

## **Pioneering Video Artist/Engineers & Electronic Imaging Technology: 1968-78**

During the period between 1965 and 1975, which could be considered as the defining period of video art, there was significant research activity principally amongst American, but also including several British artists working with video to develop, modify or invent video imaging instruments or synthesizers. This first generation of video artist/engineers include Eric Siegal, Stephen Beck, Dan Sandin, Richard Monkhouse and Peter Donebauer, as well as the well-documented collaborative work of Nam June Paik and Shuya Abe and Steina and Woody Vasulka. The work of these pioneers is significant to the history of video art because they developed a range of relatively accessible and inexpensive image manipulation devices specifically for 'alternative' video practice.

### **The Paik-Abe Synthesizer**

The Paik-Abe Synthesizer, built in 1969 and perhaps the earliest example of this kind of device, enabled the artist to add colour to a monochrome video image, and to distort the conventional TV camera image. Influenced by the development of audio synthesizers produced in the early 1960's by pioneers such as Robert Moog, video synthesizers drew on the fact that both audio and video signals were produced by the same analogue electronic processes.

People like Nam June (Paik) and Shuya Abe were good examples of what we would now call computer hackers, where this sort of kludging of found stuff would happen. The Paik-Abe synthesizer was a color encoder from a color camera and a video mixer. They didn't invent those components, they were found...

Extending a dialogue that began in Tokyo in 1964, electronic engineer Shuya Abe and Nam June Paik began building a video synthesizer in 1969 at WGBH-TV in Boston. Frustrated by the difficulty of working in the conventionally designed TV studio, Paik conceived of a video studio compressed into a piano keyboard:

The editing process in VTR is very clumsy, worse than in film. I wanted a piano keyboard that would allow me to edit seven different sources bang-bang-bang, like that- real time editing. The first thing I thought of was seven cameras with seven sources that could be mixed instantly by a console. So the machine has two suites: the piano keys for instant mixing and also a tiny clock that turns the color around, from ultra red (sic) to ultraviolet. The player can change the colors. The seven cameras are keyed into seven different colors themselves: one camera makes only red, another only blue, another so and so. The seven rainbow colors are there. Mixing them together makes what you see.

The Paik/Abe Synthesizer was first used during Video Commune, a four hour broadcast from WGBH in 1970, in which standard camera images were

distorted using the multiplicity of controls available on the synthesizer. This instrument was the first of several devices intended to distort and transform the conventional video image. In "Tracking Video Art: Image Processing as a Genre", Lucinda Furlong claims that artists and alternative media activists were actively seeking ways to make video images which looked different from conventional television in order to challenge the institution of television broadcasting:

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.

### Eric Seigel

In 1969 Eric Seigel showed his Psychedelelevision in Color at the Howard Wise Gallery as part of the celebrated and pioneering exhibition "TV as a Creative Medium". Seigel, who had been experimenting with television and video since the mid-1960's had, with encouragement and finance from Wise, built a crude video colouriser to add colour to an existing black and white television image. Psychedelelevision in Color was essentially a reworked monochrome image that used video feedback and colourised effects to break down and distort a photograph of Albert Einstein. With further funding from Howard Wise, Seigel began work on a video synthesizer in 1970. Like many of this generation of video artist/tool makers, Seigel was basically self-taught:

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 above my head.

Although he completed the prototype synthesizer, it was never marketed, as Seigel and Wise differed on how it should be developed. Wise sought a manufacturer to build it under license, but Seigel was afraid that his design would be stolen, and preferred to build it himself. Seigel's synthesizer was never manufactured, although the colouriser was briefly marketed, with ten units sold at approximately US \$2,400 each.

Eric Seigel was only briefly active on the US video art scene. By 1972 he had become disillusioned and unhappy with the direction he perceived video art to be taking:

A whole sub-culture was forming and it turned me off....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.

### Stephen Beck and the Direct Video Synthesizer

Around 1968, whilst experimenting with the sonic generation of oscilloscope images, artist/engineer Stephen Beck began seeking more precise methods

of controlling light. His first attempt to build a device was the "Number 0 Video Synthesizer", used in collaborative performances with electronic musician Salvatore Martirano.

In 1970 Beck was invited to be Artist-in-Residence at the National Center for Experiments in Television (NCET) in San Francisco. Whilst at NCET Beck completed his "Direct Video Synthesizer" and used the new instrument to produce a series of tapes called Electronic Notebooks. Intended as both documentation of the technical research and works in their own right, these tapes were made by artists and composers including Don Hallock, Bill Roarty, Willard Rosenquist, Bill Gwin and Warner Jepson as well as by Beck himself.

The Direct Video Synthesizer, designed as a performance instrument, was intended to be used to produce video images without a camera. Beck saw his machine as an "electronic sculpting device" designed to generate four key aspects of the video image- colour, form, motion and texture. In a subsequent version, Beck extended the scope of the device to include circuits to generate the elemental images of air, fire and water. Beck's stated concern was to open up television as an expressive medium and to go beyond the manipulation of the conventional camera image to produce non-objective imagery.

In "Image Processing and Video Synthesis", Beck discusses the various approaches of American video artists to the construction and use of video imaging tools, outlining and summarizing the instruments in use at the time- (1975), identifying four distinct categories of electronic video instruments: 1) Camera Image Processing. 2) Direct Video Synthesis. 3) Scan Modulation/Rescan. 4) Non-VTR recordable. In this survey of the range and variety of electronic imaging instruments, he explains attempts by artists to exploit:

The inherent plasticity of the medium to expand it beyond a strictly photographic/realistic representational aspect which characterizes the history of television in general.

Beck also identifies two tendencies in the designing and building of video processing instruments by artist-engineers; the former is one in which the images produced are a direct result of the circuitry and design of the instrument, the latter takes place when an instrument has been developed in order to produce a particular visual or psychological effect.

#### 1. Camera Image Processors

This type of instrument is designed to modify the monochrome video image from a black and white television camera. It usually includes a colouriser, which adds chrominance (colour) signals to the video signal, keyers and quantisers to separate luminance value levels in the signal in order to add synthetic colour and/or to insert additional images into the original. Further circuits may include modifiers that enable effects such as polarity inversion and mixing via the superimposition of multiple image sources. This category

of instrument includes the Paik/Abe synthesizer, image processors used by the Vasulkas, and Peter Donebauer's "Videokalos IMP" (1976). (See below)

## 2. Direct Video Synthesizers

Designed to operate primarily without a camera signal, these instruments contain circuitry to generate a complete video signal including colour generators to produce chrominance signals, form generators circuitry designed to produce shapes, lines, planes and points, and motion modulators to move them via electronic wave forms including curves, ramps, sines, triangles and audio frequency wave patterns. These instruments also contain texture amplifiers that produce "brush effects" such as shading and chiaroscuro and textural effects such as grain. Instruments in this category includes Stephen Beck's own "Direct Video Synthesizer" and the EMS "Spectron" designed by Richard Monkhouse. (See below.) Beck also designed and built the "Video Weaver" in 1975, inspired by the analogy between weaving and the construction of the television image. The circuits for Video Weaver were incorporated into his "Direct Video Synthesizer" and used to produce a series of tapes called Video Weavings.

## 3. Scan Modulation/Rescan

In this process images are produced using a television camera rescanning an oscilloscope or CRT screen. The display images are manipulated (squeezed, stretched, rotated, etc.) using magnetic or electronic deflection modulation. The manipulated images, rescanned by a second camera are then fed through an image processor. This type of instrument was also used without an input camera feed, the resultant images produced by manipulation of the raster. Examples of this type of instrument include The Paik/Abe Synthesizer, and the Rutt/Etra Scan Processor (1973). (See below.)

## 4. Non-VTR Recordable

Beck included this category for completeness. This approach is basically a 'prepared' television set, to present a non-recordable distorted display, such as Nam June Paik's Magnet TV (1965), but resultant images could be recorded using rescanning methods. This category therefore also includes Bill Hern's "Vidium Colourising Synthesizer" (1969) as used by Skip Sweeny in his video feedback work - for example Illuminatin' Sweeny (1975).

### Dan Sandin

Like Eric Seigel and Stephen Beck, Dan Sandin was interested in light shows and kinetic art. Initially working with conventional colour photography, it occurred to Sandin, a trained physicist, that he could achieve more interesting results using electronics. Through his experience with light shows, Sandin was familiar with the Moog sound synthesizer, and he began to speculate about the potential to create it's video equivalent around 1968:

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.

Teaching kinetic art and interactive sculpture at the University of Illinois, Sandin got involved with video during the wave of protests in 1970 that resulted from the Kent State riots, running an ad-hoc 'media house' cable-casting live political debates:

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....it became clear that this old idea of this image synthesizer and my new attachment to video was something I could pull off.

Securing a \$3,000 development grant from the Illinois Arts Council, Sandin developed his image-processor over the next three years. His proposal had been to develop an affordable programmable video processing synthesizer combining a number of important functions; keying, fading, and colourising into one unit. The "Sandin Image Processor", or I.P. was designed as a set of stackable modules, which could be reconfigured depending on the function or image processing required. Like the Direct Video Synthesizer and the Videokalos IMP (see below) the Sandin Image Processor was designed to be used in live performance situations. Unlike other artist/engineers, however, Sandin made a decision to make the plans for the I.P. available for others to build. Sandin and a colleague, Phil Morton, founder of the video programme at the Chicago Art Institute, spent over a year preparing a parts list and circuit diagrams for plans which were made available to anyone who wanted them.

#### The Rutt/Etra Scan Processor

The "Rutt/Etra Scan Processor" was developed by Steve Rutt and Bill Etra in 1973. Rutt and Etra obtained a \$3,000 grant from the TV Lab at WNET to develop a more controllable version of Nam June Paik's "Wobbulator", a modified TV set which he used to make manipulated video images of Richard Nixon and Marshall McLuhan. Bill Etra had approached Steve Rutt to suggest that they explore the possibility of producing a "Wobbulator that Zoomed".

Paik had figured out (with technical advice and support from Shuya Abe) how to make something move across the raster, but it wouldn't stay in the spot that it had been moved to.

The Rutt/Etra Scan Processor modifies a conventional video image by the electromagnetic deflection of the electron beam of the CRT monitor display that is built into the scan processor. Because the raster image rather than the waveform code is altered, the resulting images must be rescanned.

Approximately 20 Rutt/Etra Scan Processors were hand-built and sold for approximately \$7,000-8,000 each, before the partnership ran into financial difficulty and the operation was discontinued.

Woody and Steina Vasulka have made the most systematic use of the Rutt/Etra in their video work since its inception in 1974, producing works such as C-Trend (1974), The Matter (1974), and The Art of Memory (1987). Woody

Vasulka writing about the Scan Processor in the 1994 Ars Electronica Catalogue:

The instrument called the Rutt/Etra, named after the inventors, was a very influential one. Etra, with his art affiliations, had placed the instrument much closer to the hands of individual artists for the right price. Almost everybody I respect in video has used it at least once. Its power was in the transformation of the traditional film frame into an object with lost boundaries, to float in an undefined space of lost identity: no longer the window to "the" reality, no longer the truth.

The Vasulkas: Dialoguing with Tools

Working exclusively with video and sound since the late 1960s, the Vasulkas have taken a systematic and rigorously formalist approach, evolving a working method characterized by an interactive dialogue between the artist and electronic imaging technology, in a process of exploration that they have termed "dialogues with tools".

Over a period that continues up to the present, the Vasulkas have explored the potential for video via a comprehensive body of work that seeks to provide the foundation for a new electronic language and to explore and define the frontiers of digital and televisual space. In a recent interview, Woody explained his early fascination with the electronic image and the political implications of his decision to move from film to video in the late 1960's:

The idea that you can take a picture and put it through a wire and send it to another place- you can broadcast from one place to another- this idea of an ultimate transcendence- magic- a signal that is organised to contain an image.

To move to video was no great decision, it was clear to me that there was a utopian notion to this, it was a radical system and so there was no question of deciding that this was it. Also I was not very successful in making films- I had nothing to say with film. This new medium was open and available and just let you work without a subject.

The Vasulkas characterize their early approach to video as primarily "didactic", for many years working with the materiality of the video image towards the development of a 'vocabulary' of electronic procedures unique to the construction of a "time/energy object". They saw this formal approach to video as very much aligned with the American avant-garde film movement of the time, and felt initially that they were part of a new wave of formal experiment in video:

...when we conceived of video as being the signal- the energy and time and all of that, we thought we were right there, smack in the middle of it. These were the radical times in experimental film and there were all these people starting up in video. We were all discovering this together. We erroneously thought that everybody conceived of video this way: this 'time/energy

construction'. Now I realise we were very much alone. We were never lonely because we thought we were in the middle of it, but we were. We never had any followers who practiced this time-energy organisation.

This conception of video as 'pure' signal enabled the Vasulkas to identify the significance of the fundamental relationship between sound and image in video, an inherent property of the electronic medium which set it apart from film, and it was an exploration of this idea which characterized their earliest work. Steina sees this relationship as crucial to an understanding of video as a medium for art:

It was the signal, and the signal was unified. The audio could be video and the video could be audio. The signal could be somewhere 'outside' and then interpreted as an audio stream or a video stream. It was very consuming for us, and we have stuck to it....Video always came with an audio track, and you had to explicitly ignore it not to have it.

This exploration of the relationship between the electronic encoding of picture and sound also provided the Vasulkas with their first model for their emerging dialogue with electronic tools- the audio synthesizer, an instrument which also enabled them to begin to explore 'pure' video imagery which was free from the camera, or more specifically, from images produced via the lens. For the Vasulkas, it was a question of exploring a potential for video which was entirely different from either film or broadcast television:

How do you interact with the television screen? Its a 'time construct'. Normally it constructs a frame- the illusion or representation of a frame, and its normally organized so precisely that you are not supposed to see that its actually organized line by line using some kind of oscillators inside and if you turn the television on when there is no broadcast signal, there are free-running oscillators- two horizontal and vertical oscillators. As soon as there is a broadcast signal it locks onto it, it becomes a slave to a master which is the broadcast signal. The signal itself governs. So we would put into the input a sound oscillator- or oscillators, and we saw for the first time that we could get an image from a source other than the camera. So our discussion was about departing from the camera, which television insisted upon having, and still does. The second principle was to get the tools to organize time and energy in order to produce a visual or other artifacts. So we started with interference patterns. Interfering with that time structure, anytime you interfered with that it would organize itself and that was our entrance into the synthetic world from the audio tools.

Working with electronic imaging technology to produce video works in this period, the Vasulkas were not interested in making 'abstract' video, but were attempting to develop a vocabulary of electronic images through a systematic deconstruction process. Alongside their video tape and multi-screen works produced throughout the 1970's, the Vasulkas developed a range of special machines in collaboration with a number of electronic engineers and makers

designed to explore and develop a medium-specific vocabulary, the most important of which were:

The "Field Flip-Flop Switcher". (1971) A variable-speed programmable vertical interval switcher that enabled selection between two image sources produced by George Brown.

The "Dual Colorizer". (1972) A two-channel device for the colourisation of black and white video images according to differences in the grey scale, made by Eric Siegel.

The "Multikeyer", (1973) A device which can assign up to six layers of separate video images, allowing manipulation of their foreground/background relationships.

The "Programmer" (1974) a programmable control device for the automatic operation of a stored sequence of instructions for the Multikeyer. Both constructed by George Brown.

The Rutt/Etra Scan Processor (1974). As described above, a device that used a programmable deflection system of the cathode ray tube (CRT) to manipulate standard television images. Jeffrey Schier describes what he calls the "Vasulka Effect" in the section of the "Ars Electronica " catalogue on the Rutt/Etra:

The raster's size, position and intensity can each be modulated through voltage control signals. These voltage control signals fulfil a commercial function: to generate swooping titles and sliding graphics. A more esoteric use is demonstrated in the "Vasulka Effect". The input video brightness connects to the vertical position control. This causes the brighter parts of the video to "pull" the raster lines upward. When combined with other synthetic waveforms, the raster forms a three-dimensional contour map where video brightness determines elevation. The generation of video objects built from the underlying raster structure is evident in videotapes created by the Vasulkas.

The Rutt/Etra Scan processor and other machines enabled the Vasulkas to produce a body of work with a very clearly identified analytic objective:

...the problem was not really to mix the images, but to deconstruct them, and we went through a long charade of building these machines that would deconstruct the images- meaning they would show the elements- including the codes, because that was the mystery.

For example, in C-Trend (1974), Woody Vasulka used the Rutt-Etra Scan Processor to manipulate a video image of urban traffic flow. The horizontal lines of the video luminance signal are translated into a graphic display. The



video frame, or raster, has been reconfigured; making visible the 'space' between frames -the horizontal and vertical blanking.

Time/Energy Structure of the Electronic Image (1974-75) was also produced exclusively with the Rutt/Etra Scan Processor. (Rutt/Etra model 4). In an exploratory article, designed to open up further dialogue, Woody Vasulka set out his intentions, and identified the influence of this new tool on his ideas:

Compared with 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 have 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 element- the waveform.

In both these tapes Vasulka was interested in the Scan Processor's ability to produce non-camera imagery in which the "light/code interface" occurs at the video monitor of the processor, with the video waveform displayed as a visible image. Vasulka's intention was to systematically explore the potential image manipulations of the scan processor with the larger purpose of laying the foundations for the establishment of a new visual language free from the constraints of the conventional lens-based image:

To me this indicates a point of departure from light/space image models closely linked to and dependent upon visual-perceptual references and maintained through media based on the camera obscura principle. It now becomes possible to move precisely and directly between a conceptual model and a constructed image. This opens a new self-generating cycle of design within consciousness and the eventual construction of new realities without the necessity of external referents as a means of control.

Woody and Steina's collaborative work across more than 30 years of commitment to video is complex; the Vasulkas have constantly influenced, inspired and challenged each other. Their oeuvre includes scores of works; collaborative videotapes, multi-screen displays and installations, and live performances as well as individual tape works and installations.

Although the majority of video artist-engineers involved in producing hardware specifically for development of their own work were based in the United States, there were several English artists engaged in comparable activities, two of the most significant are Richard Monkhouse and Peter Donebauer.

Richard Monkhouse and the EMS Spectron

Richard Monkhouse, born in London in 1950, is a self-taught electronics engineer. After graduating with a Masters degree in Natural Sciences from Jesus College, Cambridge in 1972, Monkhouse worked on government defense projects for a year at Marconi-Elliot Avionic Systems, where he learned how to design circuits. He then joined EMS Ltd. (Electronic Music

Studios), a London-based company specialising in the manufacture of sound synthesizers, initially involved with the design of a video display component for a new audio instrument:

Nobody else at EMS had much expertise in video and I was, if you like, a promising newcomer/ slave. I was given the job of designing some video sync. circuitry. So I got a colour video monitor and a sync circuit and I started to plug direct RGB video signals from the digital timing circuit into the colour monitor. I suddenly realized how amazing pure colour video imagery actually is. I

Intrigued by the visual quality and purity of the colour images he had been able to produce, Monkhouse developed a prototype video instrument which went much further than simply generating coloured stripes and squares: "I thought: the video synth, what a concept. I've never heard of that before: Let me see if I can make one."

Monkhouse's prototype, initially named the "Spectre", generated considerable interest at EMS, and it was soon taken up by the company director and owner Peter Zinovieff. The machine was capable of taking a monochrome video camera feed, colourising the image to eight levels with digital control of colour brightness. After further demonstrations in the UK, a colour encoder was added, enabling the output of the Spectron to be recordable.

Although the Spectron was a novel idea with an untested market, EMS manufactured and actively promoted the instrument, making it available for £4,500 in 1974.

Although working as an electronics engineer and employed to develop the new prototype, Monkhouse was not simply interested in the technology for its own sake, but wanted to make creative use of the machine he had designed. Even before leaving EMS in 1975, Monkhouse had begun to use the Spectron to produce his own video work:

I was fascinated with its potential, not in a technical way, but because of what it could do. I was interested to explore what it could do within its limitations, and to explore what I thought its powers were- given the limitations of what I had available to me. I wasn't in an art college, and I didn't have access to a lot of colour cameras. I only had the resources that I got from EMS.

The idea to work with video as a creative medium hadn't occurred to Monkhouse until he had built the encoder for the Spectre. It was also around this time that cheaper colour video recorders were becoming available in the UK, and it was this further impetus which enabled Monkhouse to begin producing his own video work, including experimentation with video feedback.

Monkhouse had been inspired by the computer film work of John and James Whitney. In 1971 he attended a lecture by John Whitney Jr., who had recently

been given a grant by IBM for a project to reconstruct the Whitney's early work. Drawing on these inspirations, Monkhouse began to produce video work with a combination of direct video synthesis, 16mm film loops of computer graphics displays, video feedback and oscilloscope patterns, cutting his images to pre-recorded music tracks:

#### Peter Donebauer and the Videokalos Image Processor

In 1974 video artist Peter Donebauer (Born, Manchester 1947), interested in the potential of the Spectron video synthesizer, visited Richard Monkhouse at EMS. This initial meeting was the beginning of a collaboration that lasted many years and included the building of several video instruments and a tour of live video/music performances.

With the intention of finding a way to continue the abstract video work he had been producing using the colour TV studio at the Royal College of Art, Donebauer was seeking a machine that shared characteristics with the Spectron. Essentially he wanted a compact, affordable camera processing instrument which combined some of the basic features of a conventional studio video mixer capable of cross fades, a keyer and a video wipe generator, a multiple colouriser plus a genlocked sync pulse generator and encoding/decoding cards. Agreeing to work together, Donebauer and Monkhouse set out to design and build such an instrument. They pooled ideas and expertise:

We were doing it on a very low budget. Anything you could think of needed a lot of laborious work to turn it into a reality. Peter was prepared to do a bit of learning and soldering and building. He came up with a prototype and I looked at it to see how well it worked. We designed the various elements- the colouriser, the mixer, the keying circuits on the basis that I drew up a circuit, Peter prototyped it, and I modified it if necessary. This involved a number of meetings, some at his place and some at mine.

In "Video Art and Technical Innovation" , Peter Donebauer used Stephen Beck's categorisation to provide a context for a discussion of his own approach to working with video. His particular interest had been to develop video work that explored and established relationships between music and visual phenomena.

Inspired by an exhibition at the Institute of Contemporary Arts in London featuring the work of Theodore Schwenk with the surface patterning of water, Donebauer used a portapak to record video images derived from a home-made device to vibrate a thin film of water over a loudspeaker. These preliminary black and white 'sketches' formed the basis of more ambitious work that followed.

Forming a collaborative partnership with composer/musician Simon Desorgher, Donebauer began working in the television studio at the R.C.A. to explore parallels between electronic music and colour video. These

collaborations, based on notions of live feedback and improvisation between video artist and musician, were an attempt to produce visual work composed from abstract natural forms using music as a model:

The major theme that emerged from working in the studio was the whole notion of the feedback process...The performance itself is a feedback situation, and when you point the camera at a monitor you get these feedback patterns. I became very interested in the fact that the resulting images from video feedback were natural forms. They were organic-spirals, eddies, obviously related to the phenomenon which creates shells, galaxies, etc. Through this process I was suddenly thrown back into my earlier fascination with nature. Here I was, probably using the most advanced technical equipment available to an artist at the time, and suddenly I realised these electronic processes were mimicking the forces at work in nature.

One of the most significant aspects of video for Donebauer was its immediacy- he saw a direct analogy between performing with a musical instrument and his working process with 'live' video in the TV studio. Donebauer developed a method of producing a 'real-time' continuous recording that was the record or documentation of a collaborative performance. The videotapes produced by this method were selected from the best 'takes' using this process.

In 1974 Donebauer was commissioned by BBC television to produce a videotape for broadcast on Second House, an arts magazine programme. Because the BBC had no portable video recording equipment at the time, the work was transmitted via an outside broadcast microwave link from the TV studio at the RCA. This experience of the flexibility and ephemerality of video had a deep effect on Donebauer's sense of the medium and on the subsequent development of his work:

...the signal had to be bounced across via Crystal Palace and into the basement studio at White City where it was recorded. A couple of days later I went to see it, and it completely blew my mind because it was so much better quality than I'd ever seen it- even compared to seeing it 'live'on my monitors! It was startlingly better because of its technical quality- and yet it had been through the ether! It was the disembodied quality of the medium that struck me. Putting the signal down a wire somehow seems logical, but having it disembodied before it was recorded and then transmitting it back and forth across eight million people profoundly affected my sense of the medium....it made me realise that the signal was everything. The signal is completely ethereal- it has no substance...The fact that it's transmittable is a very peculiar aspect. Getting and staying closer to that sense of magic and wonder was very important.

This experience of the video signal as paramount led directly to the development of Donebauer's own video processing instrument, as mentioned above. After leaving the RCA, and with only occasional funding, Donebauer found it difficult to continue working in the way he had become accustomed to.

His solution was the development of a video image-processing tool, analogous to a sound mixer, but to be used 'live' like a musical instrument:

What was really needed was a specially-built image processor that would allow the functions of complex colourisation, keying and vision mixing in the same console, preferably utilising cheap monochrome cameras as inputs and playable as an instrument.

The "Videokalos Image Processor", designed during 1975 in collaboration with Richard Monkhouse was intended as a 'live' performance instrument, providing even better 'real time' control than the TV studio. According to Donebauer it had more precise colour mixing and allowed greater control of video feedback images because the entire unit was self-contained. In the RCA television studio for example, the vision-mixing console had been in a separate room from the engineering control area where he worked, requiring an additional operator. With the Videokalos, Donebauer was able to control the entire process himself.

Although the Videokalos IMP did not redefine the work, it did enable Donebauer to produce new video work in other locations. The main intention in building the Videokalos was to gain the same level of control as he'd had in the studio, but with simpler means. Donebauer also hoped it would bring him into closer contact with the medium: "I felt that getting involved with the integrated circuits, chips and transistors and all the rest of it, would get me closer to the heart of the medium.

Although most of the videotapes Donebauer produced in the period between 1973-1983 were performed 'live', they were performed largely for tape. The first complete videotape to make use of the Videokalos IMP was Merging-Emerging (1978). Recorded in real time, with no subsequent editing, Merging-Emerging was produced using a procedure in which all the participants- Donebauer, two dancers, and two musicians (flute and violin), had visual and aural feedback which enabled them to modify and adapt their contributions during the recording session. In 1979 Donebauer and Desorgher formed VAMP (Video and Music Performance) to present their collaborative work to live audiences, touring venues across the UK.

Although VAMP's tour was a unique event, the live aspect was central to Donebauer's philosophy. His videotapes are all derived from a 'live' performance - the final released version being the best 'take' of a studio recording session. For Donebauer this 'liveness' was a key part of the aesthetic, drawn both from the influence of Zen painting and from early television broadcasting:

...it evolved partly out of the fact that I didn't have access to an expensive edit suite. But later I saw the live single best take approach as a strength- much

like very early television that had an interesting quality because of it. This relates to my interest in music and also the oriental and Zen influence.

By combining his ideas about the parallels between music and video, his interests in Zen calligraphy and gestural painting and the immediacy and fluidity of the video signal, Donebauer saw a potential for the medium, based on its inherent properties, which challenged the more limiting conceptual definitions of his contemporaries. Donebauer's ideas were firmly tied into the technical possibilities, but in contrast to more constraining definitions; they embraced the potential of video in a forward-looking attitude, in a way that echoes the enthusiasm of Gene Youngblood in Expanded Cinema. Donebauer wrote in 1976:

Video as a medium is unparalleled by any other in its ability to allow immediate visual and aural experience extend in time and be recorded....Video however is undefined. As electronic technology pushes back frontier after frontier in terms of size and processing techniques so does video expand its possibilities. In a contemporary world where many aspects of our external environment are appearing to be finite, the interaction of human consciousness with electronic possibilities seems to be without limit.

Donebauer's attitude to video is informed by working directly with the medium in a live and interactive way. This attitude is embodied in the Videokalos IMP, and was crucial to both the development of the instrument and to the subsequent development of Donebauer's video work.

Although he was not initially aware of the work of American pioneers such as Beck, Seigel or Sandin, Donebauer's work both as an artist and as an electronics designer has much in common with this work. His interest in the 'live' aspects of video technology, the influences of music and electronic sound synthesizers on the development of his video work and the Videokalos IMP are comparable.

#### Conclusion

The artists discussed in this paper: Nam-June Paik, Eric Seigel, Dan Sandin, Stephen Beck, the Vasulkas, Richard Monkhouse and Peter Donebauer have all established their practice in relation to the specifics of developing video imaging technology. As the American writer and critic Gene Youngblood has pointed out, there is a crucial relationship between the development of new technological systems and the language inherent in them: "Our task is to discover it, identify it, draw it out and name it". He points out for example that "Vasulka has built his machines in order to discover the language in them". Youngblood also cites Peter Weibel in pointing out that human vision has always been 'machine assisted'.

Video art and video imaging technology are inextricably intertwined. The early video artist/engineers explored and investigated the unique properties of the new electronic medium; instant playback, live monitoring, feedback, continuous real-time recording, simultaneous sound and picture, image

degradation, repetition, image distortion, colour synthesis, etc. not simply as ends in themselves, but because of the ideas and cultural meanings that were imbedded in them. Creative explorations and applications of these and other techniques have inspired artists to create works which are both a testament to the developing technology and a reflection of the concerns of the times and culture they are part of. All of the video artists I have discussed have drawn on their experience and knowledge of working with video technology for inspiration and creative exploration, developing a vocabulary for an evolving visual language, opening up the territory for future developments.

Chris Meigh-Andrews, London, 2001

This paper was originally presented at "Interstanding 4- End Repeat ", Tallinn, Estonia, November 2001.