Video Feedback – Lyricism in Patterns of Light

An Essay by Barbara Doser

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Introduction

An artwork must stand alone and have an independent effect. It should not require an introductory description or explanation, as that influences an individual's reception and therefore the viewer's personal enjoyment of discovery, even depriving them of the chance to form their own opinion. In this case, and most others also: "The first impression is the deepest."

When the artist provides some sort of explanation, it is irrelevant with regard to the quality of the work itself. Information relating to the artwork, regarding technique or historical context in particular, can limit the viewer's understanding to this context alone.

An artist's interpretation of his or her work provides insight into the underlying thought process, which, of course, influences the viewer's reflections concerning the work in question. The idea behind a work of art may be altered for the recipient, possibly producing an Aha! effect that should be given a backseat to the initial impression; unfortunately, this is not normally the case. There is a wide variety of reasons why this happens, but they involve the members of the audience as individuals and will not be dealt with here.

For this reason I do not provide descriptions of my artworks, experimental art videos, video and spatial installations, or paintings and printed works in the following essay. They must stand alone.

I firstly explain the video-feedback technique, as it represents the basis of my work. A basic understanding of it must be provided before explaining what fascinates me, the opportunities it offers, and where it is ultimately taking me.

At the same time this will answer the question I am asked constantly concerning what kind of software is used to produce my moving images. My works have nothing to do with computer animation as such. They are generated by means of a video camera and connected monitor, the former directed at the latter. This produces a feedback process that autogenerates abstract forms and structures in motion. For this reason, I also term the video-feedback system a "pattern generator". In this essay I examine my interest in analyzing the resulting video-feedback material in terms of time and space and developing it further both formally and conceptually so that "mutations" and "patterns" are created.

Furthermore, I describe the role assigned to sound, and then address the question of why still images of my art videos in the sense of snapshots are so important. When adapted as paintings and printed works, they represent an essential element of my work with moving images.

In a digression I examine video feedback in the early years of video art in the US, in the late 1960s. This section focuses on artists' work and events into the 1970s that are relevant to my work in terms of thematic historical context.

Noteworthy is the fact that, also in the US, abstract animation film in the 1950s and '60s produced visual results that in a way anticipated the aesthetics of video feedback.

A concluding jump into the present calls attention to the fact that video feedback continues to exist and fascinate as a visual event.

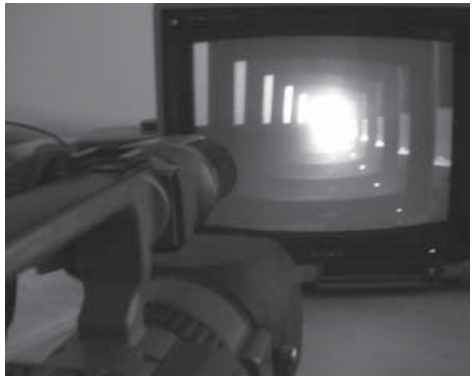
1. Video Feedback – Discovery of Light Patterns

I have been interested in optic seriality, repetitions and variations since my childhood. Noticing and observing abstract forms and structures in motion, whether in overgrown gardens or the chaos in the skies, has never failed to delight me.

In 1993, while trying out my first video camera, I discovered the phenomenon of video feedback for myself. The camera, connected to the television set, was by chance filming its screen, and in this way a world of autogenerated abstract moving images that are dependent of devices themselves was revealed to me.

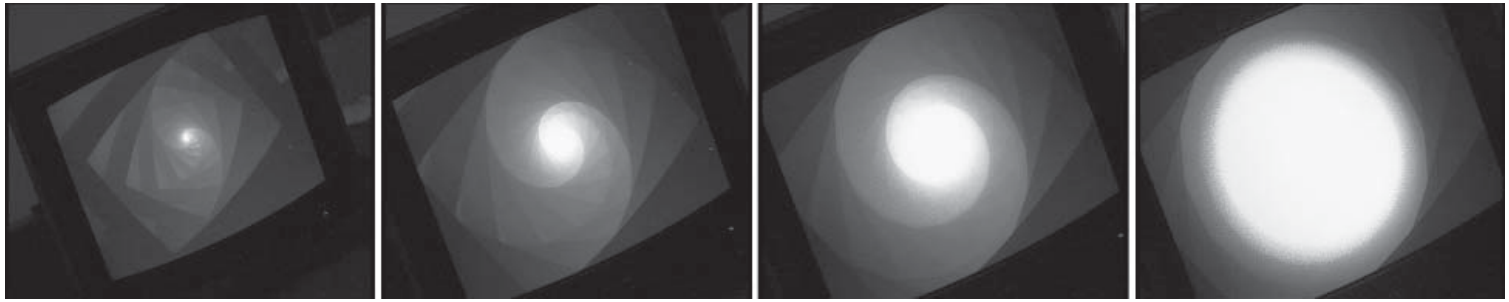
I then began to work and experiment with this technology, though without reflecting on its historical development in art. My fascination for the torrent of forms and the vast potential of complex moving structures they offered, some of which were too fast for the human eye to fully perceive, led to series of experiments. The intention was to create and manipulate the randomly generated moving images and control them according to my ideas.

An enormous pool of data comprising video-feedback material has continued to grow as



Video camera pointed at the monitor it is connected to

a result, the source of footage for my visuals that is manipulated in a vast variety of different ways.
I see abstract video-feedback forms in motion as a technical phenomenon with an organic and only seemingly natural character and appearance. When observing feedback processes I have a sense of witnessing something evolutionary, elementary taking place in a kind of temporal distension or compression, as both an analogy and contrast to nature, and characterized by a lyricism that moves me.
This gives rise to my interest in analytically observing and investigating the autogenerated formal and structural variety of video feedback. When doing so I remain in the abstract and non-representational field. My intention is to investigate motion as form and form as motion, analyze and comprehend the two in terms of time and space. This produces more than simply special insights into the dynamic processes in which structure is created, processes generated by feedback between camera and monitor in connection with light; at the same time fascinating new visual subcosmoses are created.
When played back or reproduced, an electronic moving image represents immaterial light that exists for only a moment, a visual event playing out in an electronic visual space. Video feedback, on the other hand,



The camera is rotated and zoomed toward the vanishing point

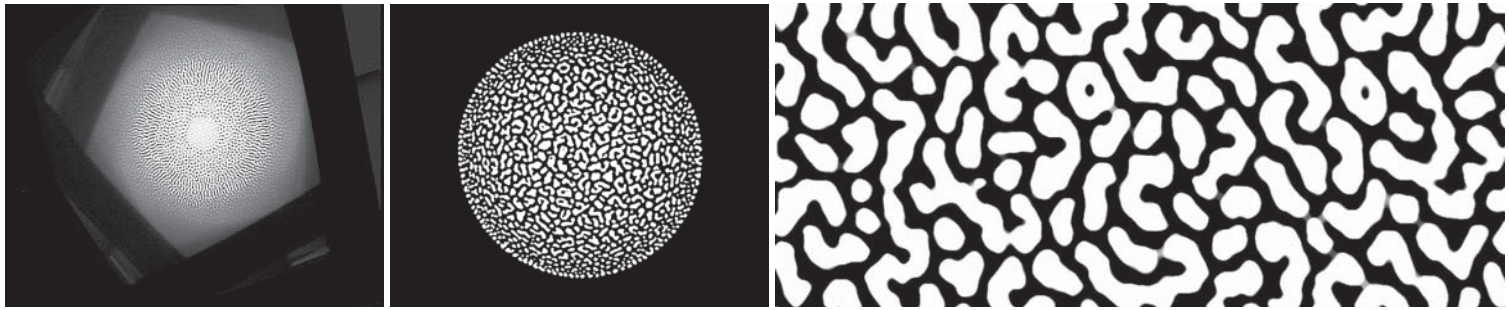
does not reproduce any kind of reality, as it is itself reality.
The aesthetic of video-feedback images results from the method used to generate them at the event horizon of chaos. Produced are forms born of a plane or an imaginary space that develop, evolve, rotate and are renewed before disappearing. Forms in motion and motion as form, chaotic cosmoses full of spatial complexity and dynamic behavior.
As they have no concrete content, their reception enjoys unlimited latitude that leads to the construction of cognitive "realities" beyond conventional perception and views – subjective mutations as correlates in the viewer's mind.

The video-feedback system has in my opinion both lyric and creative potential, and it also possesses potential infinity.

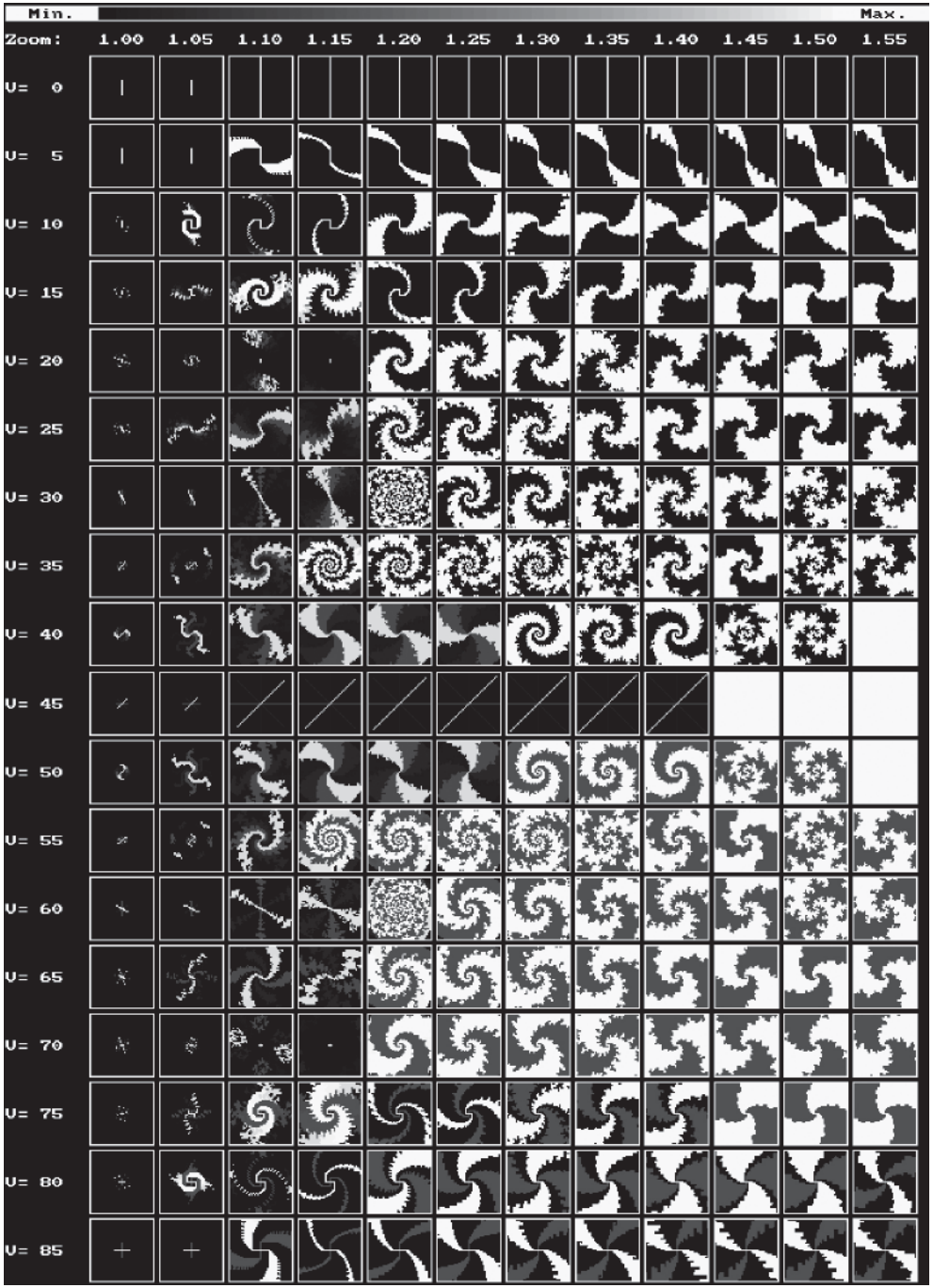
2. The Video-Feedback System and Its "Functional Strategy"

The video-feedback system involves a closed cycle between video camera and monitor in which information is "fed back" into itself. This can also be done using a cellphone with an integrated video camera connected to a notebook computer. The important thing is that the electronic recording device is pointed at the playback device to which it is connected. Light, and not only ambient light, plays an important role.
Video feedback can be regarded as the visual equivalent of electronic audio feedback. Both are systems of fed-back information in which a portion of the output signal is returned to the system's input directly or in modified form, and input and output continuously amplify each other.[1]
The video camera films the monitor it is directed at, which is blank at that moment, and immediately sends its picture back to that same monitor. By means of the automatic repetition of this process – the feedback process – these pictures are reproduced in superimpositions upon themselves. Successively smaller images of the monitor are visible in a kind of tunnel leading to the vanishing point.
This can be compared to the effect produced by two mirrors set up directly across from each other, as in halls of mirrors.
When the camera is rotated, the monitor is filmed and shown rotating in the same way. The next image that is captured and sent to the monitor is superimposed at the same angle as that of the camera's rotation, overlapping a portion of the previous image, an afterimage of which is still visible, and so on. The effect produced is one of successive partial additions in the direction of the rotation.

Left: The camera is rotated and zoomed toward the vanishing point, and brightness and contrast on camera and monitor are altered. Middle: spatial dislocation within a defined circular area: chaos, camera angle of approximately 60°, zoom >1, the forms develop from the center outward. Right: detail of the center as an analysis in terms of space



1 This should be regarded as the definitive definition of video feedback, and it is the only one relevant to my work. "Closed circuit" is often incorrectly equated with video feedback by art historians. In most closed-circuit installations a video camera is connected to a monitor showing what the camera sees in realtime. Recognized internationally as a new video-art technique since the late 1960s, this involves the viewer, who is at the same time an actor, in processes of self-reflection. In another context the term video feedback is also used in the fields of psychotherapy and coaching as an instrument for self-reflection. Video material is analyzed live or after an event.



Left: Graph showing how images change during the video-feedback process. V represents the angle at which the camera is rotated on its horizontal axis.[2]

When the video-feedback system is manipulated in some way or a change is made, such as when the camera is zoomed toward the vanishing point, which is light, the system descends into chaos. A vast number of points of light are created, and in the course of the feedback process – from one image to the next – they overlap partially or adjacent points merge. This phenomenon is produced, firstly, by the amount of time the points are illuminated on the monitor, the beginning and ending of which is fluid and which involves successive images (afterimages), and secondly, by the imprecision and fuzziness involved in the process of recording, propagation of the signal, and reproduction of the images.
As the feedback process progresses, abstract dynamic forms and structures of light are autogenerated, producing visual cosmoses within electronic devices.

My experiments since 1993 have been made with a Hi8 video camera (later replaced by MiniDV) connected to a CRT monitor. To capture the images in black-and-white, I run the signal through an image processor, which allows me to easily control brightness, contrast and focus sharpening at the same time.
The setting is a semi-dark room. External sources of light and reflections on the monitor are avoided. The relative positions of camera and monitor (distance and angle), ambient light and the angle at which the camera is rotated on its axis (up to 360 degrees) play an important role for composition and control of the image.
The camera's functions, such as zoom, focus, brightness and contrast, and brightness, contrast, focus sharpening, color and vertical hold on the monitor, represent significant parameters for manipulation when the images are generated.
Selection of the amount of zoom and the degree of the camera's rotation has a significant effect on the nature of the video feedback. At a zoom of 1 (1:1) the picture remains static, and when the camera is rotated, a spiral rotation that then stops in a point of light is produced.
Zooming toward the point of light, in other words increasing the zoom, makes the system descend into chaos. Chaotic forms and structures are generated, from their center to their edges, and their rotation follows that of the camera. Chaotic behavior is produced because the slightest change in the initial conditions results in non-periodic and seemingly irregular behavior. In the video-feedback system the mechanisms of self-propagation through feedback are responsible for the exponential increase in differences compared to the initial conditions.
The speed of repetition in the video-feedback system (capture of the picture and reproduction on the monitor) is determined by the refresh rate. In the PAL system 50 half-frames (interlaced mode) or 25 full frames (deinterlaced mode/progressive scan mode) are recorded, sent and received per second.

3. The Video-Feedback System as a Pattern Generator

In 1984 mathematician and physicist James P. Crutchfield described the video-feedback system as a "space-time simulator".
Studying this simulator's dynamics facilitates understanding of a number of other matters relating to dynamic system theory, iterative image processing, cellular automata and biological morphogenesis.[3] Relevant scientific disciplines have since confirmed Crutchfield's claim.

The fact that the video-feedback system also represents a pattern generator is a product of the system's "functional strategy" and the fact that the autogenerated images possess all the characteristics of a pattern.
This is illustrated by Kerstin Kraft's definition of pattern, formed after comprehensive evaluation of relevant results produced in a variety of scientific disciplines.

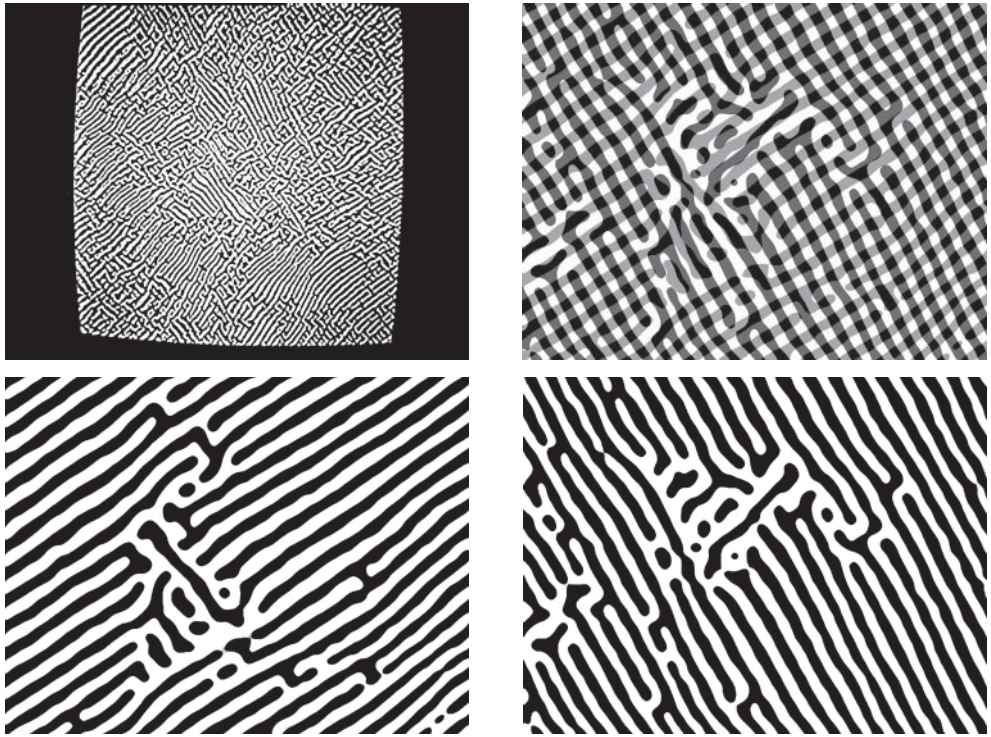
"A pattern consists of the smallest units to be isolated, which are then assembled into a potentially infinite whole according to the principle of repetition. (...) According to this definition, the pattern is not bound to either a specific material, location, discipline or time, meaning that it is not only itself infinite as a pattern, the number of its occurrences is infinite also."[4]

The structural elements of a pattern are repetition, symmetry, rhythm and dimension, whereby symmetry and rhythm serve as principles of repetition for the purpose of differentiation.[5]
"Rhythm and symmetry produce patterns in that they repeat something, and the specific nature of the repetition is decisive."[6]
As systems they are able to describe time-space relationships.[7] Thus, repetition constitutes the pattern, is its key characteristic and the source of its potential infinity. Repetition is either spatial: serial, cyclical (circular) or oscillatory; or temporal: periodic (the repetition reoccurs after a certain amount of time).
Symmetry refers to the nature of the movement in space. There are bilateral symmetries (mirror reflections), translational symmetries (shifts), rotational symmetries, and what are termed ornamental and crystallographic symmetries, which extend over planes and through space.[8] The direction of movement is circular or linear, which produces the spiral and helical form and the orthogonality.[9] Kraft uses the term rhythm *"as opposed to meter or rate"* to designate the repetition of similar elements. This involves a dynamic process that plays out in the field of tension between order and chaos. In contrast, the metric repetition of something identical is symmetric and static.[10]
The dimension determines the structure, and the dimensional structure *"provides for the viewer a living system that observes other living systems – patterns as the products of human action"*. The dimension is dependent on the viewer's perspective.[7]

In the video-feedback system, images (motifs) are repeated in the process taking place between camera and monitor, and they are displayed as overlapping in part, which alters them in successive images.
In other words, a definite principle of repetition is involved. For example, it can be described as follows when the camera is rotated: The repetition is spatially and temporally cyclical. The symmetry or movement in space is rotational. The movement's direction is circular. The rhythm represents a dynamic process, as similar elements are repeated. This creates a field of tension between order and chaos.

Once the video-feedback system has been defined as a pattern generator, one can assume that all scientific theories relating to patterns will contain analogies, as in the examples provided below.

In his 1968 book "Difference and Repetition" French philosopher Gilles Deleuze writes of "repetitive structures" rather than "patterns." In it he focuses on the essence of repetition, which is illustrated through analysis of its causality, and differentiates between two types of repetition. One involves the abstract overall effect, is static and the result of the work. The other type



Left: Video-Feedback, camera angle of approximately 90°. Right: Detail from the picture's center, an interlaced half-frame of even and odd lines (1/50 sec each) results in 1/25 sec. Down left: Even half-frame (1/50 sec). down right: Odd half-frame, (1/50 sec).

involves the efficient cause, is dynamic, and amounts to, so to speak, the "'evolution' of a bodily movement".[8] The essence of repetition in the video-feedback system, according to Deleuze's conceptual model, is determined by its efficient cause, it is dynamic and represents, so to speak, the "'evolution' of a bodily movement" – when regarded as an evolutionary autoreflexive development of symbolic messages and an allegorical sign or action.
The feedback process makes the "difference" between motif and its repetition immanent. It manifests itself as the rhythm of an ongoing dynamic process that plays out in the field of tension between order and chaos. According to André Leroi-Gourhan's theory the video-feedback system must be regarded as a creator of time, space, form and pattern. In his research the French archeologist, paleontologist and expert on prehistoric art emphasizes the dynamics of rhythm and its creative power. He also regards rhythm

2 The illustrations are by Michael Cramer Andersen, http://www.videofeedback.dk/vf/vf_simul.html (accessed November 16, 2009)
3 James P. Crutchfield, "Space–Time Dynamics in Video Feedback," Physica (1984), http://www.vasulka.org/Kitchen/PDF_Eigenwelt/pdf/191-207.pdf (accessed November 16, 2009)
4 Kerstin Kraft, "Muster ohne Wert. Zur Funktionalisierung und Marginalisierung des Musters," (dissertation, University of Bochum, 2001), 10, http://deposit.ddb.de/cgi-bin/dokserv?idn=965565424&dok_var=d1&dok_ext=pdf&filename=965565424.pdf (accessed November 16, 2009)
5 Ibid., 56
6 Ibid., 53-55
7 Ibid., 34
8 Gilles Deleuze, Difference and Repetition, trans. Paul Patton (London: Athlone, 1994), 20

– the repetition of similar elements – as a dynamic process that simultaneously creates and generates something. Action and gesture are the focus when this happens:
Rhythms are the creators of time and space, at least for the individual. "*Space and time do not enter lived experience until they are materialized within a rhythmic frame. Rhythms are also the creators of forms.*"[9]

4. Processing Video-Feedback Material

When I consciously direct the video-feedback system, which is self-contained and autonomous, it adds motion to autogenerated abstract forms.
When an AV processor is added to the generation process, the resulting video-feedback material is black and white. The non-colors black and white are significant, as the visual material's forms and structures are highlighted by the stark contrast without the disturbing impact of color. Color or a combination of colors can be added later to accentuate or emotionalize forms and their motion.
When working with video-feedback material my main interest is analyzing it in terms of time and space. The material produced in this way is altered further to create "mutations" that can ultimately be transformed into "patterns". All these processing strategies are applied to produce what could be termed "snapshots": individual or series of stills.
Inexpensive consumer software tools are used to process the material. A conventional PC and the Adobe Premiere video editing program are used for realization of my conceptual and formal ideas.

• *Analyses in Terms of Time and Space*

One of my primary goals is obtaining insight into the complexity of the video-feedback material. To this end I employ methods that enable analyses in terms of time, for example manipulating the playback speed to the point of standstill.
Analyses in terms of space are made by focusing on portions of the picture or selecting them from a feedback video. Such analyses must take into account the fact that in the PAL system and interlacing, used for television and video technology in Europe until the introduction of digital television, a second of video consists of 50 half-frames – 25 odd and 25 even interlacing half-frames of 1/50 second each – that are displayed successively.
The full-frame rate (25 frames per second) is halved vertically, and on CRT monitors the afterimage of a previous frame's odd lines are displayed in full after transmission of the succeeding even lines, thus producing a complete image. This method is based on the assumption that the contents of adjacent lines (even and odd within 1/25 second) are nearly identical. If they are not, as is the case with video feedback, flickering is produced. In progressive scanning, which is used for digital television, the frame is created line by line in full resolution and 25 times per second.

• *Generation of Mutations*

Material created through analyses of time and space is normally employed as the source material for generating mutations, done preferably by reducing or compressing visual structures within the frame. For example, reduction involves isolating the even and odd half-frames, which are then rearranged systematically so as to create permutations.
Another possible reduction method involves reducing forms to their outlines or selecting solely a detail of the images.
Visual structures are compressed by means of systematic or unsystematic layering of individual frames with others that precede or follow them. When the images are tinted

Odd and even half-frames superimposed semitransparently (1/25 second in length). Superimposing white fields over black fields produces gray. White superimposed over white and black over black remains white or black. This provides an example of what happens to the half-frames in progressive-scan mode. They are assembled or merged and lengthened to 1/25 second.

Sorted odd half-frames (1/25 second in length)

Sorted even half-frames (1/25 second in length)

Semitransparent superimposition with the following frame

Semitransparent superimposition with the following even half-frame

Odd and even half-frames superimposed semitransparently, grey and black fields get the same color

Outlines of the superimposed half-frames

and superimposed semitransparently, forms are added to or subtracted from the picture to produce new color nuances and with them new forms and therefore new motion as form.

• ***Generation of Patterns with Feedback Patterns***

Video-feedback material has already been defined as a pattern, and repetition makes it a pattern of a pattern. Repetition represents a kind of pattern itself; this is its most important characteristic and the source of its potential infinity. The only element that still requires definition is the principle of repetition characterizing the pattern's nature and appearance.

The simplest way to do this is selecting a video image as a motif and arranging it serially in a matrix. This produces a "pattern of moving images" that undergoes transformation. It develops both temporally – image by image – in a dynamic process, just like the source material, and at the same time spatially along a single plane in the form of repetition. The seriality of the horizontal lines and vertical columns creates new forms in motion and motion as form. If, for example, solely a detail of a light form moving in a circle is selected as a motif and arranged serially in a matrix, the circular motion will become linear. Once again, new forms in motion and motion as form will be created.

In all the processing methods described above, the original video-feedback material is radically altered in both form and structure. At the same time it remains video material and is employed in my experimental art videos, video installations and spatial installations, normally with sound added.

5. Combining Moving Images and Sound

In accordance with contemporary perception, the synthesis of moving images and sound is considered natural. This is based, on the one hand, on a line of logic which is, in a sense, fixed regarding the technology used, and on the other as the result of a primal human desire for synesthesia.

In my work the question of the "necessity" of and relationship between sound and image in a conceptual and aesthetic regard is posed repeatedly. My main interest does not involve the linking of sound and image.

I am interested in the "power of the auditory" as applied to the optical in experimental form. My intention is to employ experimental sound for the purpose of manipulating visual perception and suggesting content which is intended to result in interactivity among the recipient's sensory organs.

Depending on the specific moving images used, one could speak of synesthetic opto-acoustic or audiovisual units. In spite of any synesthetic effects their order must be taken into consideration, as the relative significance of sound and image plays a role.

In combination with the title, sound often serves to provide for the viewer information about the chosen content (abstract images are involved).

Synesthesia created in the recipient's mind can be found with works containing forms that are created and move in an extremely chaotic manner. This is the case whenever I use potions of the video-feedback image. Patterns of auditory accents are employed consciously for the purpose of directing the viewer's perception of movement. Metric sound structures facilitate the imagination of rhythms in the forms in motion and motion as form, while the melody and timber set emotional parameters. Due to a natural desire for seeing and hearing that provide order, recipients consciously construct realities and simultaneously perceive them as being real.

• ***PARALLEL MEDIA –***
Barbara Doser and Hofstetter Kurt

Video works, such as those I have produced together with Hofstetter Kurt under the title PARALLEL MEDIA since 1998, *"focus the interweaving and simultaneous interference at the limits of perception"*, as Hofstetter Kurt describes it. The point of departure is the specific method of generating sound and image. In the case of video feedback, visual events are reproduced upon themselves as a result of parallelism and cycles. When audio material is generated, Hofstetter Kurt employs the "Möbius Sounds"[10] he developed, which are also based on parallelism and cycles. During creation of these experimental videos, reciprocally influential, synergetic development of the visual and music composition results. The intention is to create synesthetic units that open up the viewers' imagination.

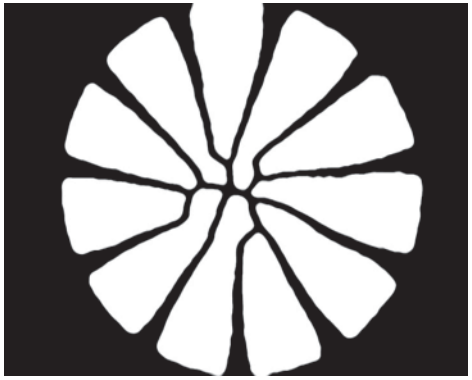
6. Stills as Snapshots –– Paintings and Printed Works

Another method I employ when working with video-feedback material involves isolating single images or stills. The medium of video is then abandoned, and work switches to the genres of painting and printing.

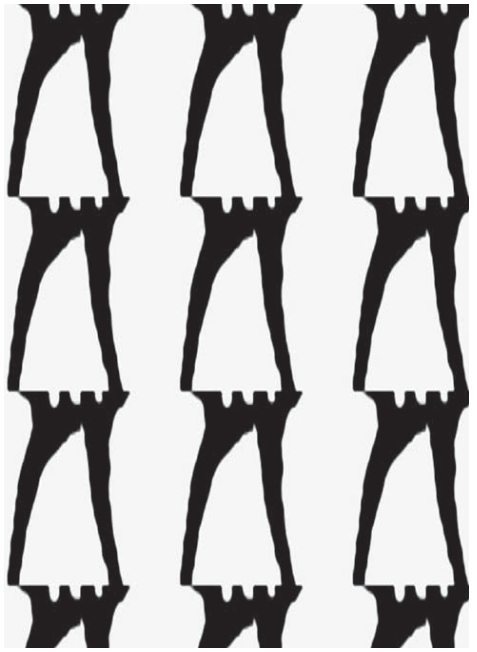
Stills represent snapshots that illustrate a video work's dynamic processes and result from the effort to understand details that because of the movement would not be comprehensible in a video.

Stills are processed on a computer (cropped, altered, etc.), interpreted as motifs, and reproduced in paintings (acrylic on canvas) or printed works (various techniques).

When this is done, conventional paintings or printed works are in no way intended to serve as antipodean contrasts to audiovisual moving images as forms of expression. On the contrary, the intention is to produce results permitting a lasting sensual percep-



Below: Serial repetition in a detail, arranged in a matrix. The originally circular motion has become linear.



9 André Leroi-Gourhan, Gesture and speech, trans. Anna Bostock Berger (Cambridge, MA: The MIT Press, 1993), 307

10 "Möbius Sounds" are units emerging at the event horizon of time. The sound is generated by two sound tracks running against each other – i.e. one track mirroring the other in reverse – so that the two tracks being played forwards and backwards sound identical. The beginning is simultaneously the end. The "Möbius Sound" is a temporal version of the spatial principle of the Möbius strip, where the upper surface is identical to the lower surface. (Hofstetter Kurt, 2005; translation by Bob Hewis)

tion that is not possible with the fleeting nature of video.

An essential aspect of my work is discovering and shaping structures, forms, movement, color and lyricism in video-feedback material's light patterns that are visible in a static visual medium.
From a wealth of stills – one second of video consists of 50 half-frames – I select the images that can, as snapshots, either sufficiently represent the entire event depicted in the video or reveal structures and forms I find fascinating.
Series of stills, in other words sequences taken from a video, are chosen so that the original motion and transformation of forms in a certain video can be comprehended on the basis of examples.
In addition, focusing on details provides microcosmic insights, though the opposite effect can also be produced, namely the original image's formal context is abandoned for different content and a new formal statement.
Again, the choice of color is extremely important, as it supports my ambition of formulating new and specific messages beyond the video source, messages that can stand alone. In a formally aesthetic regard the original source – video feedback – remains recognizable.

A sampling of snapshots selected from my experimental art videos represents the main portion of this catalogue. They are patterns of light patterns and were conceived as templates for paintings or printed works. For this reason I also term this catalogue a pattern book. The background and descriptions of the technical aspects of production and processing is for the viewer irrelevant with regard to artistic quality; these images must stand alone.

7. Digression

Video Feedback at the Beginnings of Video Art

"The new does not push aside the old. On the contrary, it facilitates the return of the old, because a mere look back leads to something that can be called tradition."[11]
Peter Weibel, 2000

When taking a look at the beginnings of video feedback in art, I do so with an interest in placing my work within a relevant historical context.
Since art historians have failed to set down a record of video feedback's history, the following information is based on my own research. However, I do not claim that it is complete.
My interest lies primarily in an artistic approach to video-feedback technology in the early years of video art. As a result, my focus turned automatically toward the US in the 1960s and '70s. Artists employed video feedback as a means of expression from the very beginning. As video artists who do experimental work demonstrate a pronounced interest in technology – and this is unique when compared to the rest of the world – there were numerous innovations in the fields of image processing and synthesis, especially in the course of the 1970s. As a result artists influenced the history of this technology in an important way, and also the birth of media art.

- ***Early Use of Video Technology***

The landmark year is 1956. Video technology was an offshoot of television technology, and the first video recorder intended for use by broadcasting professionals, made by Ampex, was presented that year at the NAB (National Association of Broadcasters) convention in Chicago. It weighed 400 kilograms and employed reels weighing 15 kilograms each.[12] The videotape recordings made with this machine represented a quantum leap for television technology, which until that time had used film stock.
Philips sold the first reel-to-reel video recorder (black and white) intended for the consumer market in 1964, followed by Sony in 1965. In the beginning these devices were used in the fields of medicine, business and education. For example, Sony's CV-2000 Videocorder, which weighed 23 kilograms, was advertised as a portable, and it had inputs for the compatible Sony VCK 2000 Video Camera Kit, which consisted of a camera, microphone and tripod, and required an external electrical power source.[13]
After the first video camera and recorder sets manufactured by Sony, Philips, Grundig and other companies, which were actually relatively easy to carry and ran on batteries, were marketed between 1967 and 1969 in America, Japan and Europe, video technology started to spread quickly.
Sony's legendary CV-2400 Porta Pak ensemble set became available in the US in 1967. It cost 1250 US dollars, making it expensive for most artists.[14] However, virtual euphoria accompanied work with video at that time, for which a variety of artistic approaches were employed.

- ***Video Feedback in Art during the 1960s and '70s***

"Feedback patterning [is] perhaps the purest line of video art."[15] Robert Arn, 1973

Artist Robert Arn wrote that video feedback is the *"entrance into that very specialized branch of video called image synthesis, in which the images are not records, but creations achieved by manipulating the basic electronic forces at work in video cameras and displays."*[16]

Artistic Experiments at TV Studios. At television studios feedback was avoided at all cost, because when uncontrolled it was able to destroy the equipment. Beginning in the mid-1960s artists and technicians performed joint experiments at a number of studios.
In 1965, for example, ***Lutz Becker***, then a student at the Film Department of London's Slade School of Fine Art, experimented with feedback together with BBC electronic engineer A. Ben Palmer at the network's studio there. Their intention was to find something equivalent to electronic music.[17] The video-feedback images, which Becker described as "sustained oscillations in two dimensions",[18] were then filmed, edited and, as they were black and white, colored.

In America, where 95 percent of all households had at least one television set in the early 1960s and TV had been an omnipresent medium since the 1950s, attempts began in the late 1960s to provide artists access to professional TV and video equipment in official programs. The intention was to provide for artists working in all genres opportunities to experiment with the equipment, develop alternative visual grammars, and design new tools for working with images. In 1967 experimental workshops were held in San Francisco at the Public Broadcasting System station KQED, which led to the creation in 1969 of the first American TV lab, the National Center for Experiments in Television (NCET). Financial support was provided by the National Endowment for the Arts and the Rockefeller Foundation.[19]

Joanne Kyger, writer and poet, created the video work entitled "Descartes" in 1967-1968 with the aid of other NCET artists. Feedback generated with a television camera and monitor was used in a wide variety of ways, becoming the *"central visual metaphor sym-*

bolizing the mind's turn toward itself in Cartesian philosophy".[20]
A naturalistic portrait of a woman was denaturalized by means of feedback and other effects, transforming the electronically manipulated image into something between representation and symbol.

The date that video feedback was first used for artistic expression cannot be determined precisely. Woody Vasulka writes on this:

"Everybody believed deeply that he had invented feedback. Feedback was invented simultaneously not by five people, like electricity, but by five thousand."[21]

- ***The Video-Feedback System as a Tool in Video Art***

The development of video art was for the most part concentrated in the US, and was characterized by a particularly strong technical orientation. Art historian and critic Seth Feldmann, in his 1974 catalogue for Media Study/Buffalo in New York, described the situation by arguing that there was no initial development apart from conventional television images: *"Early video art presented what was always there – only more so. Video feedback introduced far more complex ramifications."*[22]
After its birth as what was once the most basic and unforgivable of all technical errors, video feedback had become the basis for exploring "video image synthesis".

Nam June Paik, in many respects a key figure in the history of video art, must have come into contact with video feedback at a relatively early date, whether at a TV studio or with his own video equipment, after 1965. He showed some of the first video footage containing it at the Cafe Au GoGo in New York, a historic event.[23]

In his work Paik did not concentrate on individual optical effects such as video feedback. Everything technically possible was employed and combined, which was manifested in "Paik/Abe Video Synthesizer" (1969-1970).
Important to further development, and not only in New York's art scene, was the legendary exhibition "TV as a Creative Medium" at the Howard Wise Gallery, held from May 17 to June 14, 1969.[24]
The extent to which artists at the time saw their work as being closely related to television, from which video technology developed, is reflected in a comment Eric Siegel made during an interview with Jud Yalkut: Since a small number of people would see the exhibition and therefore no one would know that "television art" already exists, it will have little effect on people's view of the medium. The only way to change this fact would be getting examples of it on the networks. Siegel claimed that network programming of "television artists" should be broadcast throughout the country.[25]

At this exhibition ***Eric Siegel*** presented his 1968 video "Einstine" (6 min)[26], considered one of the classics of video art. This work demonstrates not only the use of video feedback to produce psychedelic effects, but also early image processing, specifically electronic colorizing. Interestingly enough, Siegel developed the equipment, a camera and colorizer,[27] himself. Thanks to his previous experience with the field of electronics, he was not forced to use the technology then available on the market, and so enjoyed opportunities envied by other artists.
Similarly to Joanne Kyger's "Descartes", "Einstine" was based on a naturalistic portrait, of Einstein in this case, which was denaturalized by means of video-feedback effects for the purpose of symbolically visualizing levels of consciousness.

New York artists such as Steina Vasulka were highly impressed and inspired by "Einstine":
"I went in there and saw Einstein [...] blasting out, and it quite blew my mind."[28]

Woody and Steina Vasulka discovered the medium of video for themselves in 1969 and began to generate feedback loops.

Woody Vasulka:
"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."[29]
Although experiments with various types of video material, including video feedback, were no longer anything new, its considerable attraction remained, as described by Steina Vasulka:
"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."[30]

11 Roland Berg, interview with Peter Weibel in Der Tagesspiegel/Online Archiv, December 1, 2000, http://nomadenderzeit.transmitter-x.org/index.php?www2/katalog.php?kid=69&s=&selwert=~rFrame (accessed November 16, 2009)
12 http://de.wikipedia.org/wiki/Magnetaufzeichnung (accessed November 16, 2009)
13 Philips' EL3400 VTR reel-to-reel video recorder sold for 7000 Deutsche marks, the Sony CV-2000 for 730 US dollars, and Sony's VCK 2000 Video Camera Kit for 350 US dollars. http://www.experimentaltvcenter.org/history/tools/ttool.php3?id=52&page=1 (accessed November 16, 2009)
14 Ibid. Its successor, the 1969 AV-3400 Porta Pak, had a portable recording und playback system and cost 1495 US dollars.
15 Robert Arn, "The form and sense of video", artscanada (October 1973), 20, http://www.experimentaltvcenter.org/history/pdf/arnformsense_110.pdf (accessed November 16, 2009)
16 Ibid., 21
17 http://www.tate.org.uk/britain/artistsfilm/programme1/calcabstract.htm (accessed November 16, 2009)
18 Three films were made in 1967 and 1968: "Experiment 5", "Cosmos" and "Horizon." Gene Youngblood, Expanded Cinema, (New York, 1970), 336, http://www.vasulka.org/Kitchen/PDF_ExpandedCinema/book.pdf (accessed November 16, 2009)
19 http://www.rdlx.com/ncet/intro.html (accessed November 16, 2009)
20 For an excerpt from the video, see Joanne Kyger, http://www.getty.edu/art/exhibitions/california_video/index.html (accessed November 16, 2009)
21 Johanna Gill, "Video: State of the Art," (part 1 of 3), http://www.experimentaltvcenter.org/history/people/ptext.php3?id=34&page=1 (accessed November 16, 2009)
22 Seth Feldmann in catalogue for Media Study/Buffalo (Buffalo, 1974), http://www.experimentaltvcenter.org/history/pdf/feldmanexprmntl5catalog_2522.pdf (accessed November 16, 2009)
23 On October 4, 1965 (this date is often mentioned in connection with the birth of video art) Nam June Paik screened video footage of the Pope's New York visit at "Cafe Au GoGo"; he had shot it earlier that same day. In other words, he had at the time access to video equipment, though it was not a portable unit that could be used for filming from a moving taxi, as is commonly believed. In 1965 battery-powered cameras and recorders were not yet available, not even in Germany or Japan, where Paik could have obtained them. The footage must have been shot from a location where an electrical outlet was available. Unfortunately, the tape has not survived. Cf. Tom Sherman, Syracuse University, New York, 2007, http://marotzki.blogspot.com/2007/01/video-art-ber-nam-june-paik.html (accessed November 16, 2009)
24 For more detailed information see http://www.eai.org/kinetic/ch1/creative/film_video.html (accessed November 16, 2009)
25 Jud Yalkut, interview with Eric Siegel, http://eai.org/eai/user_files/supporting_documents/Siegel.pdf (accessed November 16, 2009)
26 An excerpt from this video can be seen at http://www.vdb.org/smackn.acgi$tapedetail?EINSTINE (accessed November 16, 2009)
His installation entitled "Psychedelevision in Color" comprised three parts, "Einstine" (1968, 6 min), "Symphony of the Planets" (1969, 10 min) and "Tomorrow Never Knows" (1968, 3 min).
27 Since video images were still black and white at the time, colorizing was one of the first elements of processing.
"Siegel's first colorizer was a crude device that allowed for little control. Furthermore, the image could not be recorded directly, but had to be rescanned with a color camera – an expensive proposition at that time. Consequently, no tape exists from the original installation, but Siegel later remade Einstein [sic] and several other tapes (...)." Lucinda Furlong, "Notes Toward a History of Image-Processed Video: Eric Siegel, Stephen Beck, Dan Sandin, Steve Rutt, Bill and Louise Etra", Afterimage, vol. 11, no. 1 and 2 (1983), http://www.experimentaltvcenter.org/history/people/ptext.php3?id=31&page=1 (accessed November 16, 2009)
28 Lucinda Furlong, "Notes Towards History of Image-Processed Video," Steina and Woody Vasulka, Afterimage, (December 1983), http://www.vasulka.org/Kitchen/essays_furlong/K_Furlong.html (accessed November 16, 2009)
29 Ibid.
30 Ibid.

"Elements" (1971), in which variations of video feedback were altered by means of a keyer and colorizer, and "Key Snow" (1971) were their two works in the 1971 exhibition "New American Filmmakers Series: Videoshow" at New York's Whitney Museum of American Art. The artists described their works as *"electronic image and sound compositions"*, also stating:
"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."[31]

Skip Sweeney[32] began working with video feedback in 1968 and is best known for his *"shimmering, interweaving video mandalas"*.[33] Compared to other artists, Sweeney's interest in video feedback involved more than its potential for autogenerating form and structure, which must be controlled for it to be useful as an instrument for live performances.[34] He claimed that he would *"just as soon be a video rock-and-roll musician"*.
Sweeney's contemporaries regarded him as a master of video feedback, and for him it was *"a religion – a wave to ride"*.[35]
Like many others, he was not satisfied with merely generating and controlling video feedback. To complement settings made on camera and monitor, he installed a mirror or glass sheets at various angles or altered the device's voltage to increase the range of possibilities for working with the image, also using a keyer and colorizer.
His ambition was to use video feedback during a live performance, such as in the "video jam sessions" at Video Free America.
The video "Illuminating Sweeney" (1975) consists of video feedback altered with a Moog Audio Synthesizer and a Vidium Colorizer.[36]

• ***The History of Video as Technological History***
The examples of artistic works described above illustrate the fact that there has never been a concentrated interest in the phenomenon of video feedback as an autonomous autogenerative system which can produce complex abstract forms and structures, or in working with it analytically.
On the contrary, image processing and synthesis has been the focus since the very beginning, and video feedback became an element of this. The main interest lies in manipulating video images during the creation process and presenting the results at a live performance or generating synthetic moving images with electronic equipment, in connection with or as they interact with the generation of sound, live in this case also.

Seth Feldmann has the following to say:
"The most characteristic and certainly the most widely known works of American video art have been produced on increasingly sophisticated image generating, editing and colorizing devices that have grown out of the attempt to build on the initial feedback experience. American video art is dominated by this technical orientation, but the rate at which the artists invent new tools to replace old ones give their work a certain conceptual character. One must consider the initial idea for a totally new kind of image as itself a work of art."[37]

In the 1970s a wealth of image processors and video synthesizers were developed in close collaboration between artists and technicians. The intention was to realize specific artistic visions. As a result, the history of video is also technological history.
One of the first video synthesizers was developed by Nam June Paik together with Japanese electronics engineer Shuya Abe in 1969-1970. At first, the Paik/Abe Videosynthesizer (mixer, keyer and colorizer) was intended for live performances. It was able to mix images from seven different external sources simultaneously and manipulate their form and color. Paik considered this innovation as "major step making video an artistic medium." The video synthesizer was intended *"to be played in real time – like a piano. From a purely artistic viewpoint that is highly interesting – a truly new thing that has no precedent. You simply play and then see the effect."*[38]
Using this video synthesizer together with the Paik/Abe Scan Modulator (also known as the "Wobbulator") made possible Nam June Paik's video style, a combination of video feedback, magnetic scan modulation and non-linear mixing with subsequent keying and colorizing.[39]

The ways in which complex technology has been employed in experimental video work since 1970 is illustrated by ***Stephen Beck***'s "Conception" (1972). Live images are combined with feedback and oscillator patterns, and electronic keying and colorization were also employed.
Beck described "Cycles" (1975) as *"A cinematic collaboration by Belson and Beck combining video synthesis with traditional chemical film processes."*[40] In this work Beck's "video loom (video weaver)" was employed to mix live images and film with video feedback and oscillator patterns, resulting in a "visual symphony" accompanied by organ and choral music.[41]

Stephen Beck was one of the artists who, like Eric Siegel, was able to develop his own equipment due to his knowledge of electronics. In 1969 he constructed his first Direct Video Synthesizer, which was used primarily during live performances such as the "Illuminated Music" series 1972-73. In 1973 this was joined by the Beck Video Weaver, which generated abstract patterns in realtime and was used for the first time in a live performance at the San Francisco Museum of Modern Art in 1974.[42]
In 1975 Stephen Beck named the three most important technical innovations to appear since 1969:
1. Camera image processors: This includes the colorizer, keyer, quantizer and mixer, which are used to manipulate video images.
2. Direct Video Synthesizers: These devices generate synthetic moving images without images taken with a camera and arrange them into compositions.
3. Scan modulation/re-scan types: These devices display video images taken with a camera on an oscilloscope or TV screen for manipulation, stretching, squeezing, rotating, reflecting, etc. A second camera then records them. This system also works without an input camera, in which case images are produced through manipulation of the raster with a playback device to produce waves or curves that can then be filmed and processed further with camera image processors (see 1.).[43]

The interrelationships in play during this period of video art's unique development in the US were extremely complex. Firstly, television was already at that time an extremely powerful medium. Artists had to provide in many ways a counterpoint when video technology was introduced. The intention of working with TV as a mass medium was not only ideological, but also involved questioning its visual grammar, revolutionizing it and at the same time establishing a field independent of it. In the beginning all video was black and white, and colorizers were developed immediately, followed by keyers and mixers. The invention of synthesizers for electronic generation of synthetic moving images should be considered the next logical step. In the audio field the pro-

duction of synthetic sound was by that time already in full swing. Furthermore, the influence of the visual music tradition must be mentioned in this context, as it led to reinterpretations in the form of audiovisual live performances during which complex combinations of various electronic devices were employed.
As it was embedded in the Zeitgeist articulated through interweavings of psychedelic,

severals stills of a video-feedback

rock and pop culture, Pop Art and Op Art in the 1960s and '70s, the new video technology was not only influenced, the creation of new things was also encouraged, and as a result it exercised a reciprocal influence on the creation of art at the time.

The fact is interesting that, in the US of the 1960s, extremely complex equipment was developed in the field of abstract animated film before this flowering of video technology, and it was employed to produce optical effects similar to what was seen a few years later with video-feedback technology. It remains to be determined whether the work done by the first artists working with video feedback was influenced in any way.

- ***Video-Feedback Aesthetic without Video Feedback***

In 1957 James Whitney presented his film "Yantra" (7 min, color) to the public and in 1961 Jordan Belson's "Allures" (9 min, color) and John Whitney's "Catalog" (7 min, color) premiered, followed by James Whitney's "Lapis" (9 min, color) in 1966.

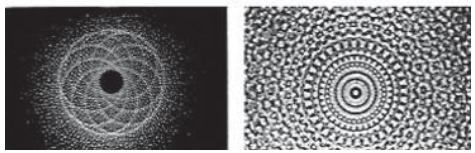
Common to all these films is that they are abstract animated 16mm works, and they anticipated the visual aesthetic of video feedback in the form of graphic structural patterns or mandalas. The similarity is not coincidental. Their creators worked with light and the movement of abstract forms similar to the images generated with the video-feedback system between camera and monitor.[44]

Jordan Belson, Allures, 1961

By rotating abstract motifs, such as concentrically arranged dots on layered glass plates, elements are superimposed so that the motifs overlap in their entirety or are semitransparent as seen by the camera doing the filming, and they merge, explode and implode. In other words Belson and the Whitney brothers also created and directed abstract forms in motion and motion as form. Simple dots and lines were assembled to form complex structures and compositional units in a process of synthesis through movement and superimposition of the smallest possible formal units. As a result, they were transformed into optical events similar to the autogenerated images found in video feedback.

Jordan Belson[45] created his abstract 16mm film "Allures" with images he employed in the Vortex Concerts: "manipulated projected light".[46] "(...) *It took a year and a half to make, pieced together in thousands of different ways."*[47] Belson considered sound synesthetically linked with an image extremely important. The essence of cinema, as he saw it, is the dynamic movement of form and color and their relationship to sound. The sound, which he often created himself with homemade electronic equipment, is conceived so that *"you don't know if you're seeing it or hearing it."*[48]

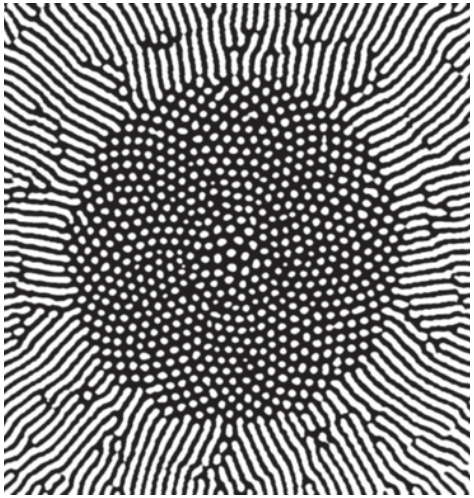
"Lapis" by ***James Whitney***, on the other hand, was originally conceived as a silent film and was created on a mechanical ana-

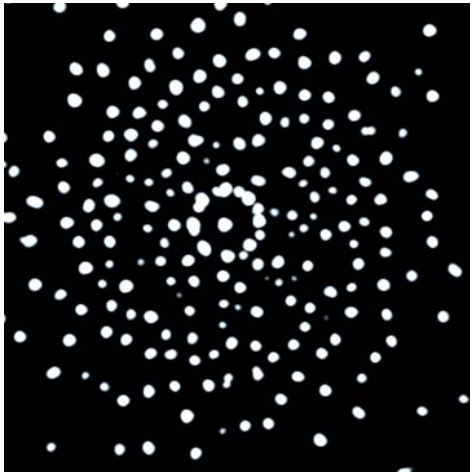


James Whitney, Lapis, 1963 – 1966

logue computer he developed together with his brother John. It was used to control the movement of glass plates hand-painted with dots, isolated to densely concentrated. The plates were mounted on tables, and several of them could be rotated simultaneously. A vertically mounted camera that moved separately filmed the glass plates' complex, mechanically controlled movement.[49]

31 Ibid.
32 "In 1969, Sweeney was one of the founders of Electric Eye, an early media collective concerned with video performances and experiments. Sweeney's work in video included abstract image-processing and synthesis, autobiographical documentaries and portraits, and video installations for theater including a version of Allen Ginsberg's 'Kaddish'(1977). [...] Sweeney later worked in collaboration with Joanna Kelly, producing video dance tapes, video art, and documentaries." http://www.vdb.org/smackn.acgi$artistdetail?SWEENEYS (accessed November 16, 2009)
33 Ibid.
34 http://www.vdb.org/smackn.acgi$tapedetail?ILLUMINATI (accessed November 16, 2009)
35 Woody Vasulka, http://www.vasulka.org/Kitchen/PDF_Eigenwelt/pdf/148-149.pdf (accessed November 16, 2009)
36 http://www.vdb.org/smackn.acgi$tapedetail?ILLUMINATI (accessed November 16, 2009)
A detail from this video can be seen at http://videofreeamerica.com/site/2008/11/26/illuminating-sweeney-1975/ (accessed November 16, 2009)
37 Seth Feldmann in catalogue for Media Study/Buffalo (Buffalo, 1974), http://www.experimentaltvcenter.org/history/pdf/feldmanexprmntl5catalog_2522.pdf (accessed November 16, 2009)
38 http://www.medienkunstnetz.de/werke/video-synthesizer/ (accessed November 16, 2009)
39 See http://www.vasulka.org/Kitchen/PDF_Eigenwelt/pdf/126-129.pdf (accessed November 16, 2009)
40 http://www.centerforvisualmusic.org/VMMay1show.htm (accessed November 16, 2009)
41 Seth Feldmann in catalogue for Media Study/Buffalo (Buffalo, 1974).
42 http://www.stevebeck.tv (accessed November 16, 2009)
43 Stephen Beck, Image Processing and Video Synthesis. Electronic Videographic Techniques, in Eigenwelt der Apparatewelt (1975) 161-164, http://www.vasulka.org/Kitchen/PDF_Eigenwelt/pdf/161-164.pdf (accessed November 16, 2009)
44 Belson and James Whitney each became familiar with and were influenced by Oskar Fischinger and his work without the other's knowledge, and they both adhered to the tradition of visual music. William Moritz, Influence and Inspiration: The Great Tradition of Visual Music, exhibition catalog for KINETICA 2, (Los Angeles: The iotaCenter, 2000), http://www.iotacenter.org/visualmusic/articles/moritz/influenceinspiration (accessed November 16, 2009)
45 William Moritz called Jordan Belson one of the last great masters of California visual music artists. http://www.centerforvisualmusic.org/BelsonAJ.htm (accessed November 16, 2009).
Jordan Belson began his career as a painter and, in the late 1940s, he exhibited large-format paintings at New York's Guggenheim Museum. Belson never stopped painting and drawing, though he is now better known for his abstract films.
Ying Tan, who was very familiar with Belson's paintings and drawings, writes, "To Belson, his films and graphic art mirror each other: they are all about sacred art, about a spiritual quest. His film and graphic art also influence each other and reflect each other." Ying Tan, "The Unknown Art of Jordan Belson," Animation Journal (Spring 99), http://www.uoregon.edu/%7Etanying/JBart.html (accessed November 16, 2009)
46 http://www.tfaoi.com/aa/8aa/8aa388.htm (accessed December 7, 2009)
47 Gene Youngblood, Expanded Cinema, (New York, 1970), 162
48 Ibid., 157-158. His later films, "Re-Entry" (1964), "Phenomena" (1965), "Samadhi" (1967), "Momentum" (1968), etc., also adhere to this principle. The soundtrack of "Allures" was created jointly with Henry Jacobs.
49 Ibid., 210.
The raga soundtrack performed by Ravi Shankar was added later at the urging of the distributor. However, James Whitney believed that the effect of the visual concept employed for "Lapis" would be considerably more intense without music. For this reason he planned to withdraw the version with a soundtrack and release another one which would either be silent or accompanied by an original composition. This never happened.
The version with the raga soundtrack was released shortly before Indian music came into vogue after being used by the Beatles. This was one of the reasons that "Lapis" became one of the best-known abstract films.





stills of a video-feedback

The video artists doing experimental work in the late 1960s and early ’70s were presumably familiar with the film work of Belson and the Whitney brothers, particularly the version of James Whitney’s “Lapis” that became one of the most well-known abstract films after 1966/67.[50]
The formal aesthetic, astonishingly similar to structures found in video feedback, may be considered the formal grammar by experimental filmmakers. The fact that only Skip Sweeney used electronic equipment and video technology as he continued to work with these abstract elements,[51] employing video feedback as a generator of forms in audiovisual live performances, is interesting. This places Sweeney within the tradition of visual music similarly to Jordan Belson und John Whitney. Belson had already screened his abstract films with those of Whitney and other artists. This happened between 1957 and 1959 in the Vortex Concerts put on in San Francisco, which became well known as audiovisual shows.[52]

- ***Video Feedback as a Contemporary Visual Event***

Beginning in the 1980s computer technology was discovered as a new medium suitable for generating abstract forms. Interest in the video-feedback technique, which in the 1970s was used primarily as an external source of images for the newly developed video synthesizers and image processors, began to dwindle. To the present day video-feedback technology is employed in the work of solely a few artists.
Since the beginning of the 21st century the situation with regard to multimedia performance and live acts has been quite different: Video feedback is employed as one of many different optical effects. Normally video feedback is either linked to music directly in some way, for example providing visuals to accompany music, or generated live by VJs. Software and innumerable electronic devices that can be used to simulate and digitally generate “video feedback” without using a camera or monitor have been developed. The “classic principle” of the video-feedback system – a camera aimed at a monitor to which it is connected – will exist as long as suitable technologies are available. And it will be discovered again and again by fascinated viewers.
n scientific fields too there has been evidence of sustained interest in video feedback. For example, the Optics Group at the University of Glasgow’s Department of Physics & Astronomy announced in 2001 that “the first stationary fractal patterns using unmodified video feedback” were generated on the basis of pixels.[53]
The fact that video feedback is a fascinating phenomenon even if not intended as art is demonstrated, for example, on the website of Video Free America, the San Francisco media art center founded by Skip Sweeney and Arthur Ginsberg in 1970. Termed “live video feedback,” it is described as being: *“Streamed live from a set of digital video machines in VFA’s studio... this video feedback is an artificial living flow of electronic light rays... It cannot be controlled... It’s more like surfing waves of light trying to find delicate balance points within the flow... left alone it changes and can wipe out... settings will be modified to allow new and different looks everyday.“*[54]

9. Conclusion

In conclusion, it should be noted that the interest of artists who in the 1960s and ’70s worked with video feedback, the product of information fed back in a process created between a video camera and a monitor to which it is connected, dwindled soon after its discovery. Strategies were immediately developed to manipulate the material as it was being created by means of signals from external sources of video and sound, or so the video-feedback system could be employed to create other video images. This includes video synthesizers that work with video feedback in addition to many other effects.
When reflecting on the work I do with the video-feedback technique, parallels can be found. Here too video-feedback material does not stand alone; it represents solely the source material for my work as an artist. A variety of methods are applied with the intention of producing something new – analyses of time and space, mutations and patterns, sometimes the medium of video is abandoned in that stills are employed as snapshots in the form of paintings and printed works.
A significant difference compared to the strategies employed in the 1960s and ’70s is that no other sources of visual material are used when I generate video-feedback material, and for that reason my work maintains the original abstraction. In addition, all my finished works are products of my interest in obtaining insight into the autogenerative processes by which structures are created and analyzing forms in motion and motion as form. What fascinates me is the lyric and creative potential of the video-feedback system and the immanent potential infinity that light patterns produce in an astounding variety of forms.
Translation Steve Wilder

50 William Moritz on James Whitney’s „Yantra” and “Lapis,” 1977, http://www.centerforvisualmusic.org/WMyantra.htm (accessed November 16, 2009)
51 Unfortunately, I was unable to find moving images or stills of Skip Sweeney’s work, which were described as “shimmering, interweaving video mandalas,” (http://www.vdb.org/smackn.acgi$artistdetail?SWEENEYS (accessed November 16, 2009). Therefore, my current opinion is based solely on the descriptions of one of the artist’s contemporaries, and I have been unable to corroborate them.
52 From 1957 to 1959 Belson was the visual director of the Vortex Concerts held at San Francisco’s Morrison Planetarium. At the time the planetarium, thanks to the high-tech equipment it possessed – special projectors for planetariums and a kaleidoscope projector in addition to conventional projectors for still images and moving images – provided unheard-of opportunities for “visual shows” and “light shows”. Belson combined the effects normally seen at planetariums with patterns and abstract film footage. http://www.iotacenter.org/ (accessed November 16, 2009)
53 J. Courtial, J. Leach, and M. J. Padgett, “Image processing – Fractals in pixellated video feedback“ (2001), http://www.physics.gla.ac.uk/Optics/play/fractalVideoFeedback/research.html (accessed November 16, 2009)
54 http://videofreeamerica.com/site/ (accessed November 16, 2009)