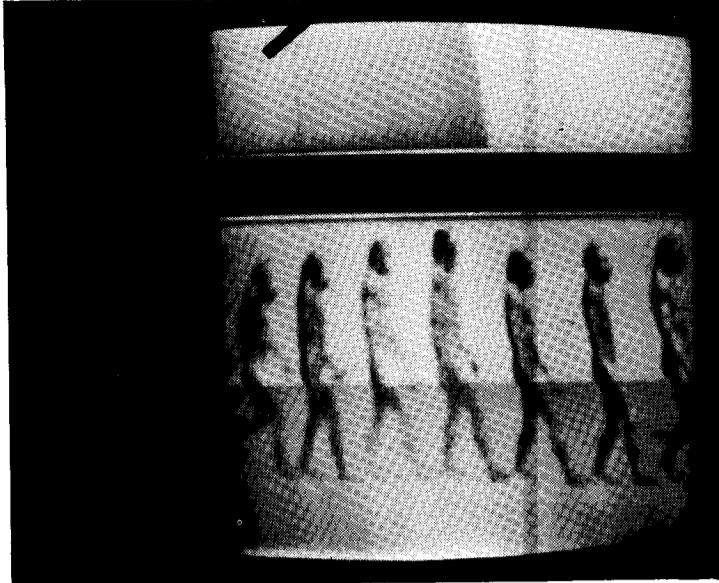
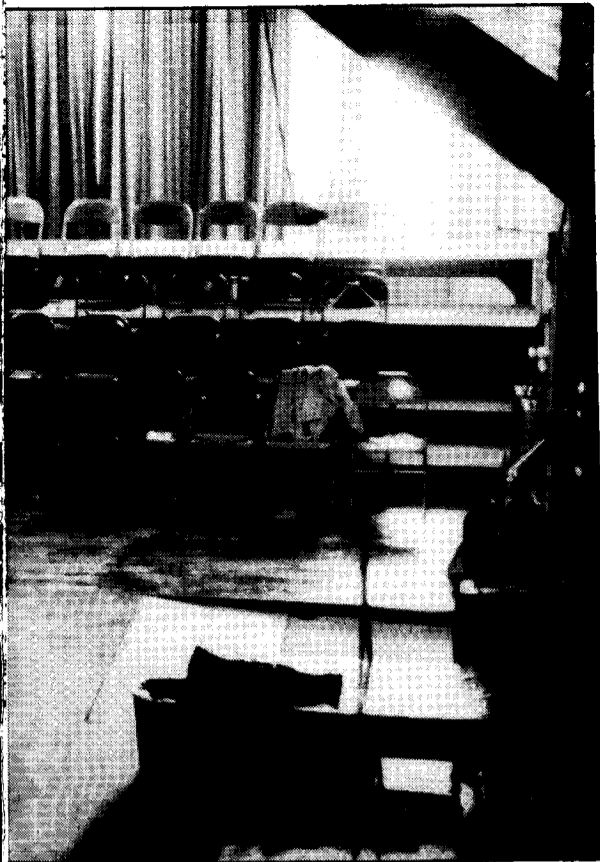
McLuhan begins with the assumption that modern human experience is characterized by the simultaneous reception of vast amounts of information in the form of sense stimuli: sight, smell, hearing, touch, and taste. Because the attempt to communicate and process this variegated experience is subject to distortion, some methods of communication are better than others. According to McLuhan, a medium which "extends one single sense in 'high definition'"—such as a photograph—is a hot medium, whereas a medium which provides only minimal extension of a sense—such as print—is cool.¹⁰ In other words, cool media demand a high level of participation, or completion, by the receiving audience, while hot media do not.

In McLuhan's formulation, the electronic communications "explosion" of the 1960s created a new form of perception which makes these stimuli directly apprehendable through the senses. Since he views all media as "extensions of man," television and radio act as cybernetic extensions of the human nervous system. As McLuhan wrote in 1964,

Today, after more than a century of electric technology, we have extended our central nervous system itself in a global embrace, abolishing both space and time as far as our planet is concerned. Rapidly, we approach the final phase of the extensions of man—the technologi-



Clockwise from top left: The Kitchen in 1971. Frames from *Evolution* (1970). Frame from *Participation* (an undistributed composite tape, c. 1970). Frame from *Spaces* (1972). The Vasulkas' studio in Buffalo, N.Y., 1973-79. Frame from *1-2-3-4* (1974). Frame from *Golden Voyage* (1973). Some of the "cooks" in The Kitchen, 1972; from left to right: Dimitri Devyatkin, Shridhar Bapat, Rhys Chatham, Steina Vasulka. The Vasulkas' studio in New York City, 1967-73. Installation view of *Matrix* (1971). All video tapes by Woody and Steina Vasulka.



cal simulation of consciousness, when the creative process of knowing will be collectively and corporately extended to the whole of human society, much as we have already extended our senses and our nerves by the various media.¹¹

Thus, McLuhan's "global village," a harmonious world "tribe" linked via a network of instantaneous communication, would evolve. Jonathan Miller has pointed out that McLuhan's overly optimistic vision could only have been achieved by "stressing the immediate mental effect of the various media at the expense of neglecting the messages they actually convey."¹² This emphasis on the effect of the medium itself—regardless of its content—is the basis for the famous dictum, "The medium is the message." This aphorism fit quite neatly with formalist art discourse; identifying those qualities specific to video as an art medium not only coincided with McLuhan's ideas but Clement Greenberg's formalism.

McLuhan's theory has since been discarded by some scholars because his utopianism completely contradicts the fact that electronic media have been used as instruments of social control. Moreover, as Raymond Williams has shown, this analysis represents a technologically determinist approach to history, which posits technology as a force in itself—responsible for changes in society and the human condition—rather than something developed with specific purposes in mind. In *Television: Technology and Cultural Form* Williams counters McLuhan: "All media operations are in effect desocialised; they are simply physical events in an abstracted sensorium, and are distinguishable only by their variable sense-ratios (emphasis added)."¹³

Still, as I said, many artists were creating intermedia sense environments, openly embracing McLuhan's ideas.¹⁴ These events—as well as others less explicitly derived from McLuhan—were commonly known as "expanded cinema" (the term was later used as the title for Gene Youngblood's futuristic survey of such work).

While the Vasulkas read Mekas's column regularly and were peripherally aware of underground filmmakers, they attended very few of these events in the first years they were in New York. Steina continued studying violin, while Woody started working on commercial and industrial films and exhibits in 1967. In 1969 he started using video. His employer, Harvey Lloyd, was using closed-circuit, multiple-monitor video displays as well as multi-screen projections and this structure eventually became the model for much of the Vasulkas' early work.

For Woody, video provided an alternative to film which he felt was an exhausted medium. In 1978 he recalled,

I was educated in film, which I understood as an extension of narrativity into space. So at that time, I was very concerned with literary forms presented in cinematic ways, which I linked directly to the economic structure of existing productions—studios, laboratories, equipment. Only much later, after I had worked in film productions in New York City, did I achieve any independence, or manage to personalize the process of image-making, and that came about as a result of working with electronic equipment.¹⁵

Beyond the compromises entailed in working in the film industry and the limitations of conventional cinematic narrativity, Woody also had an initial fascination with what might be called the phenomenology of video: "When I first saw video feedback, I knew I had seen the cave fire. It had nothing to do with anything, just a perpetuation of some kind of energy."¹⁶

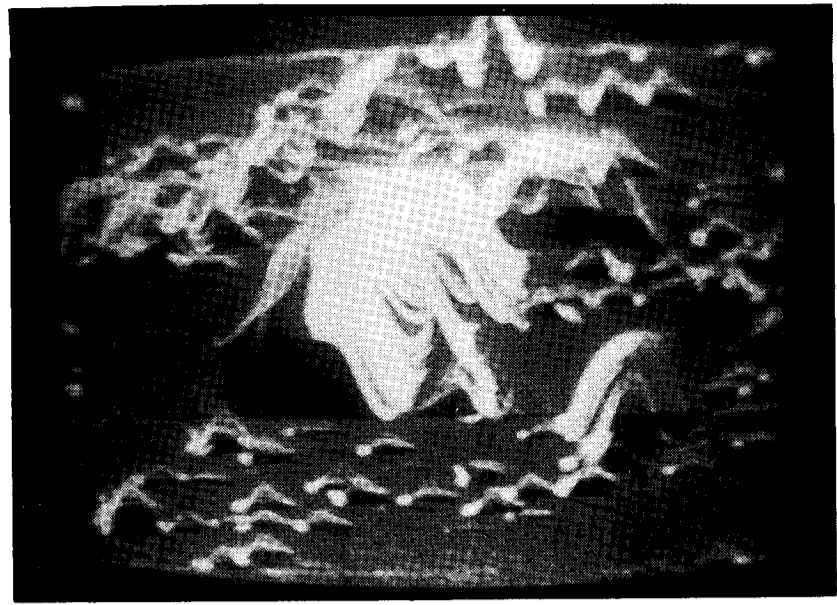
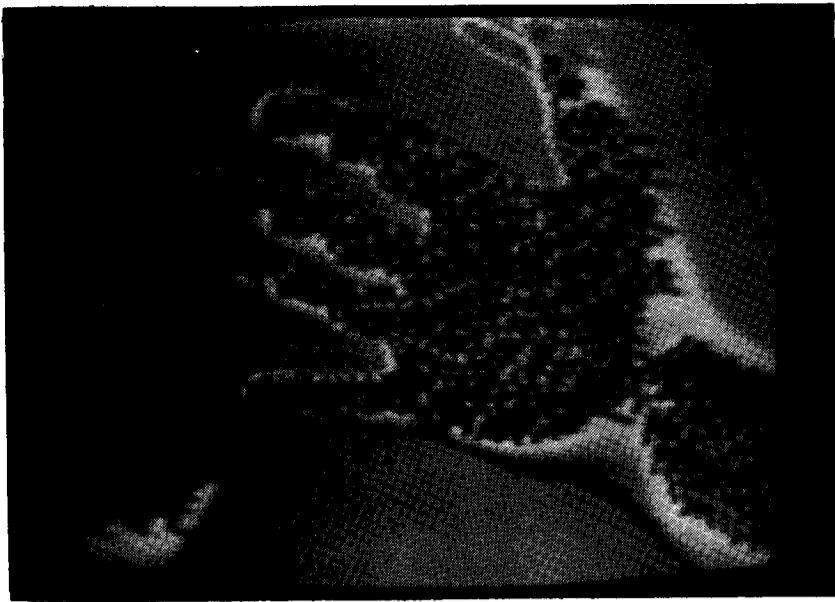
Like many other early video artists, Steina's involvement was inspired by Howard Wise's exhibition, "TV as a Creative Medium," held in the spring of 1969. "I went in there and saw *Einstein* [a tape by Eric Siegel utilizing the video colorizer he designed and built], blasting out, and it quite blew my mind."¹⁷ Soon, both the Vasulkas were using Lloyd's equipment after work, and eventually Woody began bringing it home. At that point, they realized that the only way they could really experiment was by living with the equipment. "What started happening," Steina recalls, "was that every day Woody would come home from work at five o'clock, and I would have another piece for him. He got so jealous because in the evening he was tired. So he just came home from work one day and said, 'I'm quitting!'" Using some borrowed equipment and some that they bought, in early 1970 the Vasulkas began to work more "systematically," making feedback loops and using audio inputs to generate and alter the video signal inside black and white monitors.

Although many of these experiments were not original since others had done them before, the excitement of that time was generated by the sense of being pioneers. There was a camaraderie among people who were making discoveries about the potential of video—as an electronic phenomenon and as a tool for social change. As Steina describes this animus,

Our discovery was a discovery because we discovered it. We didn't know all those people had discovered it before us. It was just like feedback: pointing the camera at the TV set and seeing feedback was an invention that was invented over and over again. As late as 1972, people were inventing feedback, thinking they had just caught the fire of the gods.

Part of the excitement, too, had to do with the informality of exchanges among people. Tapes were shown in lofts or at clubs, and information spread through word of mouth or sometimes via small ads in the *Village Voice* or the *East Village Other*. But, says Steina, "It's different [now], it was a secret then. People would come and say, 'If you go to that loft there, there's a lot of [video] stuff.'" And Woody summarized the attitude in a 1972 *New York Times* article: "What is special about video art at this time is that it isn't yet trapped in rigid rules. There are not yet any clichés, and the artists haven't had time to develop the maniacal egos one finds in the other arts. All the video artists are like one big family and thinking about video's big future."¹⁸

The video "family" was not homogenous, though. The Vasulkas were more interested in art and the counterculture



Left: frame from *Vocabulary* (1973). Right: frame from *Grazing* (1975).

than in politics. Consequently, they found themselves situated somewhere between the established artists who were doing conceptual pieces in mainstream galleries and politically active community access groups. Referring to the people who formed such groups as Global Village, People's Video Theater, and Raindance Corporation, Steina delineates these distinctions:

None of them were particularly interested in art, although a lot of them had art backgrounds. . . . This was their anti-art statement . . . so that set us immediately on the fringe, because we were never really interested in politics. I saw it as an American internal affair that was very interesting for me to watch as a foreigner, nothing else.

Despite this, boundaries were fluid. Hence, in addition to making the kind of work for which they were best known, the Vasulkas were shooting documentaries for the Alternate Media Center as well as compiling their own informal documentaries of the downtown cultural scene. "We just started going everywhere and asking to tape people," says Steina. Subsequently, they edited some of these events together in a tape called *Participation* (which is undistributed). It is a kind of countercultural happening circa 1969-71. In it, Jimi Hendrix performs a New Year's Eve concert at the Fillmore East; a group of Andy Warhol's actors—among them Ondine, Taylor Mead, Candy Darling, and Holly Woodlawn—argue viciously on the *David Suskind Show* over whether or not they'd been exploited; there are scenes from a transvestite musical by playwright Jackie Curtis; Don Cherry plays impromptu jazz in Washington Square—not to mention an assortment of other events that today elicit pure, undiluted nostalgia.

For the Vasulkas these varied activities typified American culture. In an unpublished 1978 document, they stated,

We were interested in certain decadent aspects of America, the phenomena of the time—underground rock and roll, homosexual theater, and the rest of that illegitimate culture. In the same way, we were curious about more puritanical concepts of art inspired by McLuhan and Buckminster Fuller. It seemed a strange and unified front—against the establishment.

This thread—"against the establishment"—ran through every aspect of video activity then, whether it was electronic feedback, media environments, or documentaries in which the subjects provided their own verbal "feedback." It was only after video began to become more institutionalized that people began to define their turf. In retrospect, it is very hard to see abstract or manipulated video—now divorced from its original context—as "anti-establishment."

In February 1971 the Vasulkas had their first public showing of tapes on three consecutive evenings at Max's Kansas City. A different program—electronic work, gay theater performances, and the Fillmore concerts—was presented each night, and all were displayed on five monitors. A friend in the audience, Andy Mannik, subsequently found a space that had been the kitchen of the Broadway Central Hotel on Mercer St., and he asked the Vasulkas if they had any use for it. Using money they earned working at the Alternate Media Center, the Vasulkas and Mannik spent two months renovating.¹⁹ The Electronic Kitchen opened on June 15, 1971, and the old hotel was converted into the Mercer Arts Center.

The original idea behind what eventually became simply The Kitchen was to establish an electronic lab in which artists could experiment with sound and images. (Because electronic sound and electronic imaging operate on many of the same principles, the Vasulkas wanted to explore this relationship.) In the evening, they had what they called a Live Audience Test Laboratory—or LATAL—during which the audience response to their experiments would be tested. As Steina recalls, "It wasn't supposed to be any kind of auditorium or 'legitimate' space. It was just a place where people could come in and interact with the people making the video." For the Vasulkas, it was difficult to think of their space as an "establishment" institution. They didn't want to become administrators or even have an office or phone.

What began as an informal laboratory, however, quickly evolved into a full-time alternative space. Like many organizations founded in the late '60s and early '70s, the goal was to create an open and flexible situation and, importantly, not to curate. In the early days at The Kitchen no one was ever turned away, and artists would bring their own crews and often their own equipment. As for payment, artists received no fixed fee, but if money was collected, they could choose to take it, split it, or leave it to The Kitchen. Most let The Kitchen keep the money, which paid for the monthly calendar and provided a furd of petty cash.

Soon events at The Kitchen started to get regular coverage in the *Village Voice* and periodically in the *New York Times*. Describing The Kitchen during its 1972 video festival, David Shirey wrote in the *Times*, "Visitors to The Kitchen should not expect a well-appointed theater for the projections. They will be confronted rather with a loft-like room, honeycombed with wires, videotape recorders and a roomwide battery of TV monitors." So much for the hardware; commenting on the software, he said, "Although part of the work is tediously repetitive, displaying little imagination, there is enough inspired talent to warrant a visit."²⁰

What kind of programming prompted this assessment? Although the Vasulkas originally wanted to limit The Kitchen's program to electronic music and video, they found that there was too much interesting work going on to justify such a purist attitude. Consequently, programming was actually more varied. Open video screenings, originally organized by Shirley Clarke, were held on Wednesdays. Rhys Chatham, an electronic musician who had studied with Morton Subotnick, became music director. A "Monday Series"—kicked off with a performance by LaMonte Young and Marian Zazeela—soon spilled over to Tuesday nights.²¹ Thursdays and Fridays were taken up, says Steina, by other "general events that now have a name: performance art." Rock concerts were often held on Saturdays, and seminars and workshops on such timely topics as perception and cybernetics were held on Sundays.²²

In its entirety, The Kitchen provided a focal point for a variety of informal music, video, and other categorically elusive activities which would have otherwise remained invisible to a large public. Although a few of the names, e.g., LaMonte Young, Alvin Lucier, Nam June Paik, are now known outside of new music and video circles, most people involved remained part of a lesser-known downtown scene, but their contributions were nonetheless crucial to The Kitchen's vitality.

In the fall of 1973 the Vasulkas moved to Buffalo, N.Y. to teach a video workshop at the Center for Media Study. In 1974 Woody became a faculty member at the State University of New York at Buffalo, where Steina also later taught. They remained in Buffalo until 1979. The Vasulkas had already begun their investigations into the phenomenology of video, but they probably couldn't have had a more intellectually compatible environment. In the same department were Paul Sharits, Hollis Frampton, and Tony Conrad—all filmmakers who were, in different ways, dealing with structures of moving images.

Our work is a dialogue with the tool and the image, so we would not preconceive an image separately, make a conscious model of it, and then try to match it. We would rather make a tool and dialogue with it. . . . But it is more complex, because we sometimes design the tools, and so do conceptual work as well.²³

The Vasulkas often speak of their work as a dialogue with the tools they use. In fact, tools are so central to their work that they list each one, along with credit to its designer on their videography. This information is useful in a consideration of the Vasulkas' work, but it might be construed as a characterization of the Vasulkas as "tool cultists," worshipers of technology oblivious to the negative social uses to which various technologies have been put. I don't think this assessment is valid, for behind their development and use of imaging devices is a set of concerns that is neither exclusively formal nor purely technological.

As I discussed in my first article in this series, prior to the introduction of consumer video products, the design of video equipment was geared toward broadcasting and industry. Much of the equipment we now take for granted—color cameras and lightweight portapaks, for example—were either unavailable or unaffordable for most people. It was even more difficult to acquire the devices associated with image-processing—keyers, colorizers, mixers, and synthesizers. What's more, that equipment was usually more suitable for producing special effects than for artists' experiments. Consequently, artists found themselves seeking out equipment designers who, in one way or another, were mavericks within the electronics industry. As Woody recalls,

I discovered that in the United States there's an alternative industrial subculture which is based on individuals, in much the same way that art is based on individuals. . . . These people, the electronic tool designers, have maintained their independence within the system. And

they have become artists, and have used the electronic tools which they had created. . . . We've always maintained this very close, symbiotic relationship with creative people outside industry, but who have the same purposeless urge to develop images or tools, which we all then maybe call art.²⁴

Here Woody is referring to people like Eric Siegel, Stephen Beck, Bill Hearn, Steve Rutt, Bill Etra, George Brown, Shuya Abe, Dan Sandin, Don MacArthur, and younger people like David Jones, Richard Brewster, Jeffrey Schier, and Ed Tannenbaum—all of whom have designed and/or built electronic devices for artists.

While a number of people in the late '60s and early '70s were working with video colorizers, mixers, and synthesizers, the Vasulkas took a different approach. "Our idea right from the very beginning was not to have a synthesizer. We always wanted to have open-ended boxes," Steina explains. Not only did they take a modular approach, but they wanted to control the tools by using another electronic input, not by using their hands to move a control knob until an image looked right. Most devices that incorporated colorizing, mixing, and synthesizing functions could be controlled either through external inputs—known as voltage control—or by control knobs. By opting for input-only control, the Vasulkas were imposing an organizing structure that was derived not from their own preconceived ideas about what might make an interesting image, but from the system itself. This is not to elevate their approach over one that Steina has called "knob twisting," but to illustrate that artists had certain choices in how their tools could be used.

Behind the Vasulkas's particular decision was their desire to understand the inner workings of electronic phenomena. "There is a certain behavior of the electronic image that is unique. . . . It's liquid, it's shapeable, it's clay, it's an art material, it exists independently," Woody has stated.²⁵ Video's plasticity was something that many artists explored, but the Vasulkas took a fairly rigorous, didactic, and conceptual approach. They were fascinated by the fact that the video image is constructed from electrical energy organized as voltages and frequencies—a temporal event.

Initially, they identified two properties peculiar to video. Both audio and video signals are composed of electronic waveforms. Since sound can be used to generate video, and vice versa, one of the first pieces of equipment the Vasulkas bought was an audio synthesizer. Many of their tapes illustrate this relationship—one type of signal determines the form of the other. Their second interest entailed construction of the video frame. Because timing pulses control the stability of the video raster to create the "normal" image we are accustomed to, viewers rarely realize—unless their TV set breaks down—that the video signal is actually a frameless continuum. This fact, discovered accidentally, fascinated the Vasulkas, particularly Woody.

At that time, I was totally obsessed with this idea that there was no single frame anymore. I come from the movies, where the frame was extremely rigid, and I understood that electronic material has no limitation within its existence. It only has limitation when it reaches the screen because the screen itself is a rigid time structure.²⁶

By altering the timing pulse of the video signal, the Vasulkas could create an image that continuously drifted horizontally. In the three-segment tape *Evolution* (1970), they animated a picture of the various stages of human evolution using horizontal drift. Eventually they were able to control the speed of the drift with an external timing source called the Horizontal Drift Variable Clock. This tool was built for them in 1972 by George Brown and allowed them to deviate from the standard horizontal frequency.

The Vasulkas then extended their experiments with erasing the boundaries of the single frame in a series of multiple-monitor works. Said Woody: "The electromagnetic spectrum exists, organized or unorganized, totally in space. Confining it to a single monitor is like a view through a camera or a single projection frame."²⁷ Unlike other multiple-monitor displays (now known as installations), which were often based on McLuhan's notion of the simultaneous reception of sense data, those by the Vasulkas did not mimic "information overload."²⁸ Rather, their early multiple-monitor works were intended to violate the single frame confined within a single box. In many of these early pieces, a very simple image would sweep across a band of monitors. *Spaces I* and *Spaces II* (1972), for instance, featured horizontal drift and video-activated sound. In *Spaces II*, three layers of visible textures and shapes were keyed, and the image planes, visible on all monitors simultaneously, swept horizontally.

While the Vasulkas initially focused on two basic areas—horizontal drift and the audio-visual relationship—they began to expand their repertoire of effects by commissioning various people to build specialized video equipment. As Steina recalls,

In the spring of 1970, which was the first year we were working, we met Eric Siegel, and we immediately fell in with him very well. And he made use of equipment we had gotten, and we got to use his colorizer, and he helped Woody to build one. He made the boards, and then Woody wired everything together, which was the first wiring experience that Woody got into with video. As soon as we got the first money from the State Arts Council [NYSCA], we set a little aside for tool development, and our tool person became George Brown.

In addition to the Horizontal Drift Variable Clock, Brown constructed a switcher in 1971. He also made a cascading or multi-keyer in 1973. Unlike most keyers, which key two images—one over another—the multi-keyer could key up to six images. This allowed images to be manipulated to create foreground-background relationships. In 1974 Brown also made a programmer, a digital device which could store and replay a sequence of operations such as a switching or keying order.

Between 1971 and 1974 the Vasulkas made numerous tapes utilizing these tools in increasingly complex combinations. *Black Sunrise* (1971), described by the Vasulkas as a "performance of energies organized into electronic images and sounds," is a continuum of constantly permutating abstract images which variously resemble a landscape or an aurora. *Elements* (1971) consists of variations on video feedback that are processed through a keyer and colorizer. The Vasulkas called these tapes, as well as *Key Snow* (1971), Electronic Image and Sound Compositions. And in many of these works the video was a function of the audio. In the program notes to the 1971 Whitney show, they said of these tapes, "They resemble something you remember from dreams or pieces of organic nature, but they never were real objects, they have all been made artificially from various frequencies, from sounds, from inaudible pitches and their beats."

These were the kinds of tapes that—with their colorful swirls of abstract imagery—were dismissed by many critics because they looked like a moving version of modern abstract painting, which was then becoming unfashionable. For the Vasulkas, however, their work was based on various manifestations of electromagnetic energy rather than abstract art.

Other tapes from this period can be correlated with modern art, though. *Home* and *Golden Voyage* (1973) are based on bizarre juxtapositions found in Rene Magritte's paintings, which, the Vasulkas felt, were similar to the effects they were producing. Using the colorizer, multi-keyer, and switcher, as well as horizontal drift, *Home* consists of three sequences in which still lifes are set in motion—e.g., an apple drifting past a teapot on a kitchen stove. *Golden Voyage* refers directly to Magritte. It is a sort of animation of his painting *The Golden Legend*. "We were looking at this picture and we were joking about how many cameras we'd need to reproduce it," Steina explained. "Of course, three. One camera would be on the frame, one would be on the landscape, and then one camera would be on the bread."²⁹ These images were combined using the multi-keyer and set in motion via horizontal drift. Loaves of French bread embark on a journey. They travel across various backgrounds—a mesa, a beach, a building—as well as a reclining nude woman. Initially mere loaves, the breads take on phallic connotations as they encircle the woman—an attempt at absurdist humor.

Many of their other tapes made during this time are less symbolic. For instance, in *Vocabulary* (1973), images of a hand and a sphere are manipulated with a keyer, colorizer, and the Rutt/Etra Scan Processor in order to "convey in a didactic form the basic energy laws of electronic imaging." The tapes *1-2-3-4* (1974) and *Solo for 3* (1974) are even more didactic in that images of numbers are permutated in various foreground-background relationships determined by the programmer. In *Solo for 3*, three cameras focus on three different-sized images of the number three. The image planes are layered with the multi-keyer, and sequenced by a digital musical instrument. The numbers drift, controlled by the variable clock. The result in both cases is a *Sesame Street*-style interplay of numbers, but with a synthetic soundtrack.

In 1974 the Vasulkas acquired a Rutt/Etra Scan Processor, a device which allows the video raster—as well as the images displayed on it—to be reshaped through magnetic de-

flection. To Woody the appeal of the Rutt/Etra was its capacity to visually display in a precise manner the most basic elements of the video signal—electronic waveforms. It was this device that catalyzed his preoccupation with an aesthetic that was fundamentally didactic. For the next few years, the Vasulkas collaborated less. Woody described how the scan processor influenced his work:

Compared to my previous work on videotape, the work with the scan processor indicates a whole different trend in my understanding of the electronic image. The rigidity and total confinement of time sequences have imprinted a didactic style on the product. Improvisational modes become less important than an exact mental script and a strong notion of the frame structure of the electronic image. Emphasis has shifted towards a recognition of a time/energy object and its programmable building block—the waveform.³⁰

The idea that video images were nothing more than electromagnetic energy constructed in time was central for Woody, and he made numerous tapes and films from 1974 to 1977 depicting the process. Many of these used audio and video noise as the image source. One of the clearest illustrations of what he called "time/energy objects" is found in *The Matter* (1974). In it a generated dot pattern is displayed on the raster. The three primary waveforms—sine, square, and triangle—are fed into the Rutt/Etra and used to shape the raster display so that the dot pattern assumes the shape of each waveform. Woody illustrated these kinds of changes more systematically in a set of grid-like displays consisting of still photographs that depict the various states of the raster when controlled by the primary waveforms in conjunction with alterations of the scanning process. While these pieces were designed as reductive exercises, other tapes and films apply some of these principles to camera-generated images. Because the Rutt/Etra processes the signal in such a way that light energy—or brightness—can be converted to magnetic energy, the illusion of three-dimensionality is created. This is accomplished by connecting the incoming video signal to the vertical deflection system—or the magnetic force that "pulls" the image vertically—so that the brightest portions of an image stand out. As Johanna Gill described the effect, "what one is seeing is a topographical map of the brightness of an image; where the image is bright, it lifts the lines [of the raster]; where it is black, they fall."³¹

Woody's tapes *Reminiscence* (1974) and *C-Trend* (1974), the film *Grazing* (1975), and the tape *Telc* (1974) by Woody and Steina, all transform camera images—landscapes, street scenes, sheep grazing—into topographic renderings. These tapes and films all start with a referent that is "real," so that one can more easily see the process of magnetic deflection than with less specific imagery. These tapes possess eerie, web-like qualities. However, neither those qualities in themselves nor what they might symbolize interested Woody. Rather, this type of imaging challenged the dominance of the camera, and this challenge had implications that extended to fundamental perceptual issues.

The theory that Woody first articulated in the mid-'70s and has continually refined reevaluates not only cinematic form but what we generally call "reality." "Since we look at reality through our eyes, the reality has total dependence on perception, on how images are formed in the eye."³² In other words, because the camera lens has come to represent an extension of human vision, it has been equated with a truthful rendering of reality.

According to Woody, electronically-generated, non-camera images—based on neither the lens nor the eye—indicate the potential for a new visual code that would supplant the traditional lens-bound mode of visual organization which has come to be accepted as most "real." He described his goal in 1978:

I can at least unleash some attack against the tradition of imaging, which I see mostly as camera-obscura bound, or as pinhole organizing-principle defined. This tradition has shaped our visual perception, not only through the camera obscura, but it's been reinforced, especially through the cinema and through television. It's a dictatorship of the pinhole effect, as ironic and stupid as it sounds to call it that.³³

Woody's work with the Rutt/Etra, which he characterized as "the inevitable descent into the analysis of smaller and smaller time sequences," was a first step toward discovering a new code. The code was derived from nature, in that the devices he was using—in particular, the Rutt/Etra—were capable of revealing and displaying as waveforms the electromagnetic forces that occur in nature. These become perceivable as sounds and images only when artificially proces-

sed by oscillators, and displayed on oscilloscopes or video monitors, or processed through devices like the scan processor. Hence Woody's pursuit was not so much the investigation of video's inherent properties as a formalist end in itself; rather, it was more phenomenological, directed at challenging culturally determined notions of what constitutes reality.

Meanwhile, Steina took a different, though related, tack in *Machine Vision*, a series of tapes and installations begun in 1975. By utilizing a variety of mechanized modes of camera control—originally built by Woody for film work—Steina began to set up apparatuses designed to disassociate the camera from a human point of view.

Habitually, by looking, we keep selecting, subjectively "zooming," and "framing" the space around us. I wanted to create a vision that can see the whole space all the time. . . . And it too derived from my watching so many videotapes, watching an individual "delivering" you space. . . . It was a challenge to me to create a space that would not deal with the idiosyncrasies of human vision.³⁴

Signifying Nothing (1975), *Sound and Fury* (1975), and *Switch! Monitor! Drift!* (1976) are all documentations of Steina interacting with studio set-ups in which two motorized cameras monitor not only the surrounding space but the movement of the other camera. The most complex of these is *Switch! Monitor! Drift!*, which consists of 13 scenes that variously combine the two cameras' automated movements with assorted effects achieved by keying, switching, horizontal drift, and scan processing. The result is not merely technologically impressive, but cerebral: the dislocation of the picture plane forces the viewer to make sense of the surrounding fragmented space. In these tapes Steina is observing the system observing her and repositioning herself in the space in response.

In the installations *Allvision No. 1* (1978) and *No. 2* (1978-79), set up respectively at the Albright-Knox Gallery in Buffalo and at The Kitchen, these contraptions become at once kinetic sculptures and activators of the seeing process.

Two cameras are mounted on the ends of a slowly revolving axis with a perfectly spherical mirror at the center of the axis. On the monitors, viewers see an artificially created 360-degree image. While the viewers are part of the "real" space, they can at the same time see themselves in the "imaginary" dimension created on the screens.³⁵

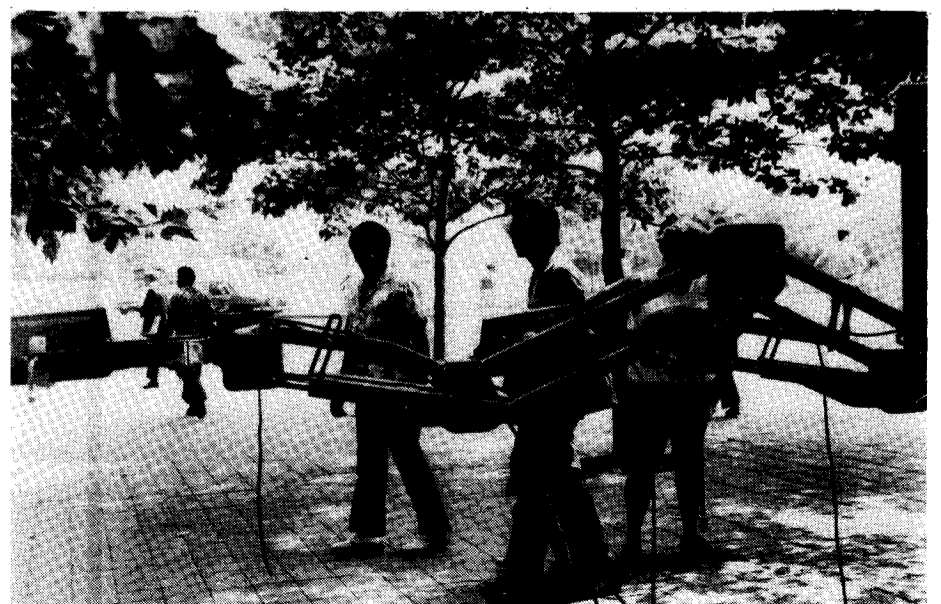
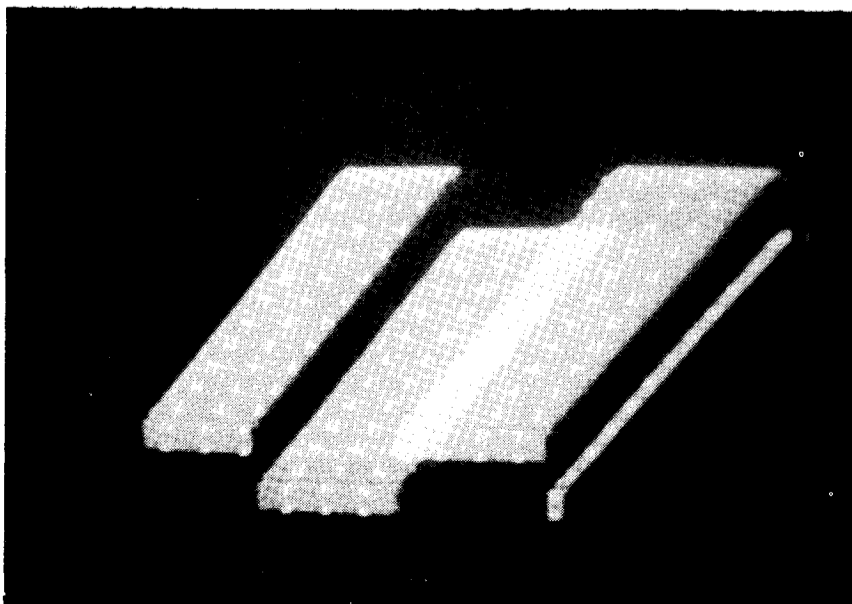
Allvision fragments and reconstructs reality and, in so doing, challenges us to participate in the deciphering process. Robert Haller aptly summed up this series: "[These pieces] under the sense of the 'true' in favor of the act of perception, demanding active seeing rather than the passive look."³⁶

At this time Steina also began to use her violin to control the video image. *Violin Power* (1970-78) begins with Steina playing a classical piece and proceeds from that to electronic music. The violin—patched through an audio synthesizer to a video switcher—then activates switching between two different camera views of Steina playing. (This scene constitutes one segment of *Switch! Monitor! Drift!*) Similarly, in other segments the violin generates other image and sound distortions. *Violin Power* is another demonstration of the Vasulkas' use of sound to create video. For Steina, both sound and imaging devices are instruments. In this case, starting with a traditional musical instrument, the relationship is eloquently made obvious.

Much of her subsequent work reiterates these themes, but her methods vary, as do the results. For example, for *Urban Episodes* (1980) Steina constructed yet another motorized contraption in downtown Minneapolis which could perform automatically the four basic camera movements—pan, zoom, tilt, and rotation. Various mirrors were mounted in front of the lens and, combined with the camera's movement, confound our sense of what's reflected and what's real. More recently, in a group of tapes called *Summer Salt*, she utilizes the various mirrors and mechanical devices as well as pre-programmed switching to present images of the southwestern U.S. that once again pose questions about vision. However, these tapes seem to be less programmatic, less cerebral than some of her *Machine Vision* pieces. For instance, in *Somersault* (1982), a mirrored sphere is fastened a short distance from the lens, creating a fish-eye effect. Steina becomes a contortionist, jumping, bending, and twisting her body in a humorous mock-gymnastic performance.

Until 1977, all of the machines the Vasulkas employed—with the exception of the programmer—operated according to the parameters of analog electronics, in which changes in the signal—audio volume, video brightness—are interpolated as voltage changes that vary continuously. An image or

Left: frame from *The Matter* (1974), by Woody Vasulka. Right: installation view of *Machine Vision* (1975), by Steina Vasulka, in Cathedral Park, Buffalo, N.Y.



sound is produced through amplitude and frequency variations that are subject to distortion. By contrast, in the digital mode the parameters of a signal are sampled at discrete time intervals, and these samples are translated—through an analog-to-digital converter—into a binary code. When displayed, this code is transformed into discrete picture elements, or pixels, each one controlled individually or systematically by a computer. Pixel size varies according to the amount of memory available: more memory capacity allows a smaller pixel size, thus providing the greatest resolution.

In the mid-'70s, the implications of digital computers were considerable: not only was digital imaging more precise, but for Woody it offered a third model for imaging based not on electromagnetic energy but on mathematical systems. But in the mid-'70s computers were so complex and expensive that an extensive programming background was essential for anyone who wanted to employ them. Moreover, getting an image on the screen was not too difficult but manipulating it in real time was. Producing a recordable output was yet another stumbling block—a problem exacerbated by the fact that computer designers and video designers hardly communicated.

The Vasulkas began work on a digital system in 1976. Don MacArthur fabricated a prototype and Walter Wright wrote its first programs; both men had experience with computers.³⁷ But it was Jeffrey Schier, then a student at the State University of New York at Buffalo, who designed and built, with Woody, a more complex system called the Digital Image Articulator or Imager. Because of the enormous time and energy required—by Steina's count, Woody soldered over 20,000 connections—all of the Vasulkas' efforts in the late '70s were directed toward building the Imager. (The tape *Cantaloupe*,

completed in 1981, is Steina's documentation of the process.) In 1977 and 1978 the Vasulkas made several tapes titled *Update*, which are visual summaries of their work with the Digital Image Articulator.

This system can take two video inputs, digitize these, and then perform a series of operations on those two images based on logic functions derived from the Arithmetic Logic Unit (a standard computer component). Depending on which logic function is operating, the numerical codes—and hence the images—are combined in different, but absolutely predictable ways. Such combinations revealed the system's inner structure to the Vasulkas, and also constituted what Woody has called a syntax.

What was surprising to me was to find that the table of logic functions can be interpreted as a table of syntaxes—syntactical relationships which are not normally thought of as being related to abstract logic functions. Because the logic functions are abstract, they can be applied to anything. That means they become a unified language, outside of any one discipline.³⁸

To illustrate his ideas, Woody organized a set of grids—just as he had in 1975 with analog images—which represent the precise visual manifestations of this syntactical structure.

In video terms, however, an important property of the Imager was its capacity to perform these and other operations in real time. This was substantial, since a video signal could now be digitally processed as it passed through the Imager—practically instantaneously—contrasted to the kind of computer imaging in which a program is entered and one must wait minutes or hours, depending on the program's complexity, for the computer to perform the operation.

Artifacts (1980) is a sort of demonstration tape that uses the logic of the computer to combine real-time, digitized, cam-

era-generated images and texture so that effects like keying, zooming, and multiplication of the image are achieved. Woody described the tape as a "collection of images initiated by basic algorithmical procedures, to verify the functional operation of a newly-created tool." *Artifacts* reiterates the Vasulkas' analogy of their work as dialogue with a tool. In the tape, Woody explains, "By artifacts, I mean that I have to share the creative process with the machine. It is responsible for too many elements in this work. These images come to you as they came to me—in a spirit of exploration."

Steina also utilized the digital system, but within much less theoretical constraints. In several tapes, among them *Selected Treecuts* (1980), she juxtaposes variations of trees through programmed switching—digitized and non-digitized. This "rhythmic collage," as she describes it, is paradoxical in that it not only mesmerizes, but directs the viewer's attention to two different representations—analogue and digital—of the same reality.

Woody's project of using a linguistic model for imaging is hardly novel; rather, much of his thinking proceeds from his film background. A number of film semioticians have examined, in Christian Metz's words, "the ordering and functioning of the main signifying units used in the film message."³⁹ Similarly, Woody has attempted to discover what some of the signifying units might be for electronically-generated and manipulated images. Some important qualifications should be interjected, however. He did not want to remain limited to images generated by the camera, nor did he want to rely on traditional narrative structures. But, as Metz has pointed out, "The cinema was not a specific 'language' from its inception, but only became so in the 'wake of the narrative endeavor.'" He continues: "The pioneers of 'cinematographic language'—Melies, Porter, Griffith—could care less about 'formal' research conducted for its own sake . . . men of denotation rather than connotation, they wanted above all to tell a story."⁴⁰

In 1978, after the Vasulkas made some of the first of their digital experiments, Woody expressed an interest in applying electronic imaging codes to a narrative: "The process of understanding these structure became aesthetic to me. But I also suspect that I feel again some kind of need to express literature. . . . Beyond dealing with these minimal image structures, I can foresee a larger structure of syntactical or narrative conclusions coming out of this work."⁴¹ Woody's most recent tape, *The Commission* (1983), sets out to do just that. The 45-minute tape is narrative; Woody calls it an opera, but it is more akin to modern fiction, relying heavily on the spoken word. This apparent irony, however, is countered by his strategic use of both audio and video effects as narrative devices. Initially, the extreme slow pace of some sections of *The Commission* is completely mystifying and frustrating. At the same time, the work is so carefully structured and the texts so compelling that upon repeated viewing the viewer can discern various themes unfolding, building, and resonating.

The Commission is a metaphor for art-making as realized in the story of two eccentrics—the violinist Niccolò Paganini and the composer Hector Berlioz. Both are self-indulgent, theatrical, and ultimately tragic. As such, they represent archetypal artist-characters. Paganini, played by video artist Ernest Gusella, is a sickly, agonized, romantic figure, near death, who describes his grotesque, fantastic visions. Berlioz, played by composer and performer Robert Ashley, is a cerebral and rather fussy character who speaks in abstractions. A male narrator is never seen, but his tale of Paganini's life—interspersed between scenes—provides continuity as well as a context for the otherwise opaque texts.

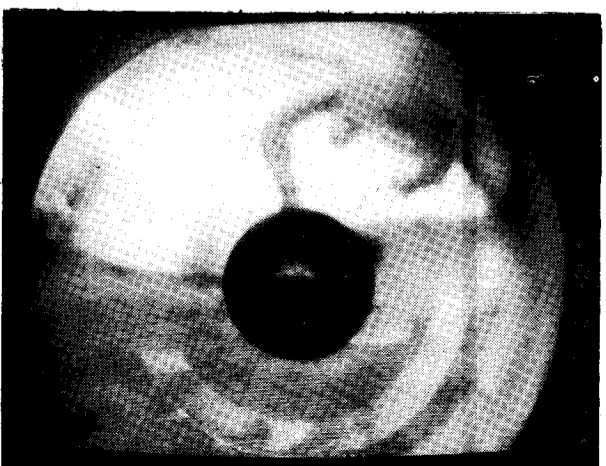
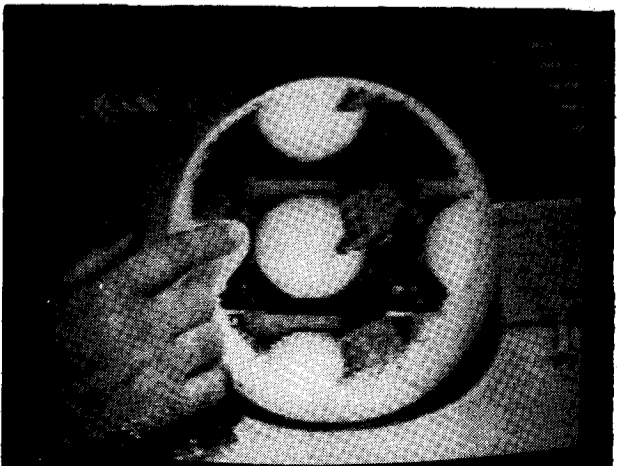
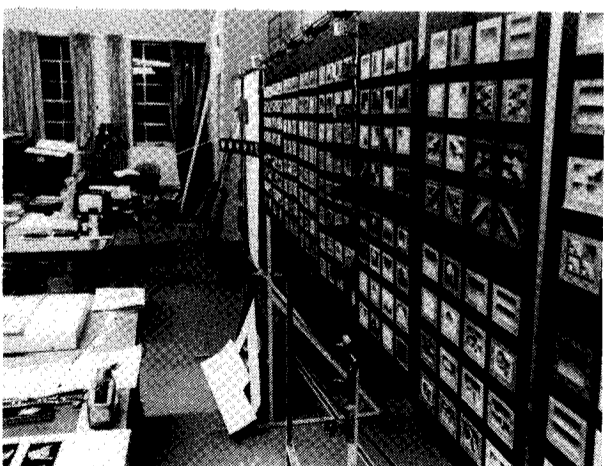
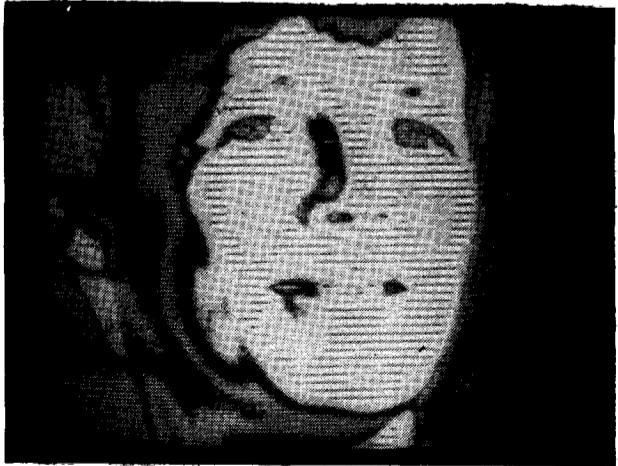
The script was written by the respective players, who seem physically and temperamentally well-suited to their roles. In Ashley's case, his Berlioz is much like his other performances; he adopts the same elliptical ruminating with the same sing-song delivery. However, in *The Commission* Ashley's opacity is appropriate to the depiction of a self-absorbed and self-interested man. Similarly, Gusella's Christ-like appearance suggests a tortured artist, who is abused even in death. If it's Paganini who actually dies in the end, it's clear that Berlioz—lost in his own world of tea and toast—is not much more lively.

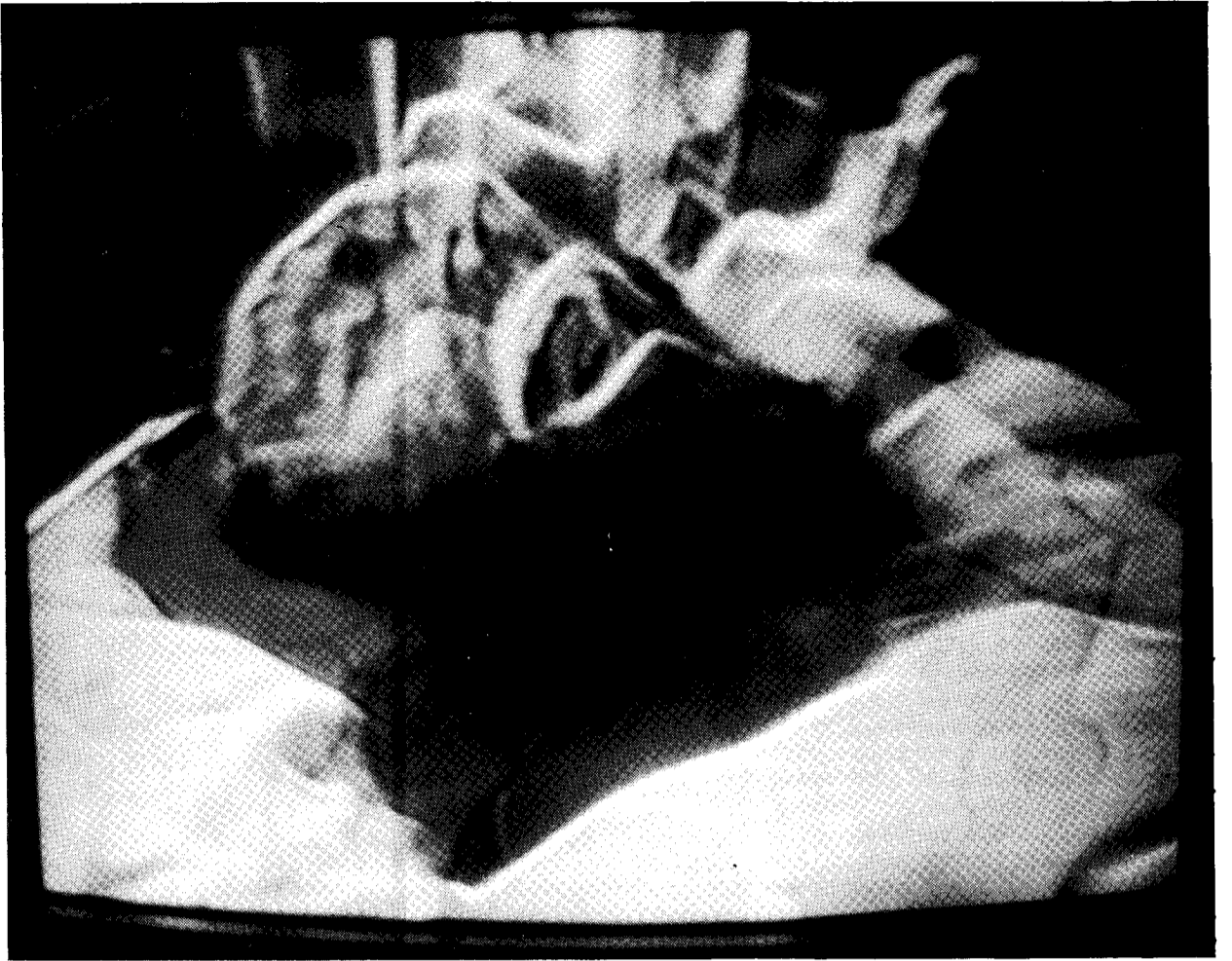
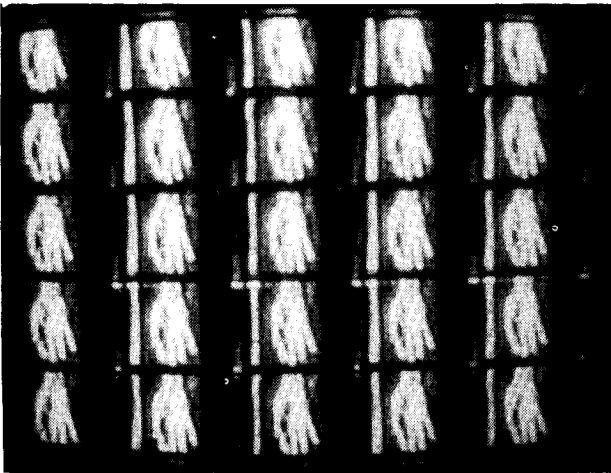
Without embarking on a textual analysis of *The Commission*, I would like to suggest a few of the ways that Woody—and Steina, who did the camerawork for the tape—have applied some of the techniques developed in their previous work. In each of the 11 segments, a different effect is employed and then exercised through a series of variations. This enables correlations to be made between that particular device and the scripted text. And since action is minimal, the text is thus underscored, rather than diffused.

Perhaps most important, though, is the almost obsessive repetition in every segment: interweaving of nuances and variations of sound, image, and, in the process, meaning. At the opening of the tape, we are told that toward the end of his life, Paganini lost his voice and had to speak through his "beloved illegitimate son." The exactness of this relationship becomes a metaphor for interpretation but is also a device which aids the audience in apprehending the story. In the next scene, a gaunt Paganini whispers—through the use of a sound processor—into the ear of his son. The son repeats—not always accurately—what his father has just said. In subsequent scenes, sections of the texts are also repeated, and the voices are all processed in a variety of ways that reinforce the actors' speeches. For instance, in one segment, the narrator describes the intense feeling of expectation that a follower of Paganini experienced when he thought he would get an opportunity to hear the virtuoso play. The pitch of the processed voice rises and falls as he tells of his anticipation and eventual disappointment.

The video, too, is carefully conceived. In one scene Paganini hands Berlioz an envelope containing a commission for a

Top: frame from *Violin Power* (1978), by Steina Vasulka. Middle left: frame from *Digital Images* (1978), by Woody and Steina Vasulka. Middle right: "Binary Images" (in progress), an exhibition by Woody Vasulka. Bottom left: frame from *Artifacts* (1980), by Woody Vasulka. Bottom right: frame from *Somersault* (1982), by Steina Vasulka.





Frames from *The Commission* (1983), by Woody Vasulka.

musical score, acting as an intermediary for an anonymous patron. Here images of the two men are rapidly switched. This device—first used in Steina's *Sound and Fury*—emphasizes the gesture of giving; however, the stiff jerky movement which results also provides a visual counterpart to Paganini's false pretenses. Woody also uses the potential of the Rutt/Etra very effectively in the scene of Paganini's embalming: the web-like effect used earlier in Woody's "time/energy objects" is used here in conjunction with Bradford Smith's set to vividly create a death chamber space.

Such instances demonstrate how the Vasulkas' electronic devices may be used as narrative devices in the future. Woody has made a difficult tape that attempts to rethink complex problems of characterization, plot, and even representation.

In trying to distinguish between various videomakers' work with imaging devices, my first impulse was to invoke an old dichotomy within modernist art discourse—that is, to make a distinction between two basic approaches that can be identified as formalist and expressionist. According to this framework, the first approach would be represented in the "first generation" of video artists by the Vasulkas, while the latter would descend from Nam June Paik. Having established these two points, one could chart an axis along which other artists could be placed. However, as closer scrutiny of the Vasulkas' work clearly demonstrates, such a dichotomy does not hold. In spite of the formalist implications of what they have done, they have also suggested how some of the imaging practices might be used to challenge representational conventions. In the next article, I will discuss other artists' work in relation to the flip side of the modernist coin—expressionism.

NOTES

- David Bienstock, program notes for "A Special Videotape Show," Whitney Museum of American Art, 1971.
- Sherry Miller, "Electronic Video Image Processing: Notes toward a Definition," *Exposure*, Vol. 21, No. 1 (1983), p. 22.
- Maureen Turim, "Process Video," in *The Electronic Gallery*, exhibition catalogue (Binghamton, N.Y.: University Art Gallery, State University of New York, 1983).
- Ibid.*, n.p.
- Interview with the author, June 22, 1983.
- Johanna Gill, *Video: State of the Art* (New York: Rockefeller Foundation, 1976), p. 46.
- Except where otherwise noted, all quotes from Woody Vasulka are from interviews with the author, March 18, 1983.
- Jonas Mekas, "On New Directions, On Anti-Art, On the Old and the New in Art," *The Village Voice*, Nov. 11, 1965, reprinted in *Movie Journal* (New York: Macmillan Co., 1972), p. 208.
- Jonas Mekas, "On the Plastic Inevitables and the Strobe Light," *Ibid.*, p. 242.
- Marshall McLuhan, *Understanding Media: The Extensions of Man* (New York: Signet Books, 1964), p. 36.
- Ibid.*, p. 19.
- Jonathan Miller, *Marshall McLuhan* (New York: Viking Press, 1971), p. 6.
- Raymond Williams, *Television: Technology and Cultural Form* (New York: Schocken Books, 1974), p. 127.
- See, for example, Mekas's description of a piece by Gerd Stern with Jud Yalkut and Brian Peterson at the Filmmakers Cinematheque, *Movie Journal*, p. 215; also his description of a multi-monitor display at Global Village, *Movie Journal*, p. 360.
- Charles Hagen, "A Syntax of Binary Images: An Interview with Woody Vasulka," *Afterimage*, Vol. 6, Nos. 1&2 (Summer 1978), p. 20.
- Gill, p. 46.
- Except where otherwise noted, all quotes from Steina Vasulka are from interviews with the author, February 1982; March 19, 1983; and Aug. 28, 1983.
- David L. Shirey, "Video Art Turns to Abstract Imagery," *New York Times*, July 4, 1972, p. 6.
- Rent for the first year was covered by \$8,000 the Vasulkas received from the New York State Council on the Arts. Because by law NYSCA cannot fund artists directly, all projects are funded through non-profit organizations. According to NYSCA records, the Vasulkas—as a part of the group Perception—were funded in 1971-72 through Howard Wise's Intermix (later called Electronic Arts Intermix). Besides the Vasulkas, Perception originally included Eric Siegel and Vince Novak. The following year, still under the Intermix umbrella, they formed Vasulka Video as a way of getting funding for their tool development. Perception expanded to include Juan Downey, Frank Gillette, Beryl Korot, Andy Mann, Ira Schneider, as well as Gillette and Siegal.
- Shirey, *op. cit.*
- Among the new music composers and performers were Laurie Spiegel, Jacob Druckman, Emmanuel Ghent, Phill Niblock, Frederick Rzewski, Gordon Mumma, Alvin Lucier, Tom Johnson, Charles Madden, and Charles Dodge.
- In addition to the Vasulkas and Chatham, other "cooks in The Kitchen"—as they were initially called—were Dimitri Devyatkin, a video artist who, with George Chaiken, organized a computer video festival; Shridhar Bapat, a video artist who organized a video festival with Steina in July 1972; Michael Tschudin, rock musician, composer, and founder of the Midnight Opera Company, a rock band that played on weekends. Also involved in music programming were Jim Burton and Bob Stearns, who became director of The Kitchen in the summer of 1973.
- Gill, p. 48.
- Hagen, p. 20.
- "The Vasulkas," *Cantrills Filmnotes*, No. 13, (April 1973); quoted in the program notes for "Video Art Review," a series of 18 programs presented by Anthology Film Archives, March 1981.
- Gill, p. 47.
- Ibid.*
- An example of this influence is found in a NYSCA grant proposal by Perception after the Vasulkas formed Vasulka Video. Describing the group's multi-channel projects, it said: "Through the application of cybernetic [sic] principles, multi-channel systems demonstrate in microcosm, the future posture of global communication."
- From a talk given at the Museum of Modern Art in the "Video Viewpoints" series, 1978.
- Woody Vasulka and Scott Nygren, "Didactic Video: Organizational Models of the Electronic Image," *Afterimage*, Vol. 3, No. 4 (October 1975), p. 9.
- Gill, p. 49.
- Ibid.*, p. 50.
- Hagen, p. 23.
- Quoted in program notes for "Video Art Review," Anthology Film Archives, March 1981.
- From program notes for exhibition at The Kitchen, 1978-79.
- Unpublished paper by Robert Haller.
- At the Experimental Television Center, then in Binghamton, N.Y., Ralph Hocking and Sherry Miller began to discuss the possibility with MacArthur and Wright in 1975. The original plan was for the Center and the Vasulkas to get the same computer and develop compatible software. This proved to be less realistic than originally thought, and the Center opted for a less software-dependent system.
- Hagen, p. 21.
- Christian Metz, "Some Points on the Semiotics of the Cinema," from *Film Language*; reprinted in *Film Theory and Criticism*, edited by Gerald Mast and Marshall Cohen (New York: Oxford University Press, 1974), p. 103.
- Ibid.*, p. 106.
- Hagen, p. 21.

SELECTED VIDEOGRAPHY

Steina and Woody Vasulka

Sketches (1970) 27 min., black and white.
Calligrams (1970) 12 min., black and white.
Sexmachine (1970) 6 min., black and white.
Tissues (1970) 6 min., black and white.
Jackie Curtis' First Television Special (1970) 45 min., black and white.
Don Cherry (1970) 12 min., color. Co-produced with Elaine Milosh.
Decay #1 (1970) 7 min., color.
Decay #2 (1970) 7 min., color.
Evolution (1970) 16 min., black and white.
Discs (1971) 6 min., black and white.
Shapes (1971) 13 min., black and white.
Black Sunrise (1971) 21 min., color.
Keysnow (1971) 12 min., color.
Elements (1971) 9 min., color.
Spaces 1 (1972) 15 min., black and white.
Distant Activities (1972) 6 min., color.
Spaces 2 (1972) 15 min., black and white.
Soundprints (1972) endless loops, color.
Home (1973) 17 min., color.
Golden Voyage (1973) 29 min., color.

Vocabulary (1973) 6 min., color.
Noisefields (1974) 13 min., color.
1-2-3-4 (1974) 8 min., color.
Solo for 3 (1974) 5 min., color.
Heraldic View (1974) 5 min., color.
Telc (1974) 5 min., color.
Soundgated Images (1974) 10 min., color.
Soundsize (1974) 5 min., color.
Update (1977) 30 min., color.
Update (1978) 30 min., color.
 Six Programs for Television (1979): *Matrix*, *Vocabulary*, *Transformations*, *Objects*, *Steina*, *Digital Images*, all 29 min., all color.
In Search of the Castle (1981) 12 min., color.
Progeny (1981), with Bradford Smith. 19 min., color.

Steina Vasulka

From Cheektowaga to Tonawanda (1975) 36 min., color.
Signifying Nothing (1975) 15 min., black and white.
Sound and Fury (1975) 15 min., black and white.
Switch! Monitor! Drift! (1976) 50 min., black and white.
Snowed Tapes (1977) 15 min., black and white.
Land of Timoteus (1976) 15 min., color.
Flux (1977) 15 min., color.
Violin Power (1978) 10 min., color.

Cantaloupe (1980) 28 min., color.
Urban Episodes (1980) 9 min., color.
Selected Treecuts (1980) 10 min., color.
Exor (1980) 4 min., color.
Summer Salt (1982) 18 min., color.

Woody Vasulka

Explanation (1974) 12 min., color.
Reminisce (1974) 5 min., color.
C-Trend (1974) 10 min., color.
The Matter (1974) 4 min., color.
Artifacts (1980) 22 min., color.
The Commission (1983) 45 min., color.

SELECTED INSTALLATIONS

Steina and Woody Vasulka

Tissues (1970) two channels, black and white.
Soundprints (1971) two channels, black and white.
The West #1 (1972) three channels, black and white.
The West #2 (1983) two channels, color.

Steina Vasulka

Machine Vision (variations, 1975-83).
Switch! Monitor! Drift! (1976).