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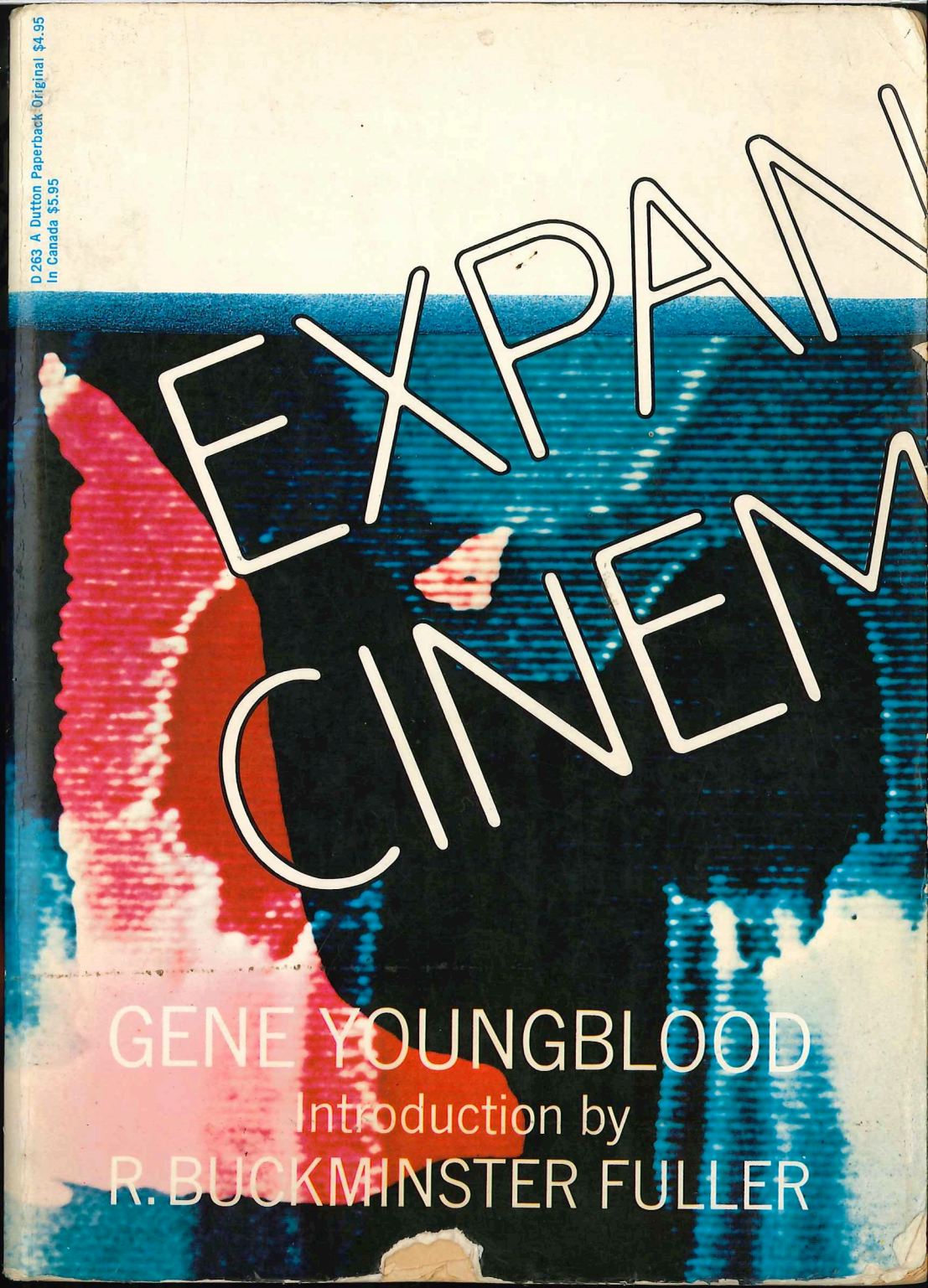


GENE YOUNGBLOOD

Introduction by

R. BUCKMINSTER FULLER

EXPANDED CINEMA

"Today, when one speaks of cinema, one implies a metamorphosis in human perception," writes the author of this extraordinary book. "Just as the term 'man' is coming to mean man/plant/machine, so the definition of cinema must be expanded to include videotronics, computer science, and atomic light."

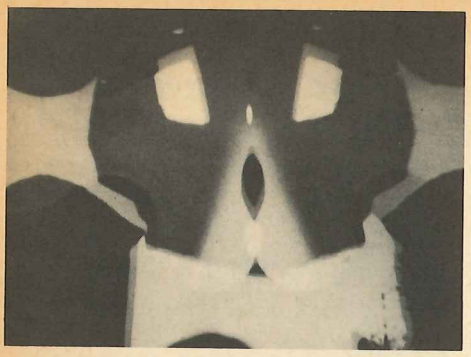
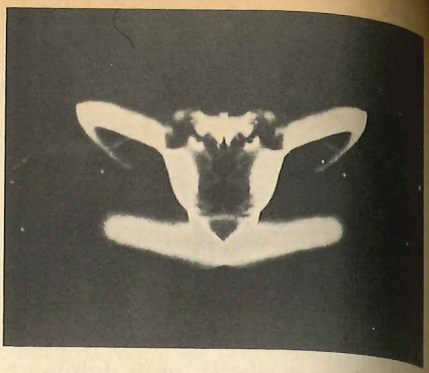
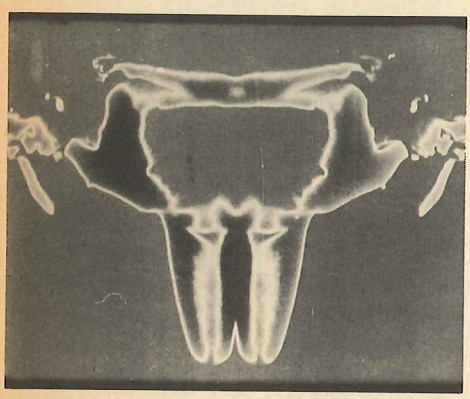
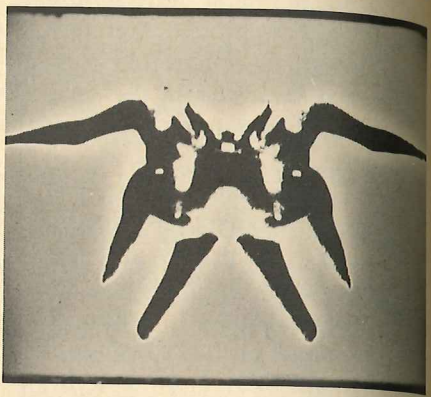
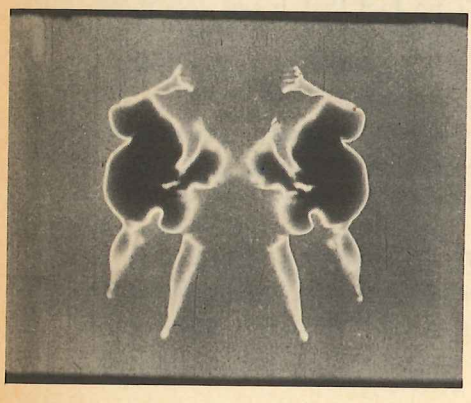
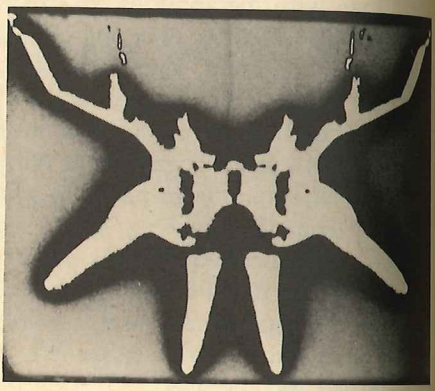
In a brilliant and far-ranging study, Gene Youngblood traces the evolution of cinematic language to the end of fiction, drama, and realism. New technological extensions of the medium have become necessary. Thus he concentrates on the advanced image-making technologies of computer films, television experiments, laser movies, and multiple-projection environments. Outstanding works in each field are analyzed in detail. Methods of production are meticulously described, including interviews with artists and technologists. *Expanded Cinema* is filled with provocative post-McLuhan philosophical probes into "The Paleocybernetic Age," "the videosphere," and "the new nostalgia," all in the context of what the author calls "the global intermedia network." In "Image-Exchange and the Post-Mass Audience Age," Mr. Youngblood discusses the revolutionary implications of videotape cassettes and cable television as educational tools. His observations are placed in comprehensive perspective by an inspiring introduction written by R. Buckminster Fuller. The text is illustrated by 284 photographs, including 60 in color. Vast in scope, both philosophical and technical, *Expanded Cinema* will be invaluable to all who are concerned with the audio-visual extensions of man, the technologies that are reshaping the nature of human communications.

GENE YOUNGBLOOD

Cover design by James McMullan

Cover photograph from *Offon* by Scott Bartlett

Will Hindle: *Chinese Firedrill.* 1968. 16mm. Color. 24 min. "We discover to what extent our soul partakes of the constant creation of the world."

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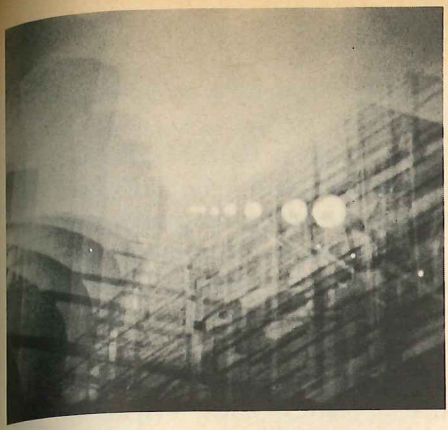

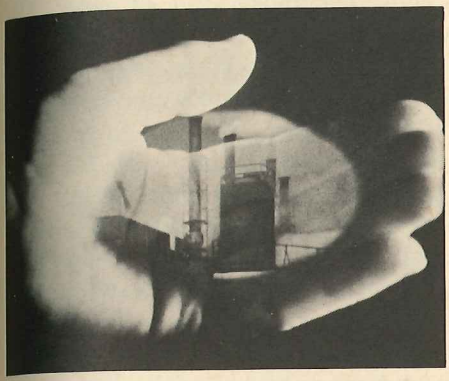

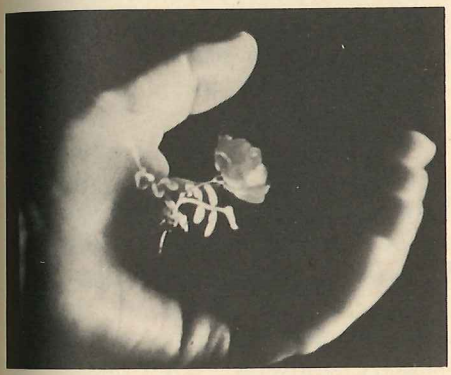

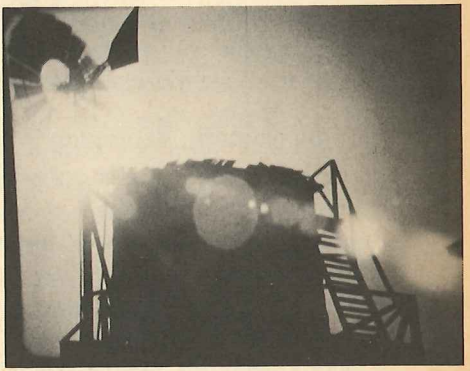

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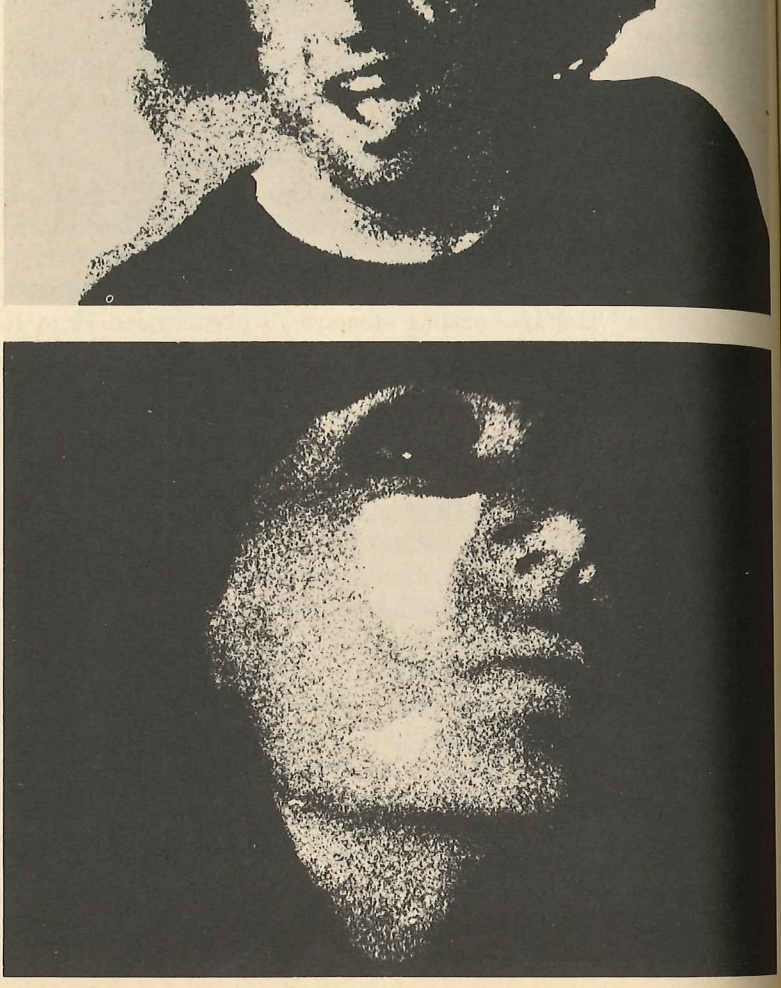

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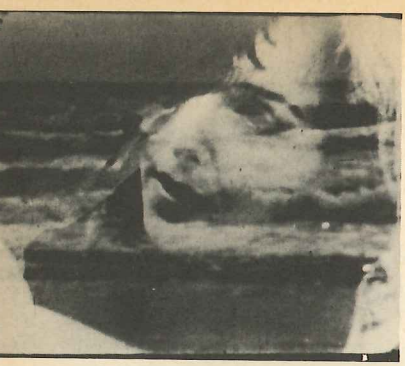

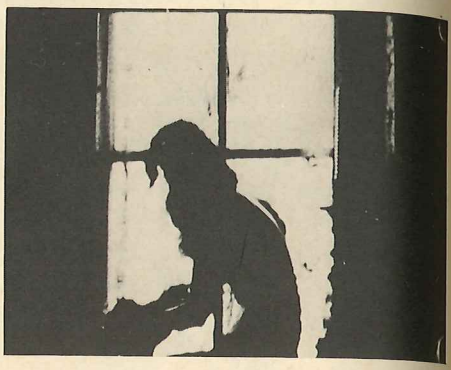

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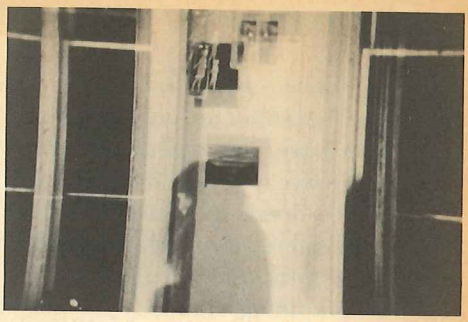
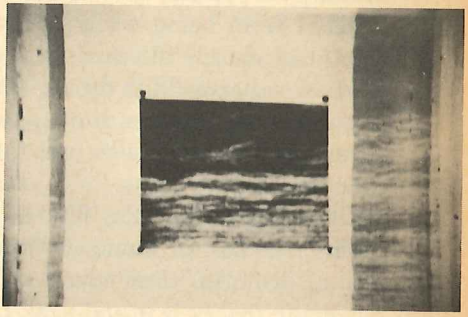
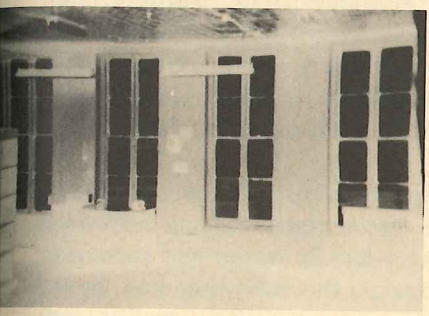
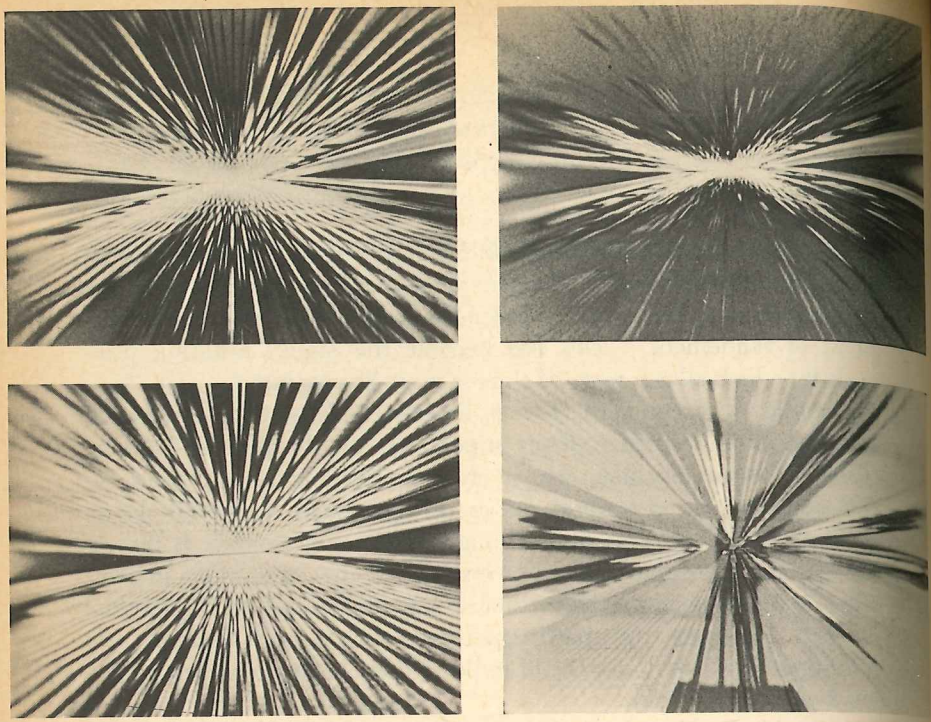
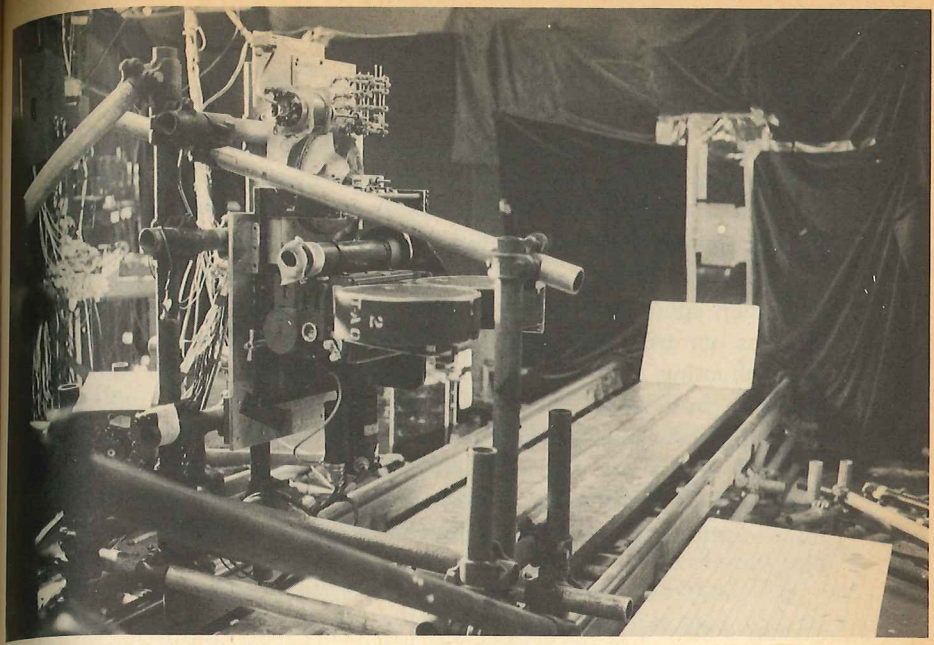



Michael Snow: *Wavelength*. 1967. 16mm. Color. 45 min. "The first post-Warhol, post-Minimal movie, one of the few films to engage those higher conceptual orders that occupy modern painting and sculpture."



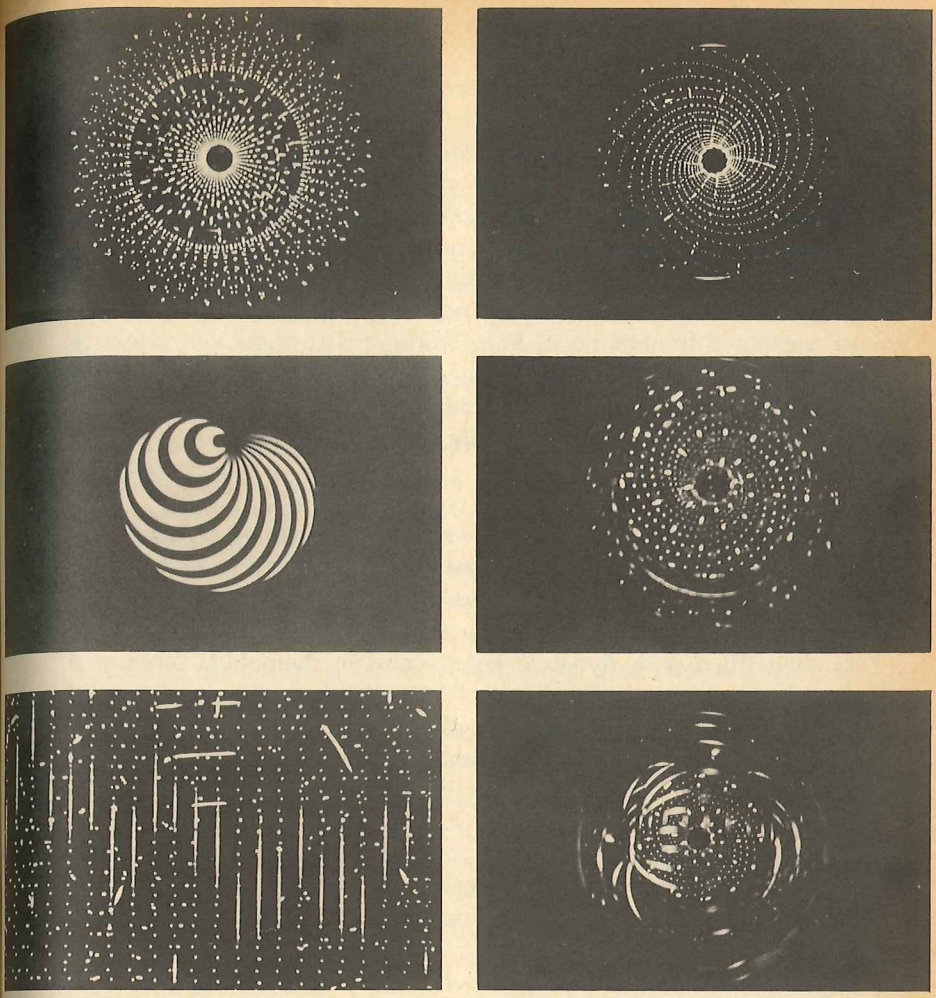
Slit-scan Stargate Corridor from
Stanley Kubrick's *2001: A Space Odyssey.*



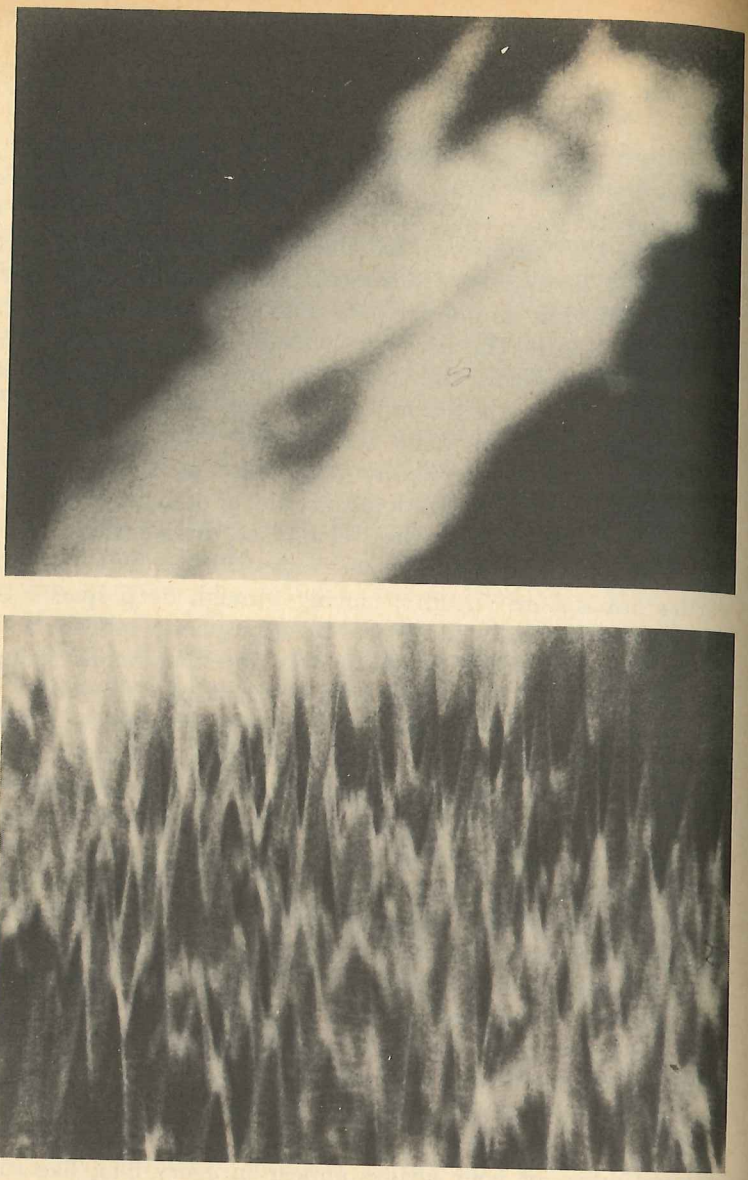
Slit-scan machine built by Douglas Trumbull for the Stargate Corridor sequence of Stanley Kubrick's *2001: A Space Odyssey.*

later, John Whitney, Jr., has constructed a computerized, hybrid optical printer that automatically scans a projected motion-picture sequence. In addition, the camera need not track perpendicular to the scanned image; a diagonal approach would create effects of warped perspective in otherwise representational imagery.

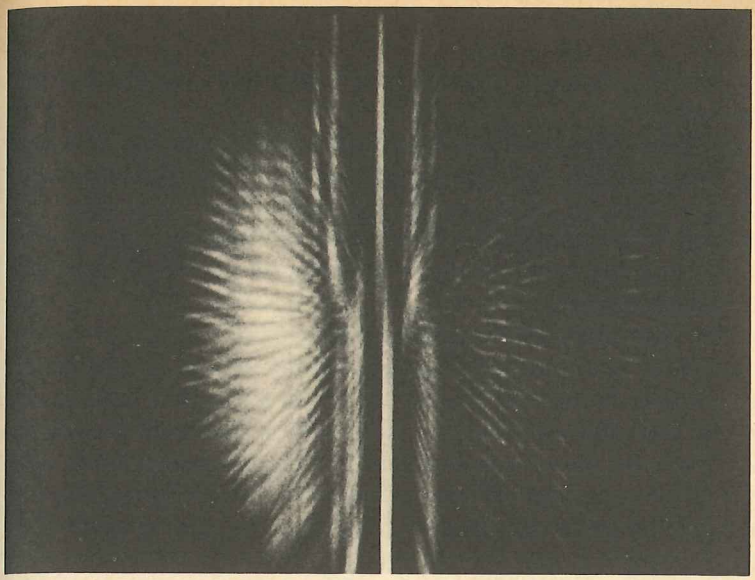
TRUMBULL: There was one short slit-scan sequence—a bad take, actually—which started out black and instead of having walls of color come at you it had little points of light which were parts of the artwork before it actually developed into walls. It started out black, then a few little red sparks came out, and then a few more and it generated more and more. That particular shot was done with a device I rigged for automatically accelerating the speed. So as the dots were coming up it was accelerating at such an incredible rate that we used up all the artwork in a couple of seconds. Though the shot is brief it was the only one with a

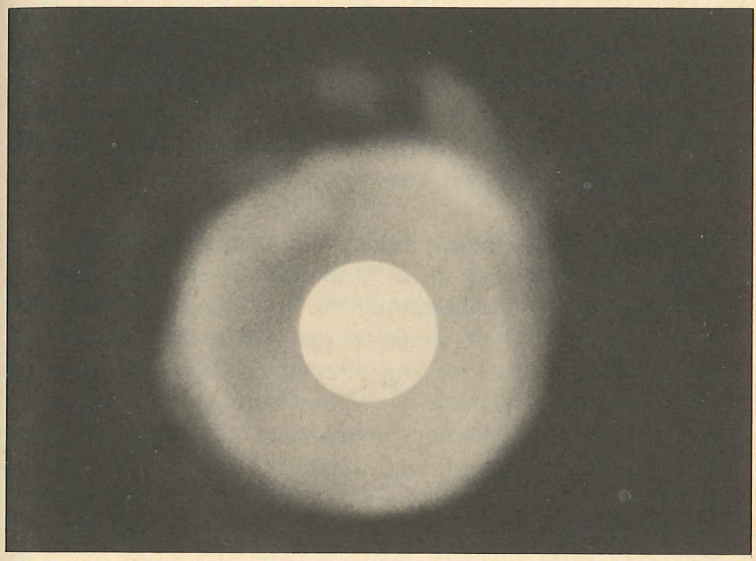


Jordan Belson: *Allures.* 1961. 16mm. Color. 9 min. "A combination of molecular structures and astronomical events mixed with subconscious phenomena . . . a trip backward along the senses from matter to spirit."

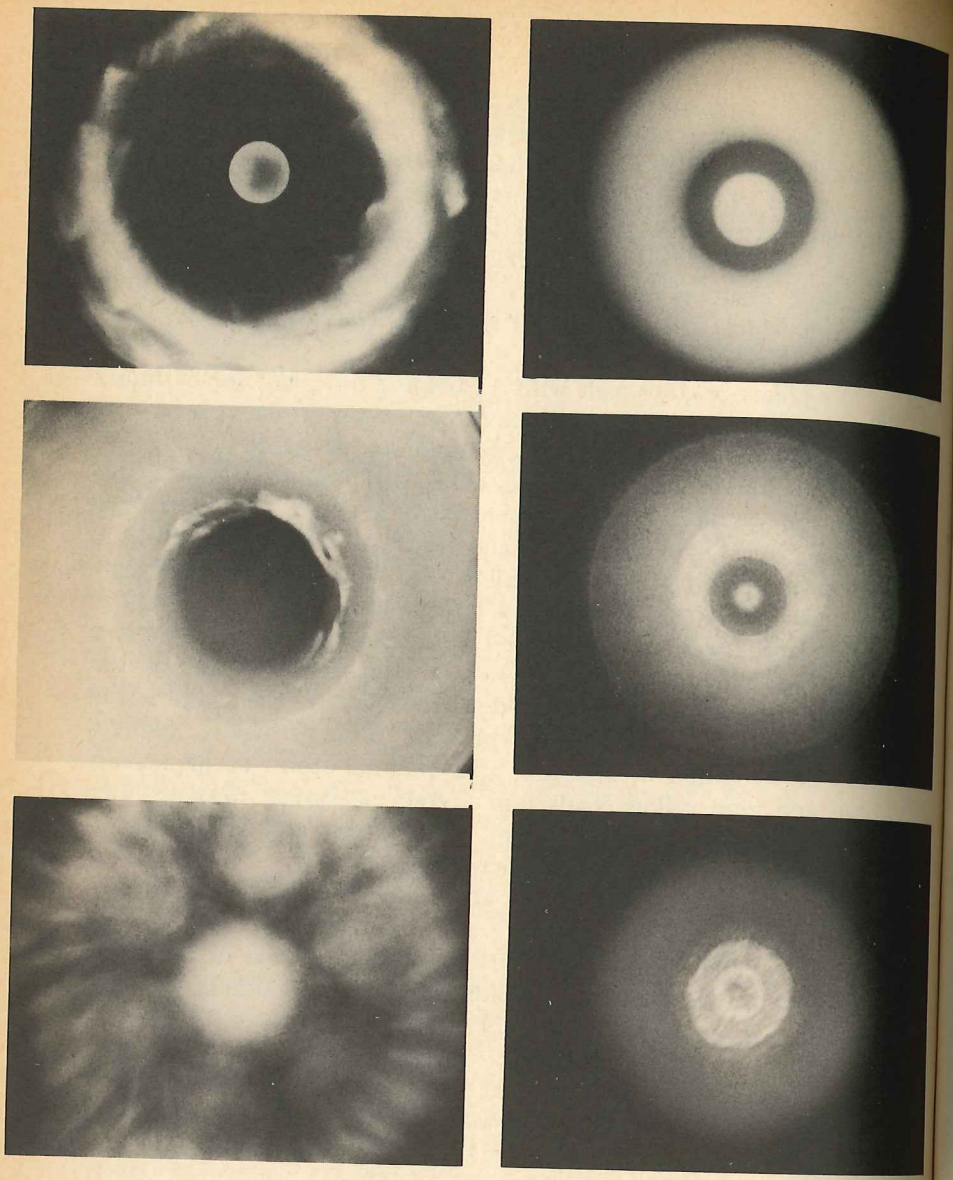


Jordan Belson: *Re-Entry.* 1964. 16mm. Color. 6 min. "The film does manage to transport whoever is looking at it out of the boundaries of the self."

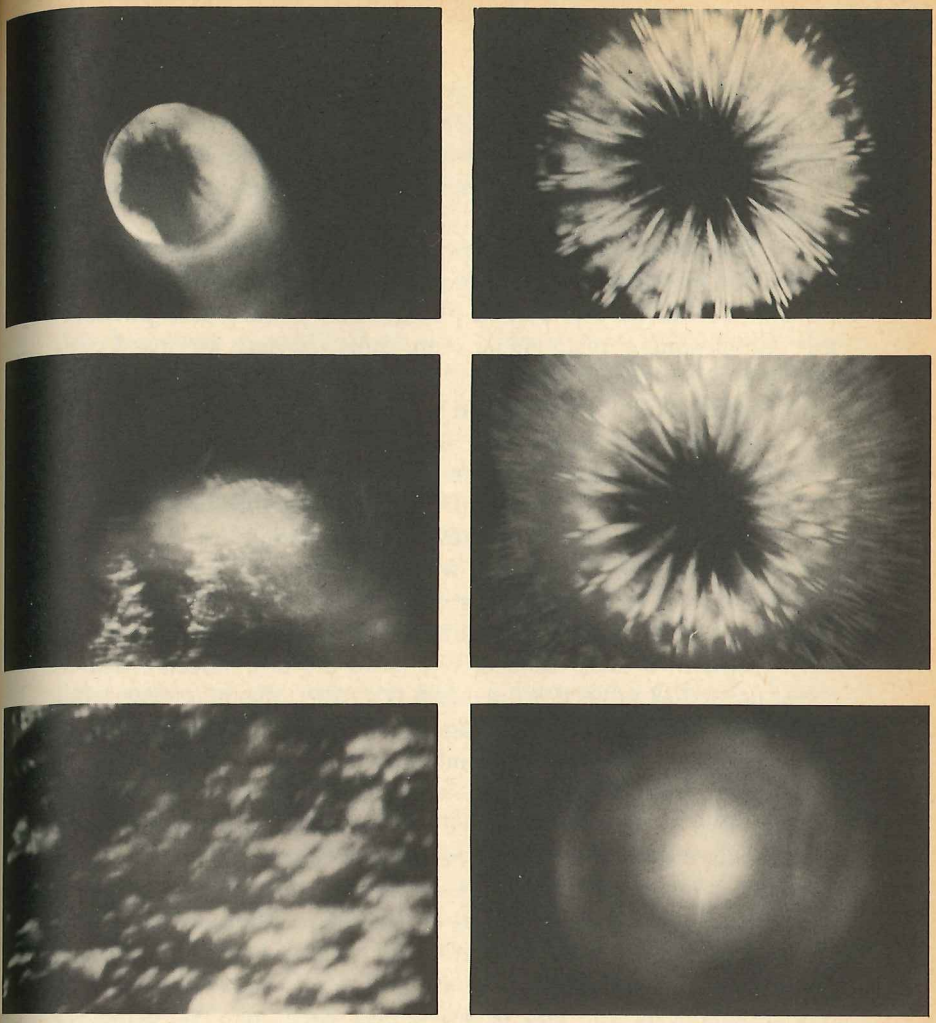




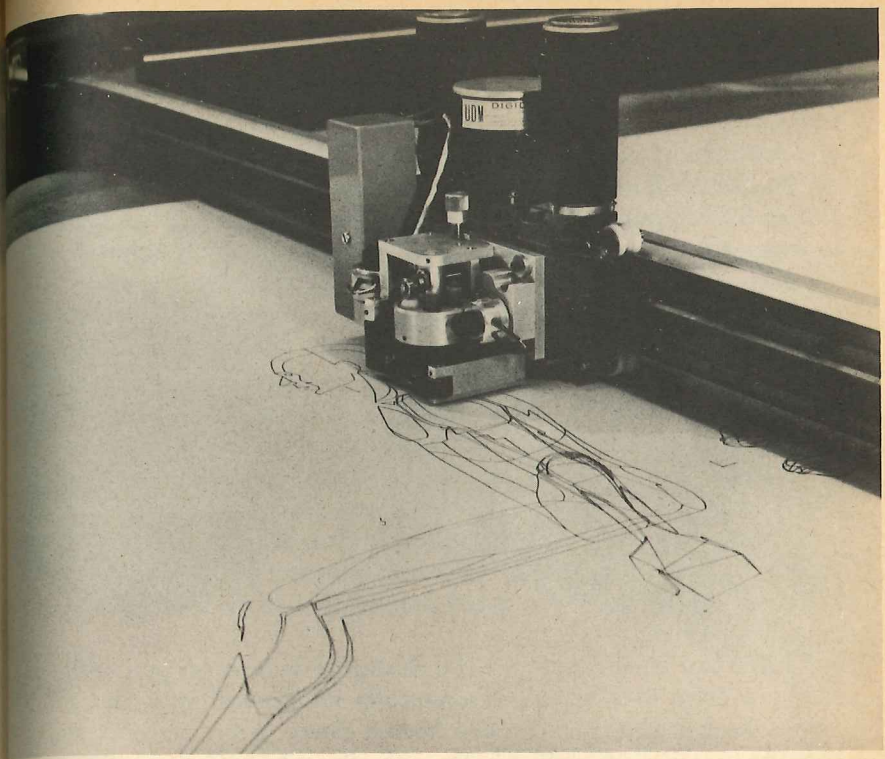
Jordan Belson: *Re-Entry.* ". . . the next thing you know you're in heaven. You're surprised to be there. On the other hand, it's happening . . ."

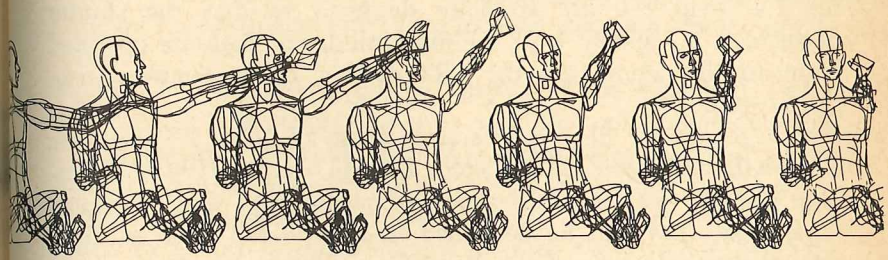


Jordan Belson: *Samadhi.* 1967. 16mm. Color. 6 min.
"When I finally saw how intense *Samadhi* is, I knew I had achieved the real substance of what I was trying to depict. Natural forces have that intensity: not dreamy but hard, ferocious."

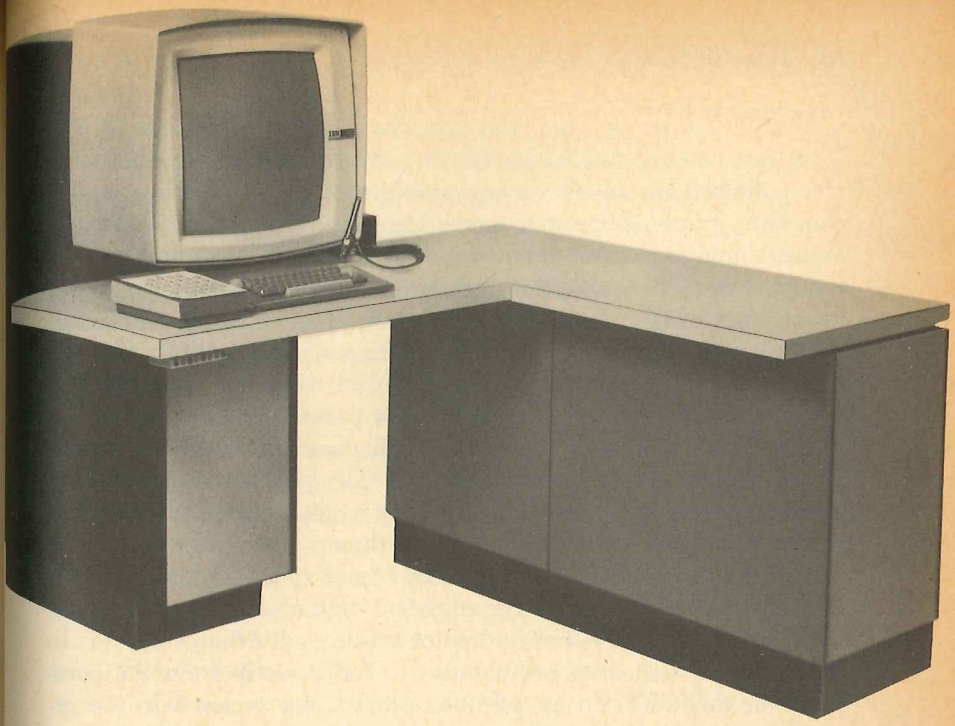


Jordan Belson: *Momentum.* 1969. 16mm. Color. 6 min. "The paradoxical realm in which subatomic phenomena and the cosmologically vast are identical."





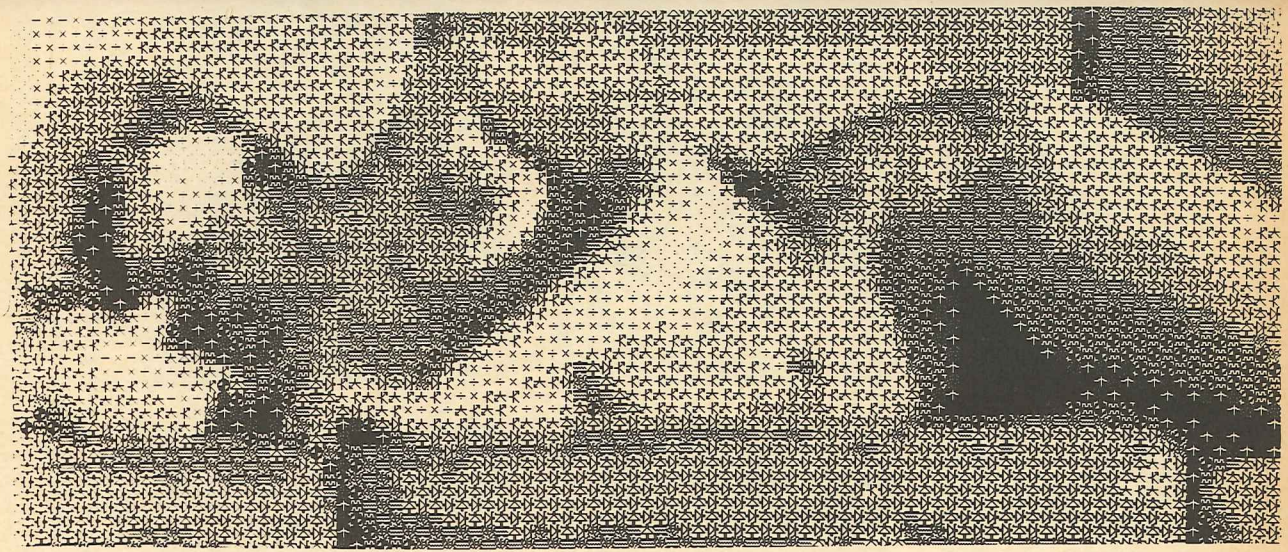
Above: Mechanical analogue plotter draws pilot for computer-animated film by William Fetter of the Boeing Company in Seattle, Washington. *Below:* Animated sequence from the film. Photo: Boeing Company.



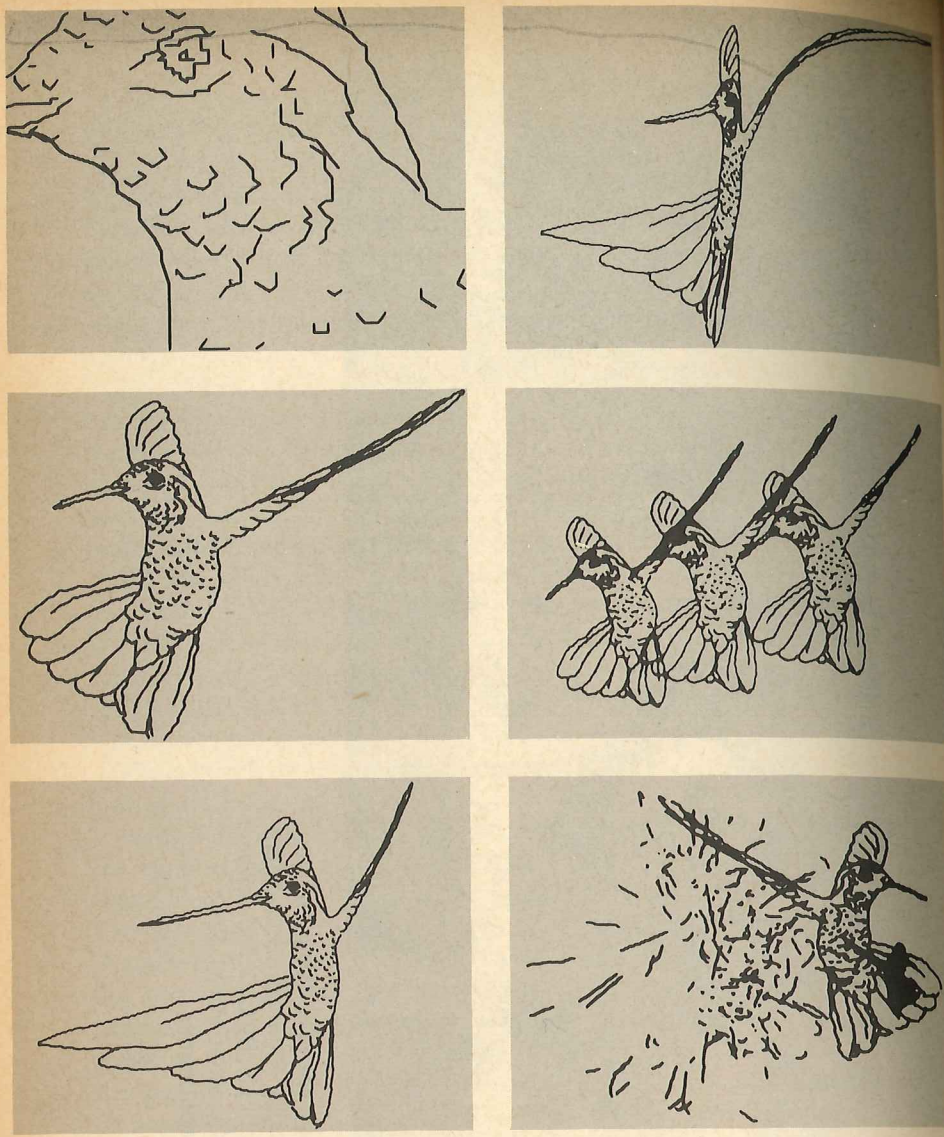
Cybernetic movie studio: The IBM 2250 Display Console with CRT, light pen, and function keyboard. Photo: IBM.

and the CRT becomes a passive display of the algorithm). Also, until recently the display console was the only technique that allowed the artist to see the display as it was being recorded; recent microfilm plotters, however, are equipped with viewing monitors.

Since most standard microfilm plotters were not originally intended for the production of motion pictures, they are deficient in at least two areas that can be avoided by using the active CRT. First, film registration in microfilm plotters does not meet quality standards of the motion-picture industry since frame-to-frame steadiness is not a primary consideration in conventional microfilm usage. Second, most microfilm plotters are not equipped to accept standard thousand-foot core-wound rolls of 35mm. film, which of course is possible with magazines of standard, though control-modified, cameras used to photograph active CRTs.



Reclining nude scanned from photo and reconstructed by computer using brightness-level symbols. By L. D. Harmon and Kenneth C. Knowlton. Photo: Bell Telephone Laboratories.

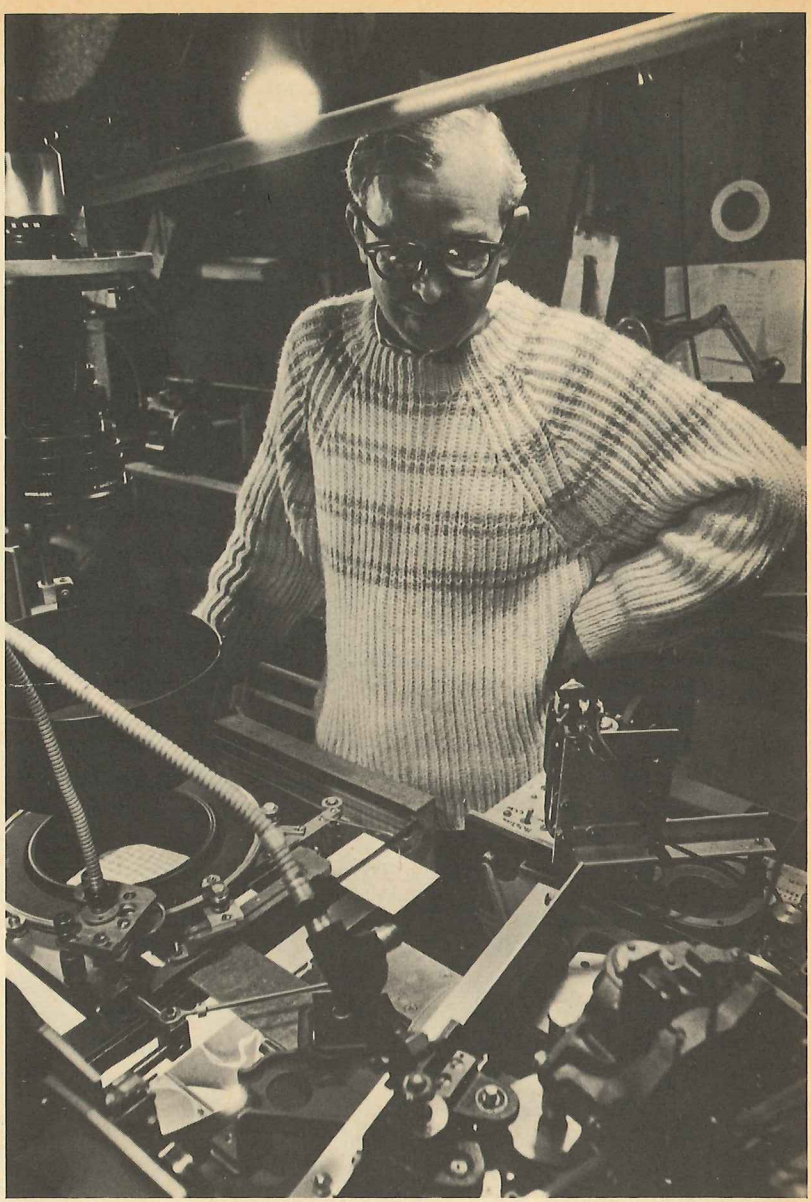


Charles Csuri: *Hummingbird.* 1967. 16mm. Black and white. 10 min. Computer-manipulations of hand-drawn figure using *xy* plotting coordinates.

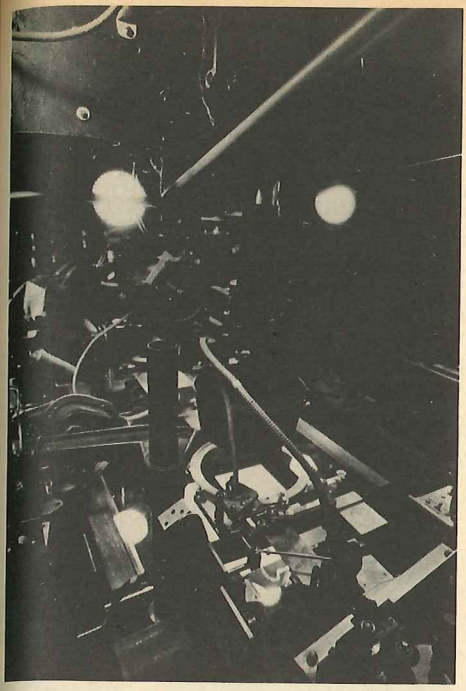
Prototype for flat, wall-size TV screens and computer visualization subsystems of the future: Dr. George Heilmeier demonstrates RCA's liquid crystal display. Photo: RCA.

tin oxide. When an electric charge from a battery or wall outlet is applied between the two coatings, the liquid crystal molecules are disrupted and the sandwich takes on the appearance of frosted glass. The frostiness disappears, however, as soon as the charge is removed.

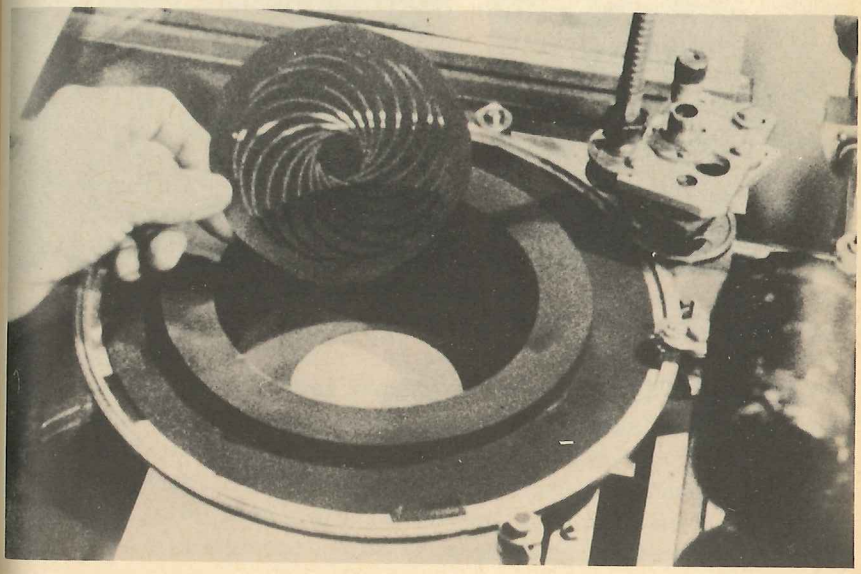
In order to display stationary patterns such as letters, symbols, or still images, the coatings are shaped in accordance with the desired pattern. To display motion the conductive coatings are laid down in the form of a fine mosaic whose individual elements can be charged independently, in accordance with a scanning signal such as is presently used for facsimile, television, and other electronic displays. To make the images visible in a dark room or outdoors at night, both coatings are made transparent and a light source is

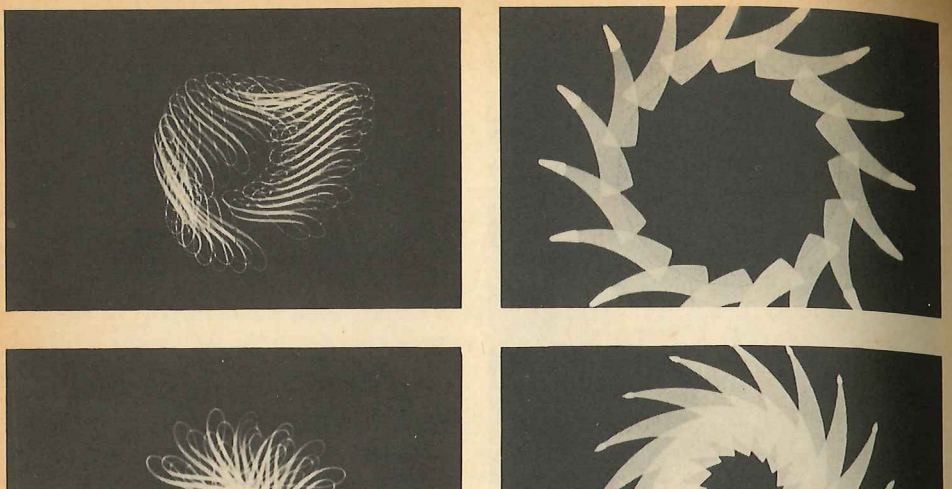


John Whitney working with his mechanical analogue computer. Photo: Charles Eames.

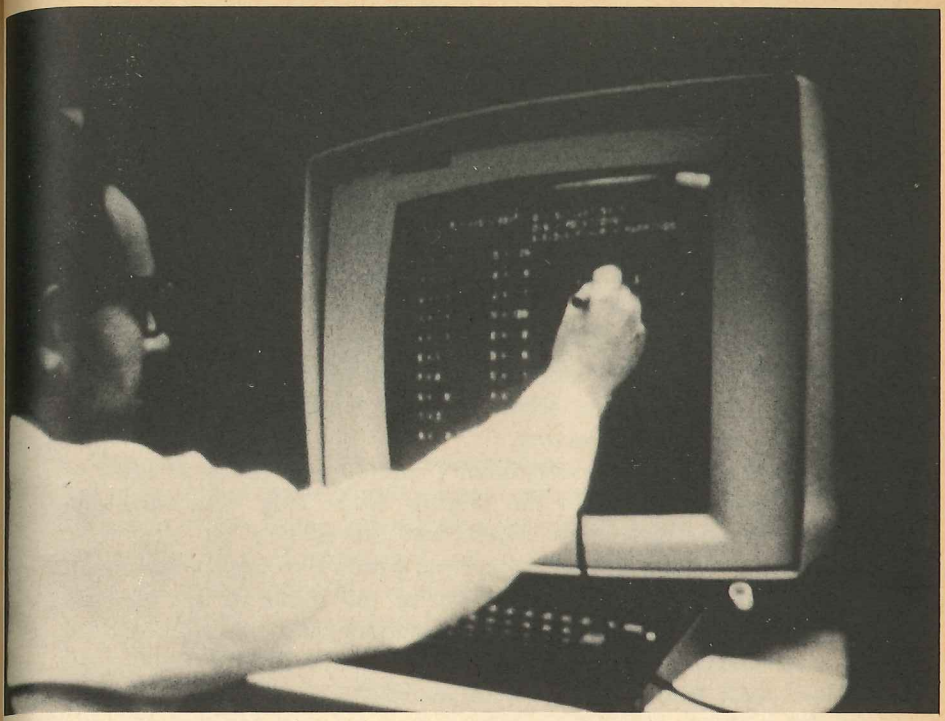


Left: Camera zoom lens (*center*) focusing into primary rotating table of Whitney mechanical analogue computer. (Photo: Charles Eames) *Below:* Whitney places design template into computer table.





John Whitney: *Catalogue.* 1961. 16mm. Color. 7 min. "Floral patterns curl as though they were actually organic growths . . ."

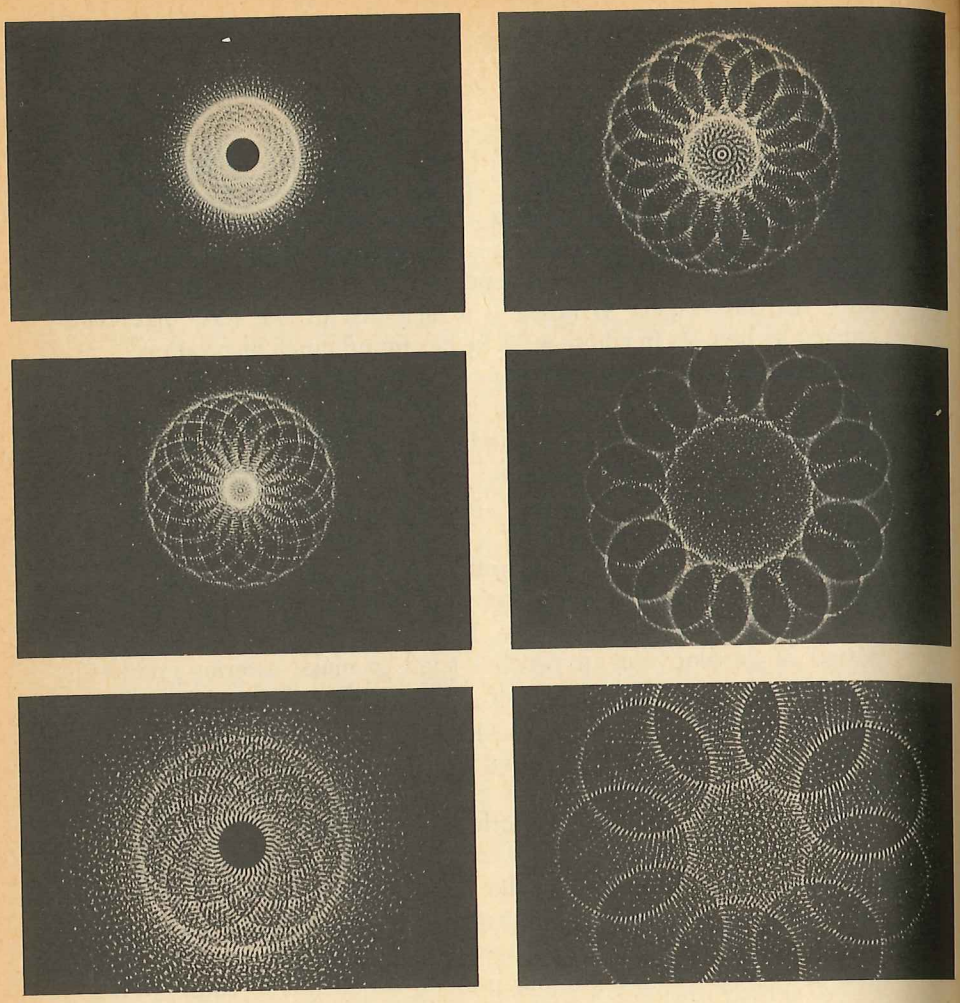


Dr. Jack Citron, IBM Los Angeles, selects numerical values for a typical image, using the light pen at the 2250 Display Console.

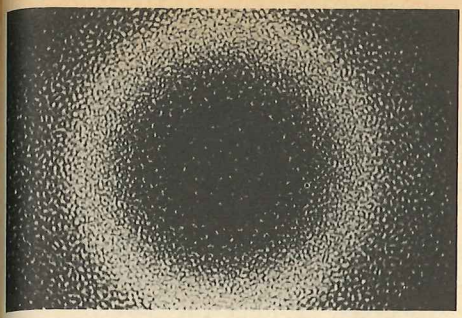
While a series may have any number of works, it must as a precondition of seriality have at least two . . . there are no boundaries implicit to serial imagery; its structures can be likened to continuums or constellations . . . all contemporary usage of serial imagery is without either first or last members. Obviously at one point there had to be a beginning, but its identity becomes subsumed within the whole, within the macrostructure. The same principle applies to the last member. At any given point in time one work in a series stands last in order of execution, but its sequential identity is irrelevant and in fact is lost immediately on the work's completion."[25]

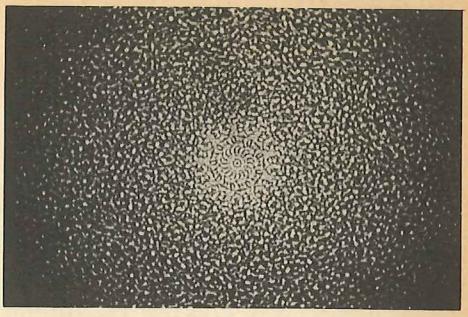
It is this seriality, then, that identifies *Permutations* both as

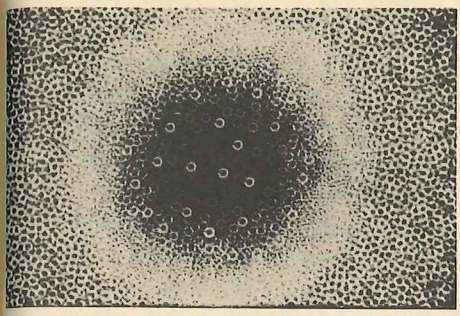
[25] John Coplans, "Serial Imagery," *Artforum* (October, 1968), pp. 34–43.

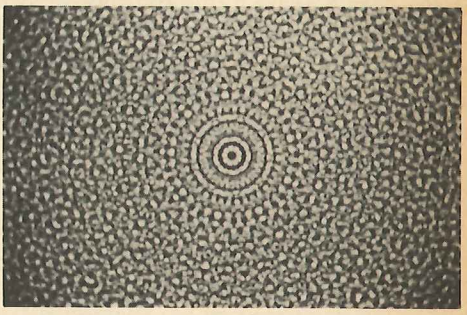


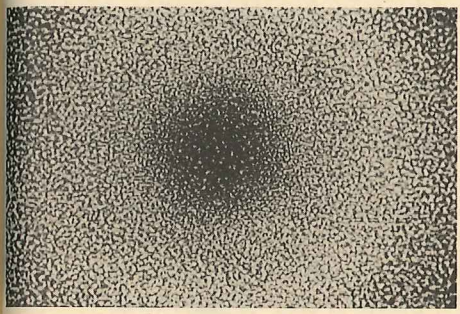
James Whitney: *Lapis.* 1963–66. 16mm. Color. 10 min. "A mandala that revolves eternally like the heavens."

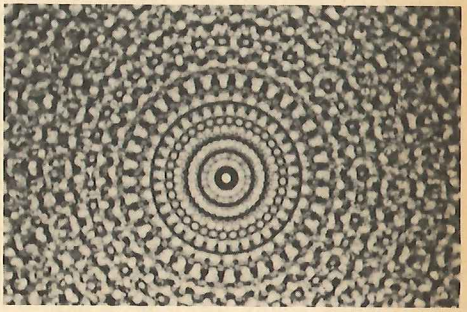




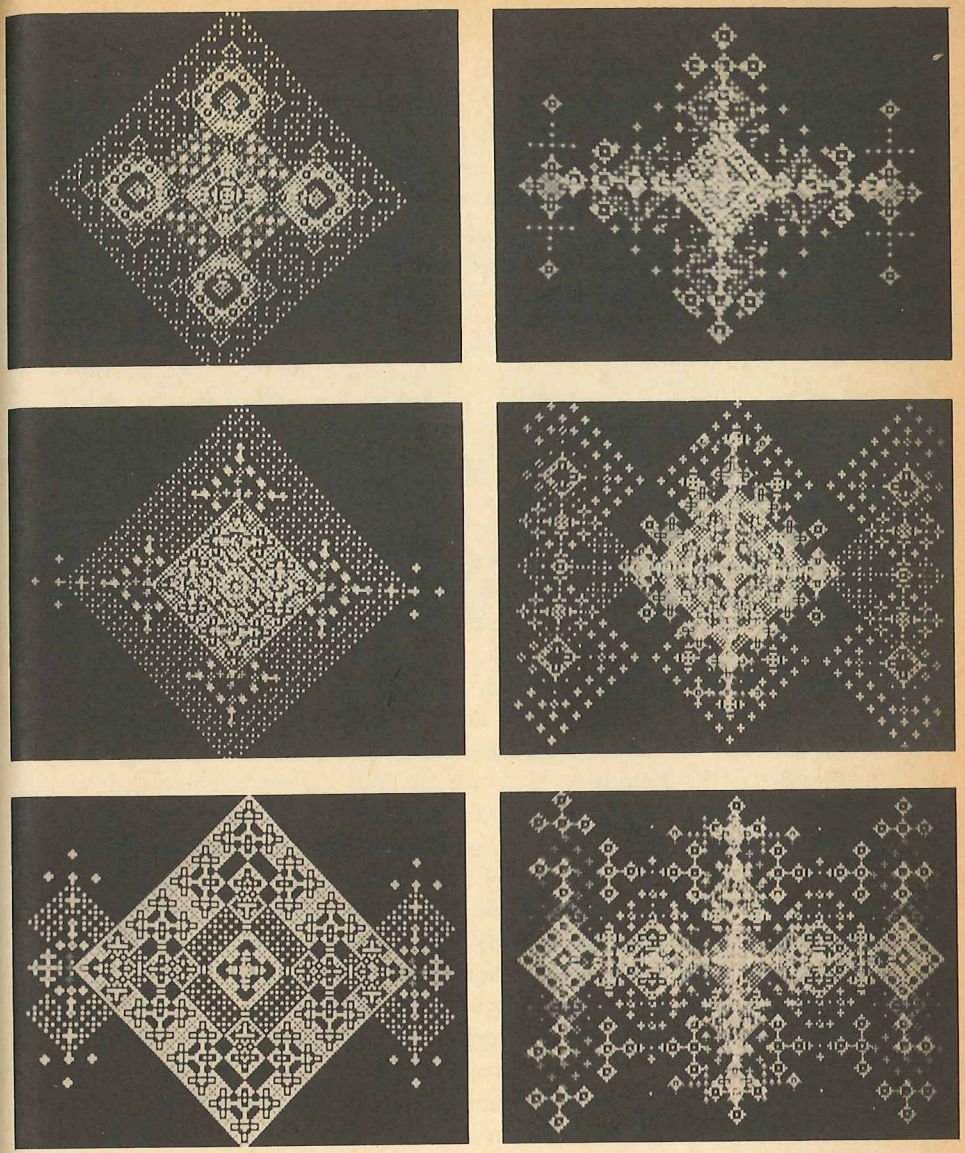








Lapis: ". . . they manifest as though out of the air itself, gathering and converging around a central sphere . . . revolving with implacable grace against the eerie drone of the tamboura."

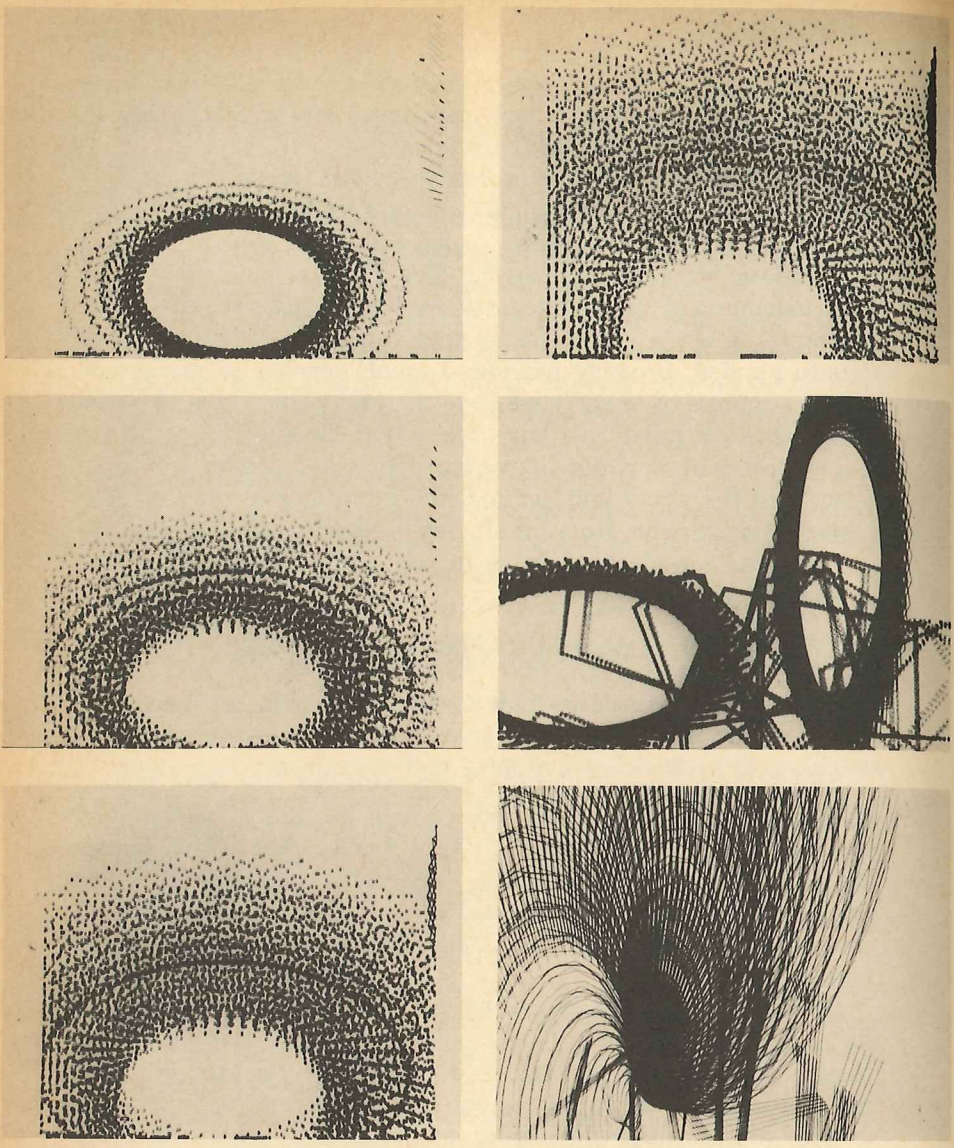


Michael Whitney: *Binary Bit Patterns.* 1969. 16mm. Color. 3 min. "Squadrons of polyhedral modules come pulsating out of a black void . . ."

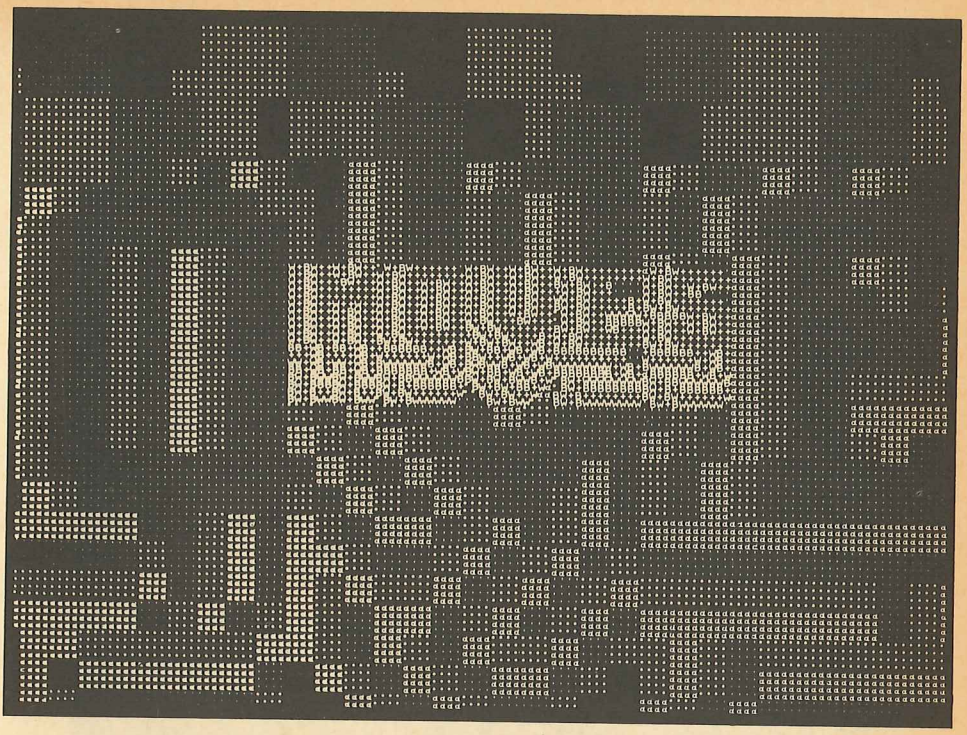
The Whitney brothers. *Left to right:* John, Jr., Mark, Michael. Photo: Gene Youngblood.

think about what is the meaning of the film work I'm doing? I believe it's possible that an inadvertent spin-off from technology will transform man into a transcendental being. There isn't much we can conceive now that can give us a clue to how it will come about. But I suspect that vision will play an important role. The eye will have a lot to do with it. It could conceivably be some external thing, which metaphysically will affect the mind and cause some transcendental experience. So with that in mind I've been thinking of ways to integrate the realist image into the nonobjective image so that a synthesis will evolve, a cinematic experience which might contribute to an evolutionary transformation of man's thought processes.

MICHAEL: It's very effective to use a realist image for its nonobjective values. You're using it for its form, and if the form happens to be human it's evocative and easily digested. The whole idea is to work with the imagery and to develop total and complete control through structuring, once you have the ability to control the prob-



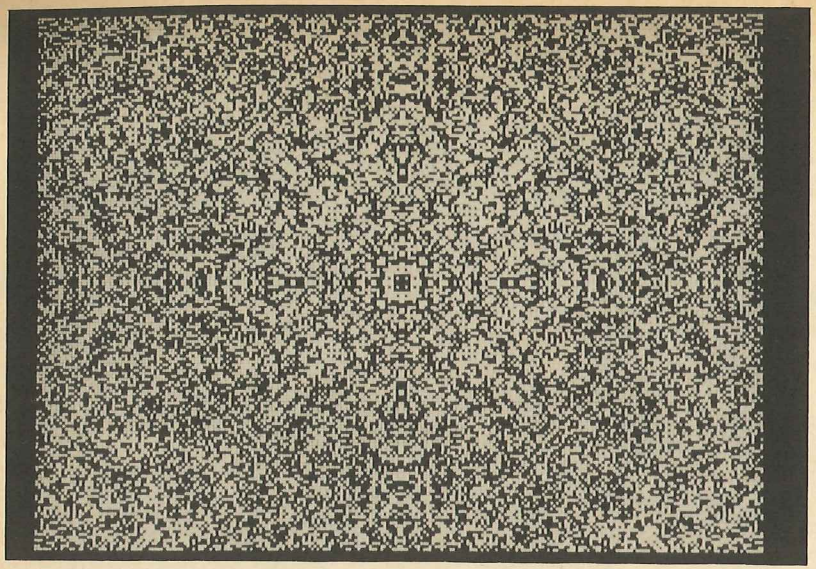
John Stehura: *Cybernetik 5.3.* 1965–69. 16mm. Color. 8 min. A series of basic image forms before the addition of color, showing random character of permutations.

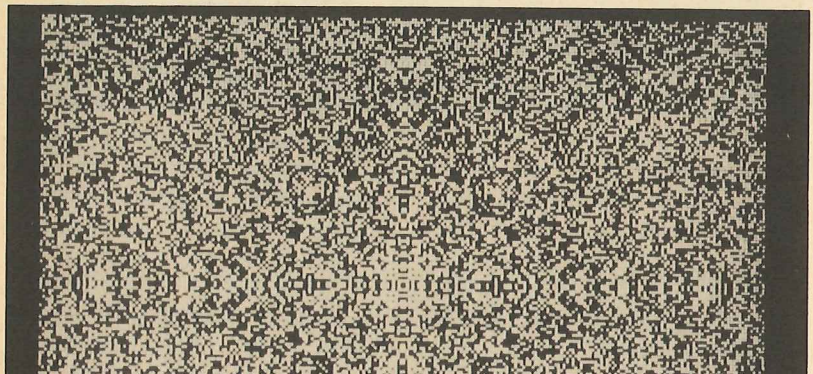


Computer interpretation of the word "movies," from a film by Stan VanDerBeek and Kenneth C. Knowlton.

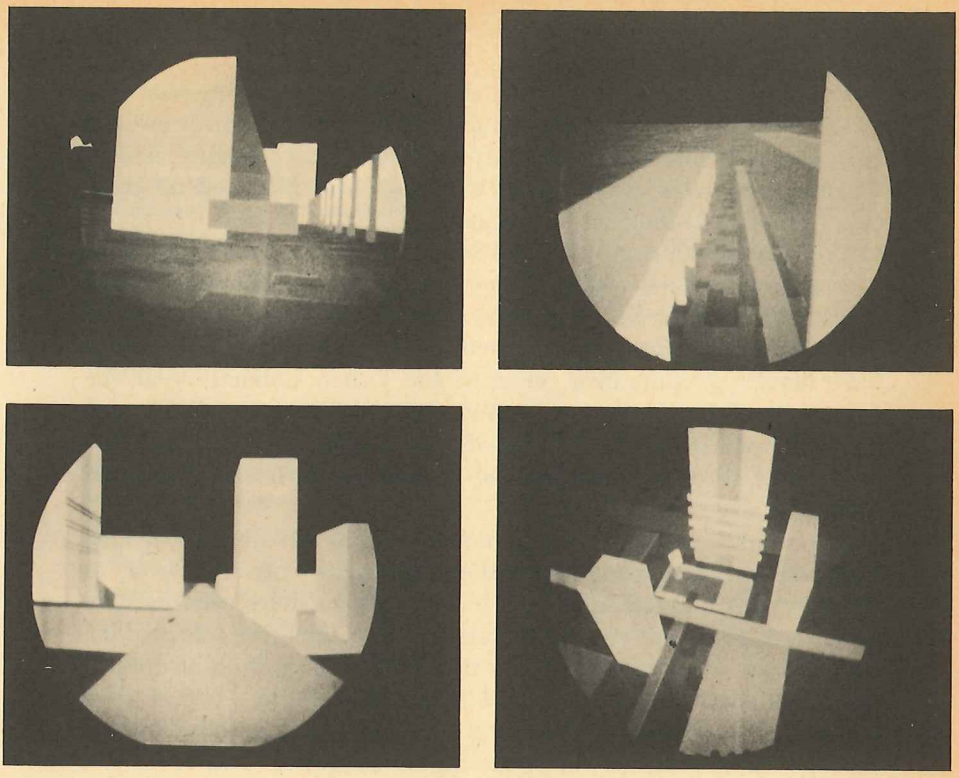
VanDerBeek, "not railroad tracks. Human intelligence functions on the order of a hundred-thousand decisions per second." It appears this brain capacity was a prime motive in the production of the *Poem Fields,* whose micro-patterns seem to permutate in a constant process of metamorphosis which could very likely include a hundred-thousand minuscule changes each second.

"The present state of design of graphics display systems," VanDerBeek explains, "is to integrate small points of light turned on or off at high speeds. A picture is 'resolved' from the mosaic points of light." The artist seems to feel that this process bears some physiognomic similarities to human perception. "The eye," he notes, "is a mosaic of rods and cones."

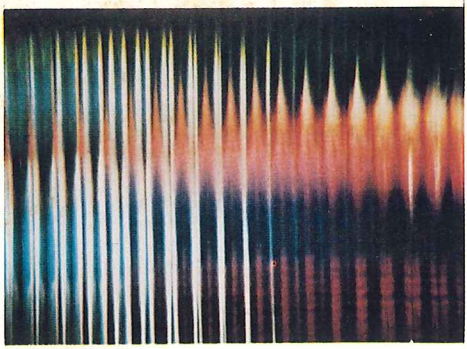


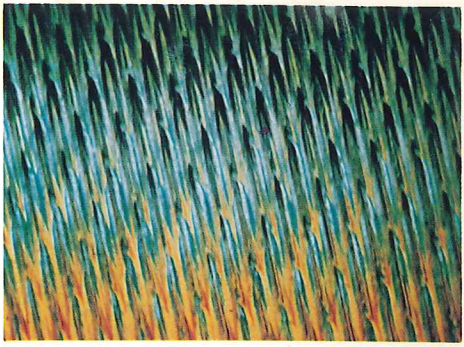


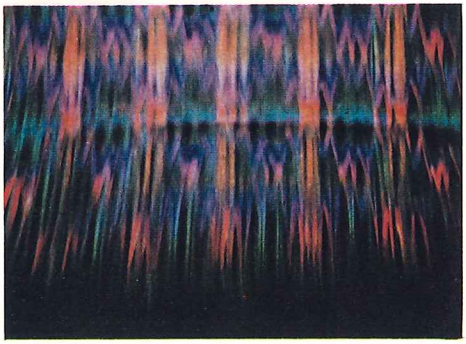
Variations of the Beflix technique of mosaic image-making, from computer films by Stan VanDerBeek and Kenneth C. Knowlton.

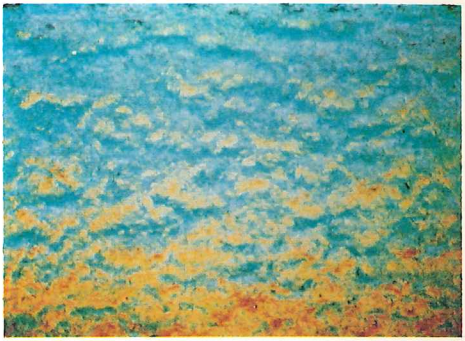


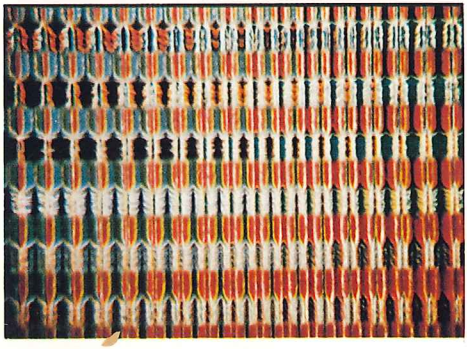
Peter Kamnitzer: *City-Scape.* 1968. 16mm. Color. 10 min. Made at the Guidance and Control Division of NASA's Manned Spacecraft Center, Houston, Texas. Four views of the imaginary city.







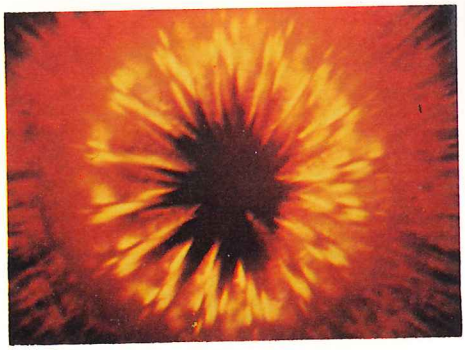




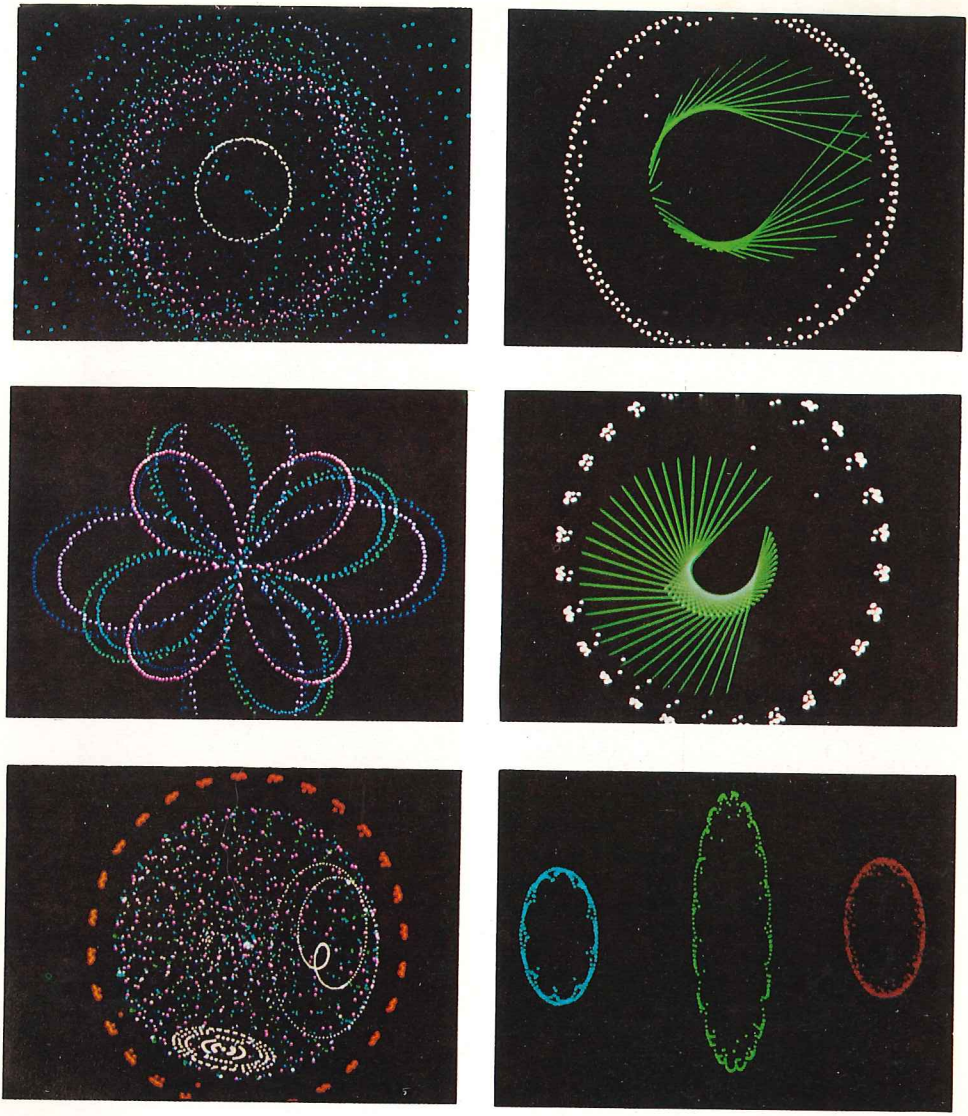
Jordan Belson: *Phenomena.* 1965. 16mm. Color. 6 min. ". . . As though you were approaching earth as a god, from cosmic consciousness. You see the same things but with completely different meaning." (See page 167.)



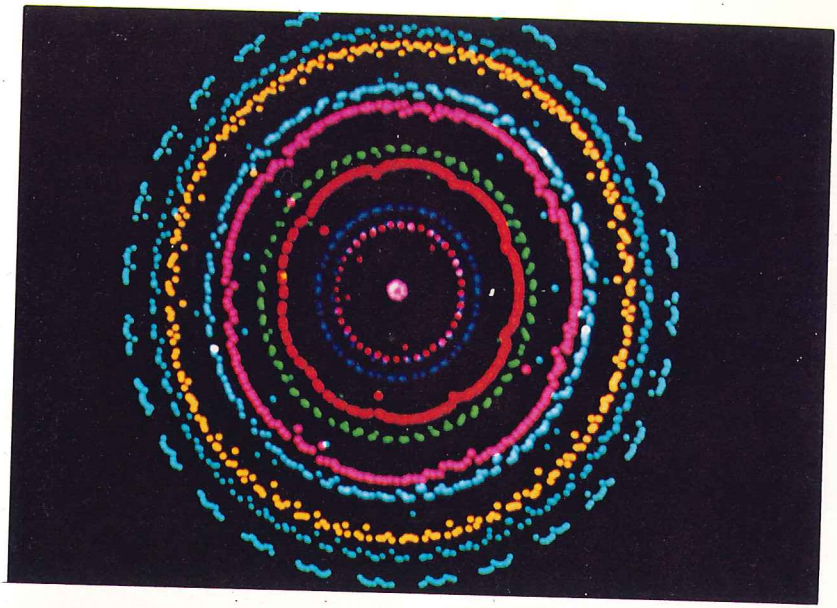


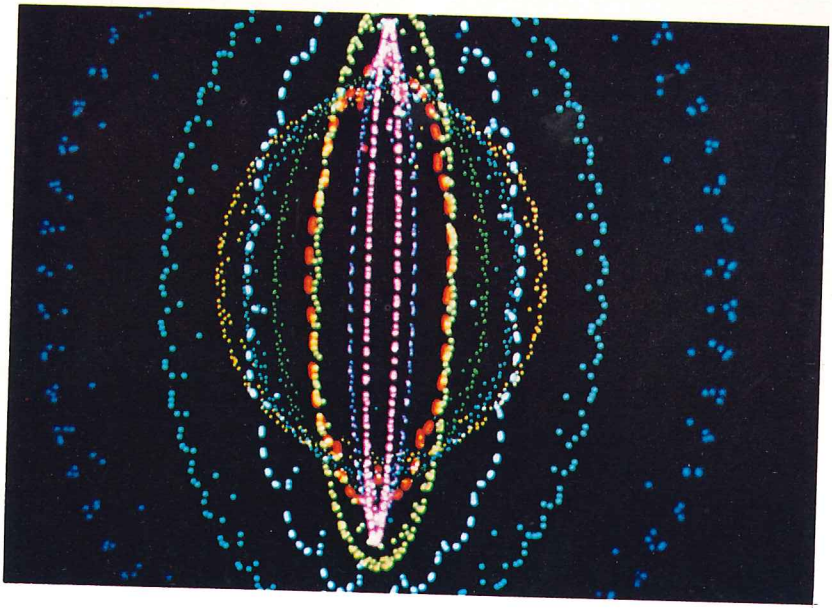



Jordan Belson: (*Left column*) *Samadhi.* 1967. 16mm. Color. 6 min. (*Right column*) *Momentum.* 16mm. Color. 6 min. "I first have to see the images somewhere: within or without or somewhere. I mean I don't make them up . . . in a sense everything I've learned in life has been through my efforts to find out what these things mean." (See pages 171, 176.)

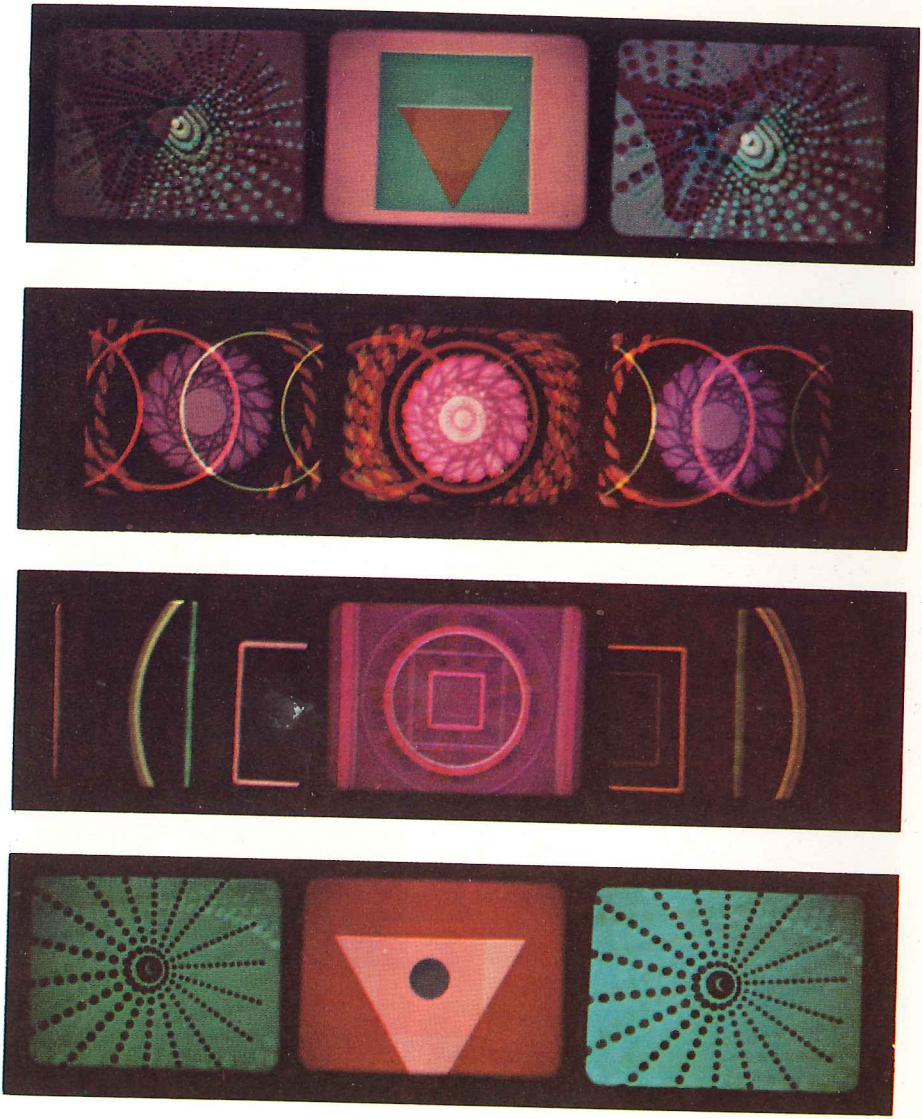


John Whitney: *Permutations.* 1967. 16mm. Color. 8 min. "The parallel is with counterpoint or polyphonic musical phenomena. Should it be called polygraphic phenomena?" (See page 215.)

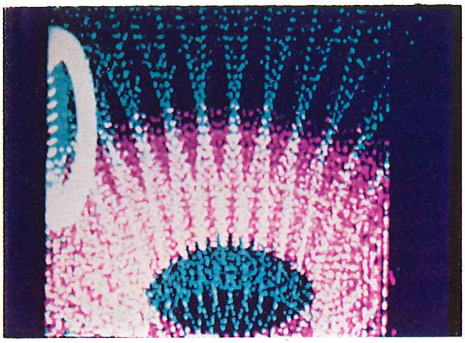
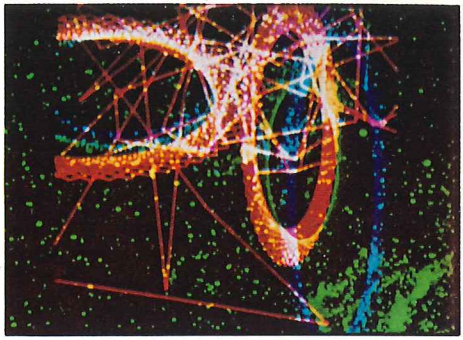
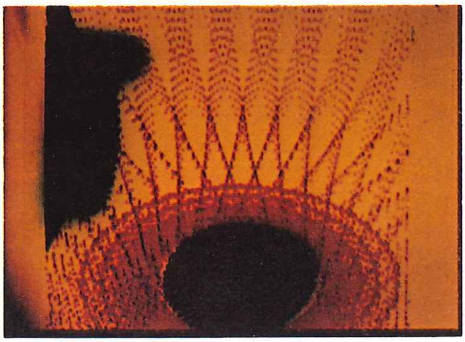
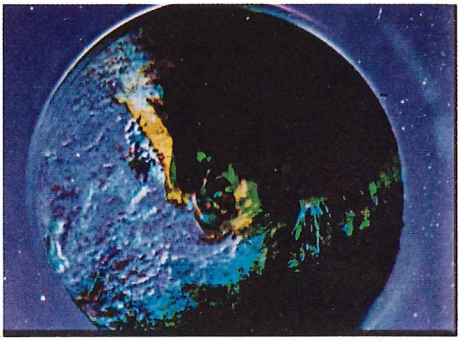
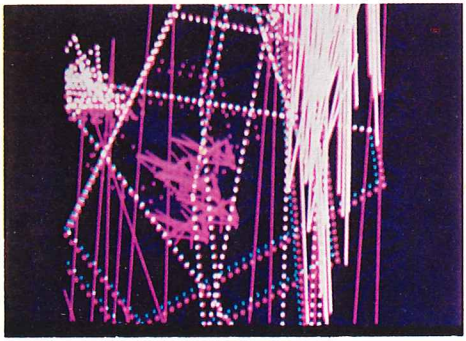




John Whitney: Permutations. 1967. 16mm. Color. 8 min. "So I ask myself what can be essentially the image of time for the eye to perceive?" (See page 215.)

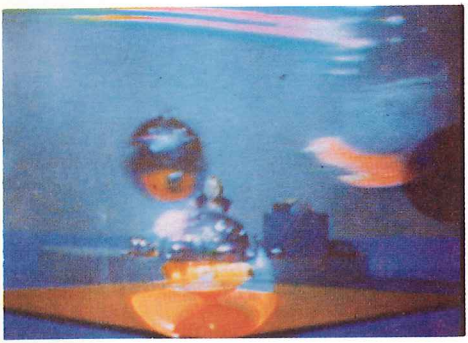
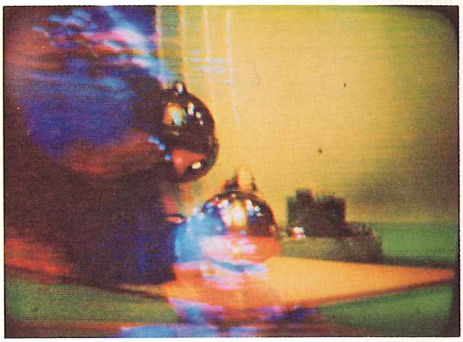


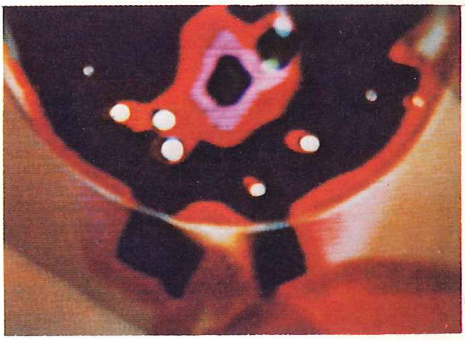
A selection of images from John Whitney, Jr.'s, triple-projection computer film. 1967. 16mm. Color. 17 min. (See page 231.)


John Stehura: *Cybernetik 5.3.* 1965–69. 16mm. Color. 8 min. "It creates an overwhelming atmosphere of some mysterious transcendental intelligence at work in the universe . . . as though one were peering into a new dimension of existence." (See page 239.)

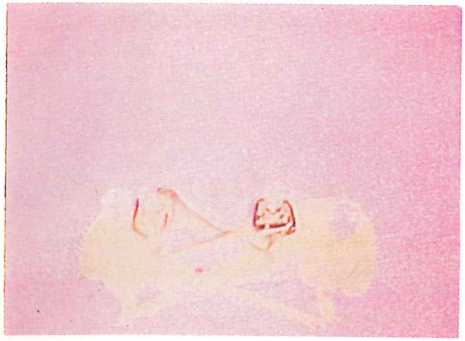


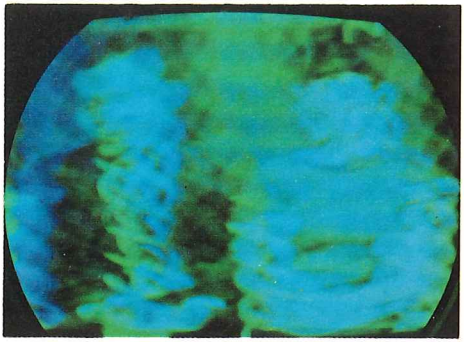


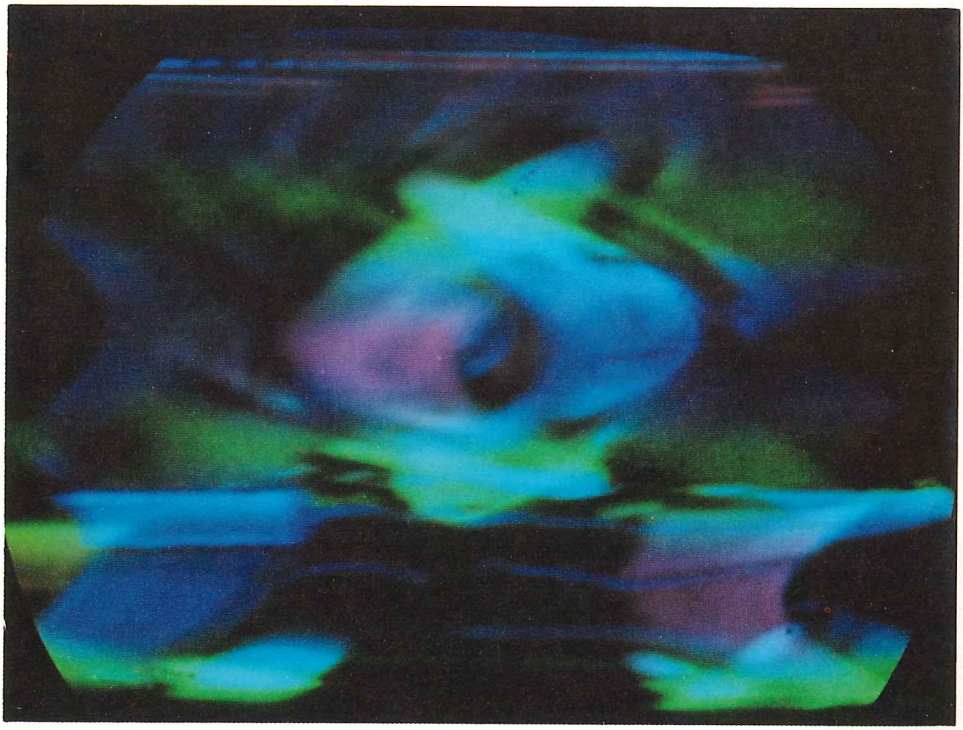
Terry Riley and Arlo Acton: *Music With Balls.* 1969. Hi-Band Color VTR. 15 ips. 23 min. "A rich mantra of color, sound, and motion . . . phantasmagoric convolutions of spatial dimensions." (See page 293.)

Philip Makanna: *The Empire of Things.* 1969. Hi-Band Color VTR. 15 ips. 20 min. "Haikuesque impressions of things observed, events remembered, nightmares experienced . . . the sky bursts in spectral madness." (See page 295.)

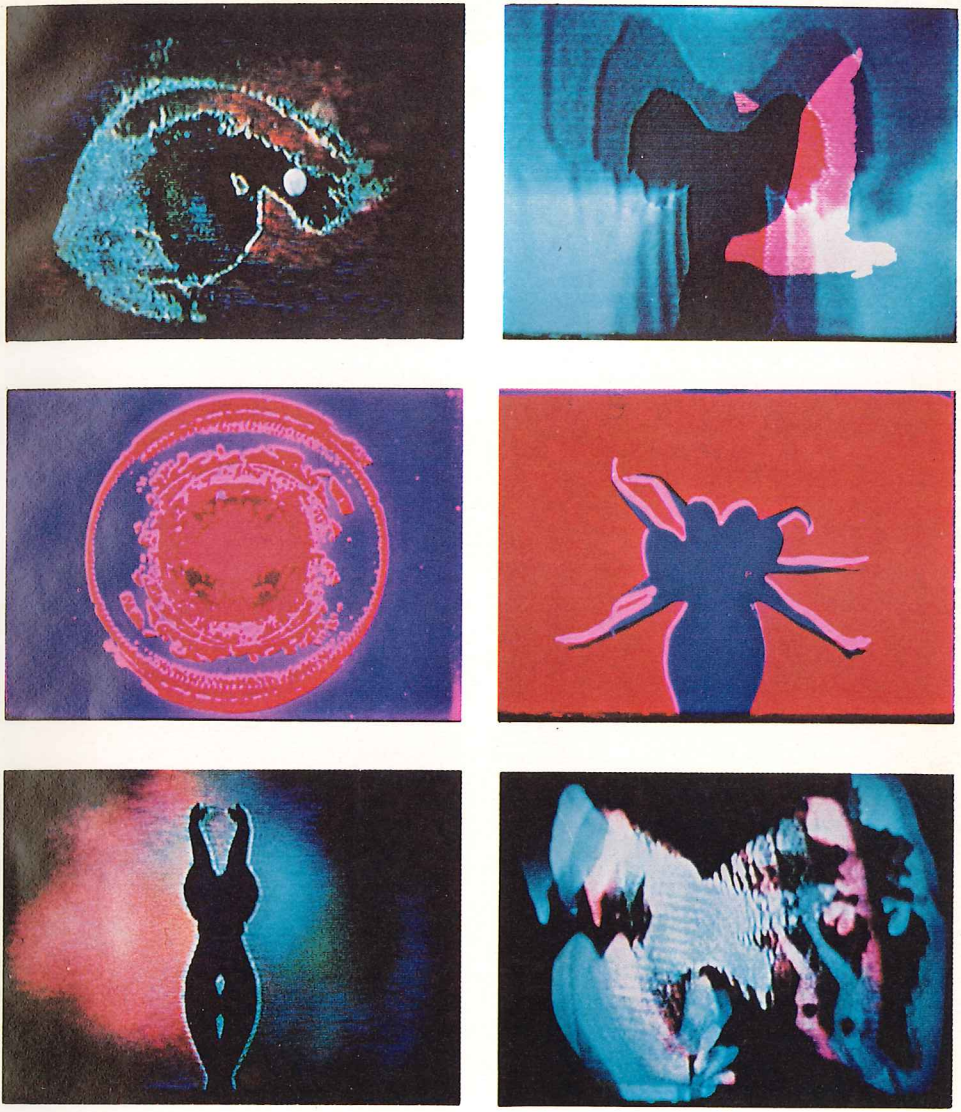


James Seawright: *Capriccio for TV.* 1969. Hi-Band Color VTR. 15 ips. 5 min. "It was possible to see two images of the same figure performing the same action at different stages in different colors." (See page 301.)

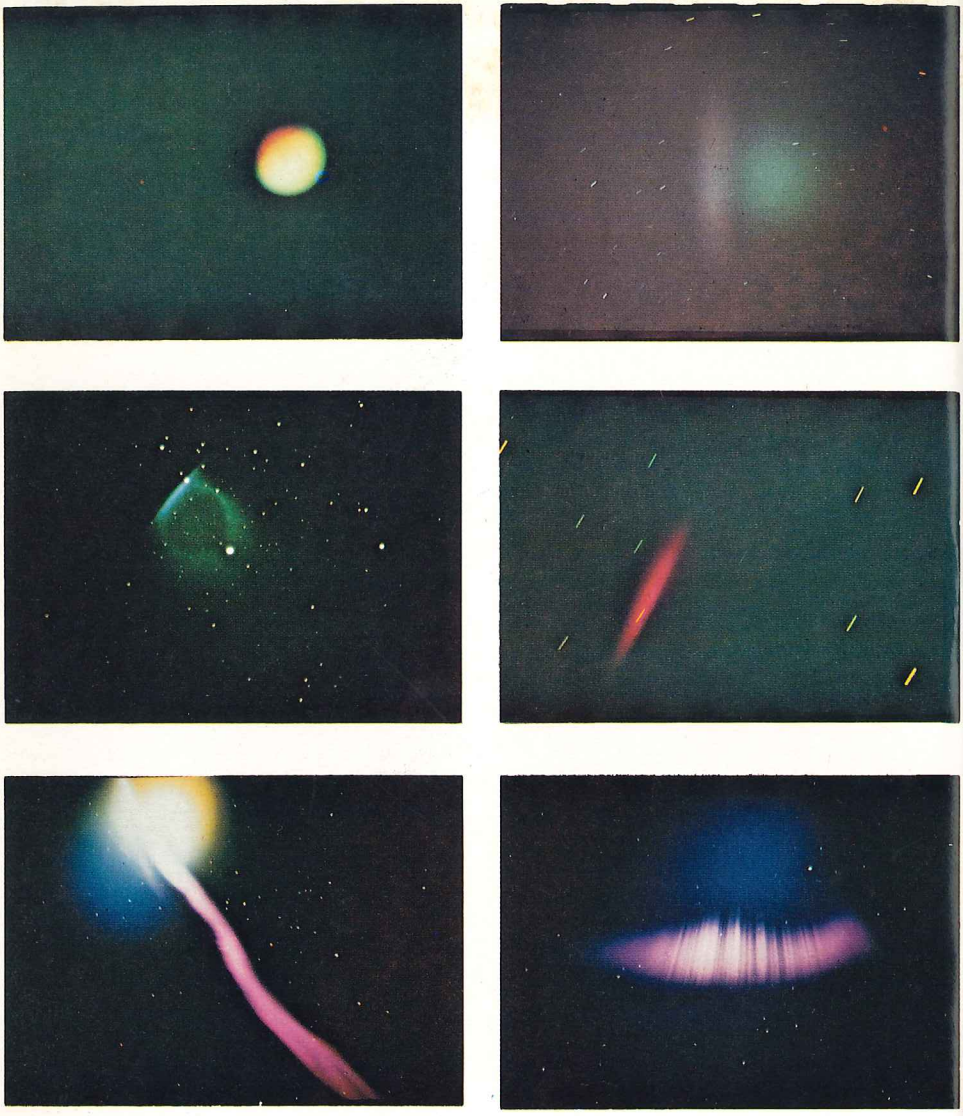




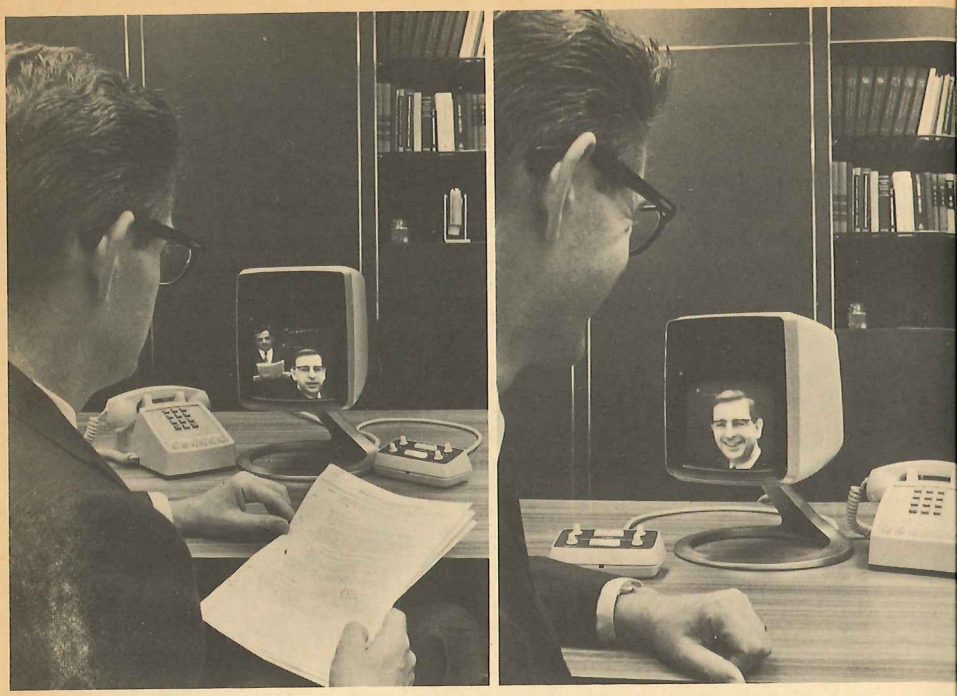
Three experiments with the color cathode tube by Korean artist Nam June Paik. "It's so cool," he says. "It's like going to the moon." Photos: Paul Wilson. (See page 303.)



Scott Bartlett: *OFFON.* 1967. VTR/ 16mm. film. Color. 10 min. Spectral breakdown and videographic metamorphosis. (See page 318.)



Clouds of barium atoms released by rockets at high altitudes are ionized by solar radiation. They then interact with electromagnetic force fields around the earth. Several artists have proposed similar projects to generate hemispherical lumia displays. Photo: courtesy of the Max Planck Institute for Physics and Astrophysics, Munich, West Germany. (See page 348.)



The Picturephone: "A completely new video environment and life-style." Photo: Bell Telephone Laboratories.

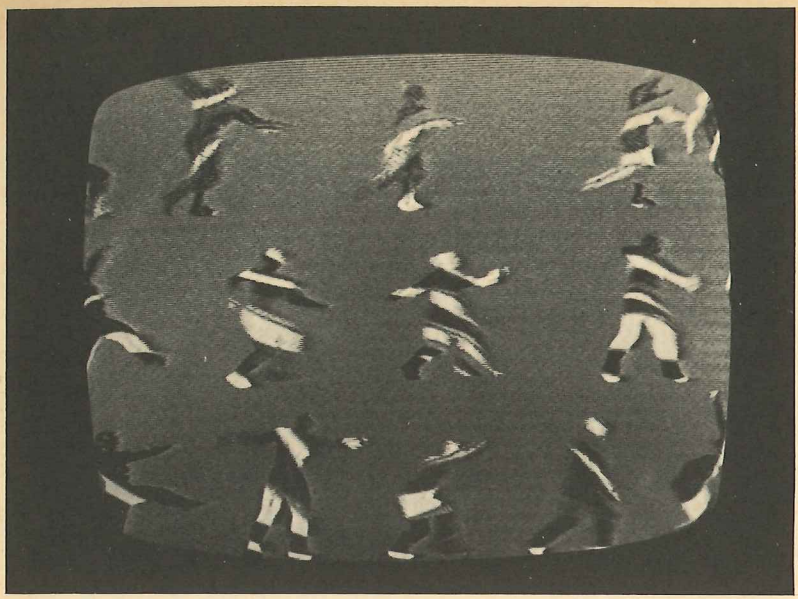
television. Soon entertainment and localized functions of the videosphere will be handled by CATV and videotape cartridges, leaving broadcast television free to perform vital new tasks. Large communications conglomerates such as RCA, CBS, ABC, CBC, BBC, Eurovision, Bell Telephone, AT&T, and COMSAT are now planning networks of planet analysis that will result in television as a constant source of global metabolic and homeostatic information.

Direct satellite-to-home television has been technically feasible for some time. Scientists at Bell Telephone and COMSAT anticipate fifty domestic communications satellites in orbit by 1977. The total system will be capable of 100,000,000 voice channels and 100,000 television channels.[4] Hughes Aircraft engineers estimate that within

[4] *Videa 1000 Newsletter*, Vol. 3, No. 3 (New York: Videa International, January, 1969).

Chroma-Key video matting makes arms of Alwin Nikolais dancers seem to float in space. Photo: WCBS-TV.

series of wavy stripes that moved from right to left to accentuate the effect of motion. Two cameras and three videotape recorders were used. In this way, three separate "takes" of one row of dancers were combined in the final image. On take 1 the camera framed the dancers at the top of the screen. The dancers were placed against a large blue canvas backdrop that curved down to the floor, permitting even lighting so that the dancers' full figures could be matted. The background was a green slide that appeared wherever there was blue in the picture. The outlines of the dancers cut the "hole" in the matted green slide, and these "holes" were filled by another camera shooting a revolving drum with painted stripes on it. This was recorded on videotape 1 (VT-1). This was played back to the studio where a wipe was used to combine the first level of dancers on tape with a second level of dancers now being framed live in the center of the camera. The resulting composite of two rows of striped dancers was then recorded on VT-2. This was played back to be

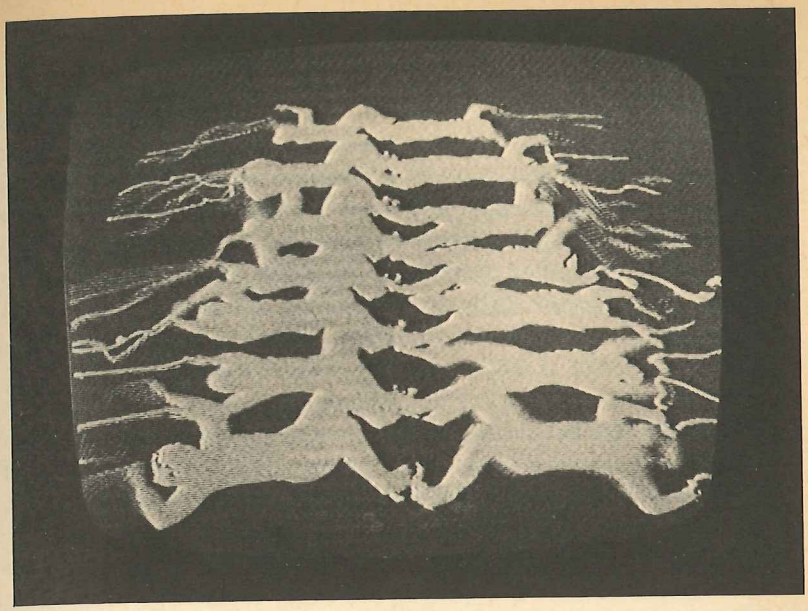


Two cameras and three VTRs were used to suspend candy-striped dancers in green space. Photo: WCBS-TV.

combined with the third level of dancers using the same process. The total effect was recorded on VT-3.

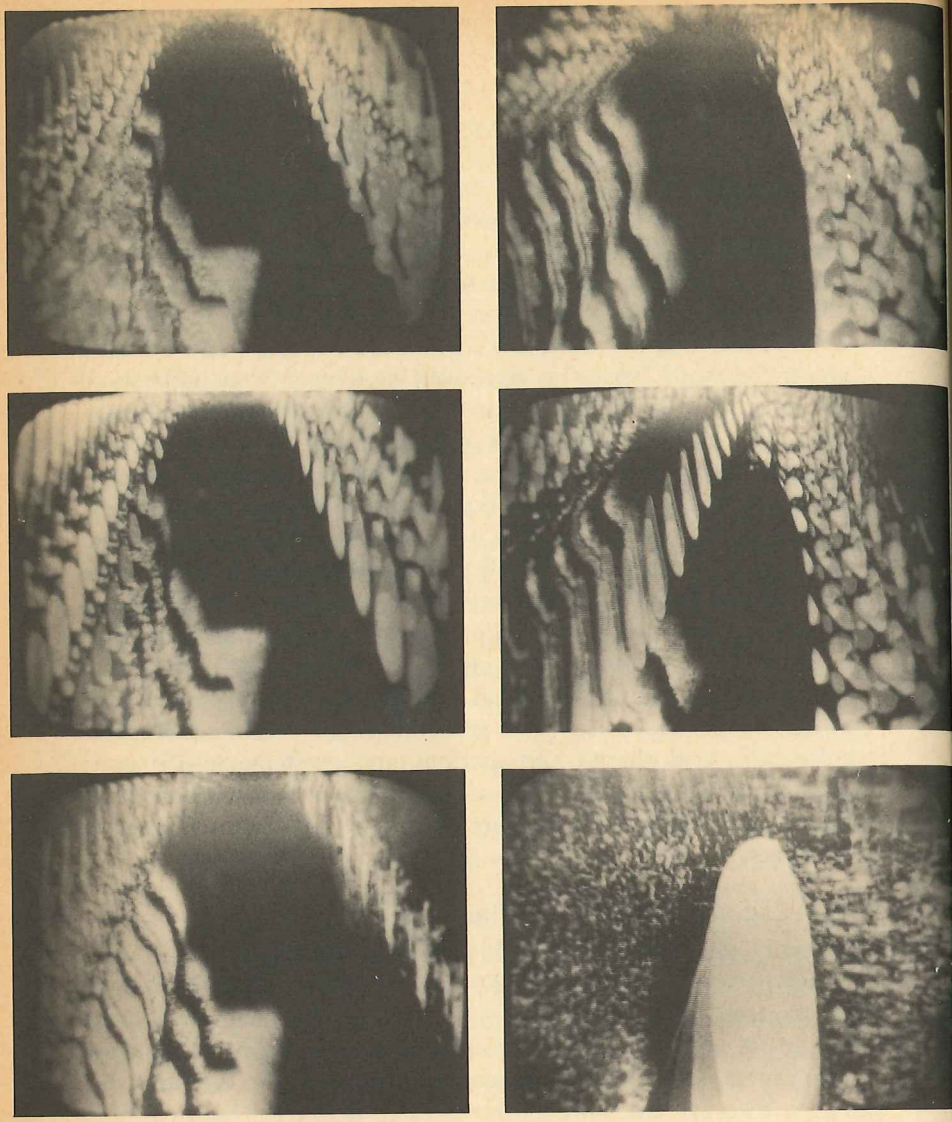
In another vignette the dancers were to represent the torments of everyday living, from crawling sensations to jangling nerves. The final effect was of two lines of dancers, toe to toe, lying side by side on clouds and water, holding long tapes above their head to represent nerve endings. The outlines of bodies and tapes were filled with red. The segment was done in two takes. The first take was tape-recorded with the dancers lined up on the right side of the screen. On the second take, the dancers moved to the left side of the screen. The tape was played back and combined with the live action using a vertical wipe. Later this effect, plus goldfish and crawling ants, was inserted inside the body of the principal dancer.[7]

[7] Technical descriptions of the *Limbo* program were provided by Herb Gardener, WCBS-TV Studio Operations Engineer, in *How We Did It,* a publication of the WCBS-TV Repertoire Workshop, New York.

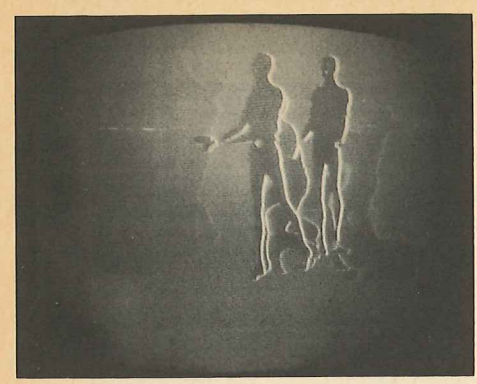


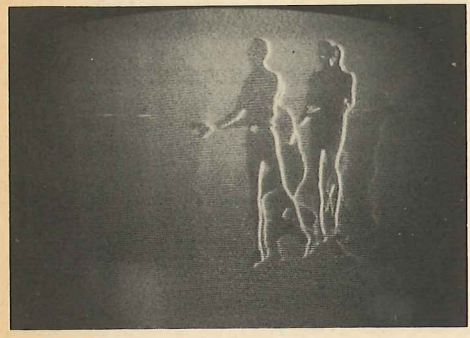
Two VTRs were wiped together in this composite scene from the *Limbo* program. Photo: WCBS-TV.

While demonstrating the nature of Chroma-Key, these examples also clearly show how a purely electronic medium with an unexplored range of possibilities has been used to imitate the older discipline of cinema, and to express an archaic intelligence that insists upon "objectivity" and linear development in graphic forms. The rigid adherence to "clean" matting implies disdain toward what is obviously the unique property of video keying: "metamorphosis," not overlay or insertion. The new consciousness seeks the transformation of realities whereas the old consciousness ventures no further than a timid juxtaposition of "objective" realities that retain their traditional identity. The fact is that there exists no cinematic equivalent of video keying. Tearing a key in grays or colors produces graphic designs of unique character, blending form and color in a manner virtually impossible in any other medium. Video keying is inherently synaesthetic; such a claim can be made for no other aesthetic medium.

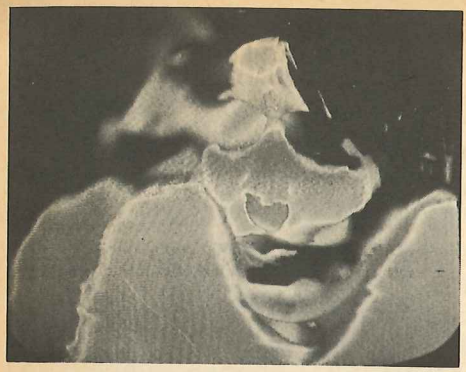
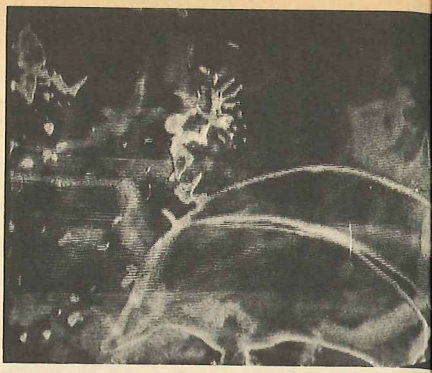
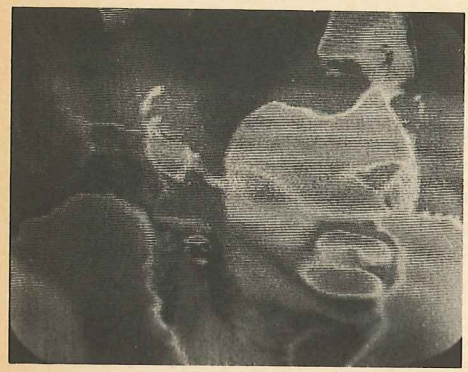


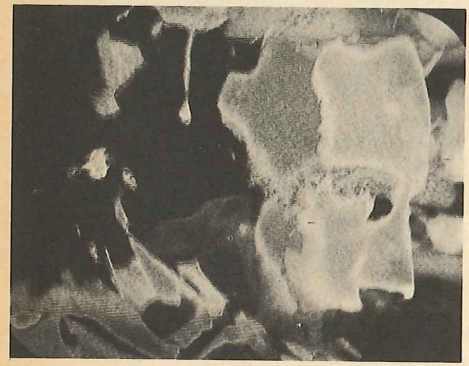
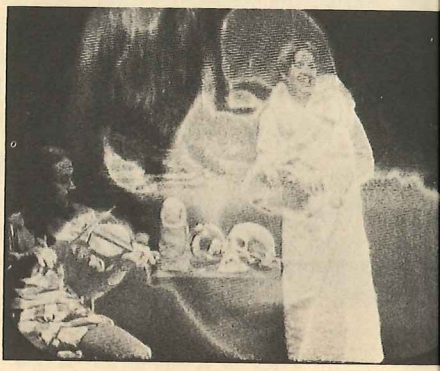
Multiple-camera feedback techniques produced this disintegration of form in *Videospace* at the KQED Experimental project.



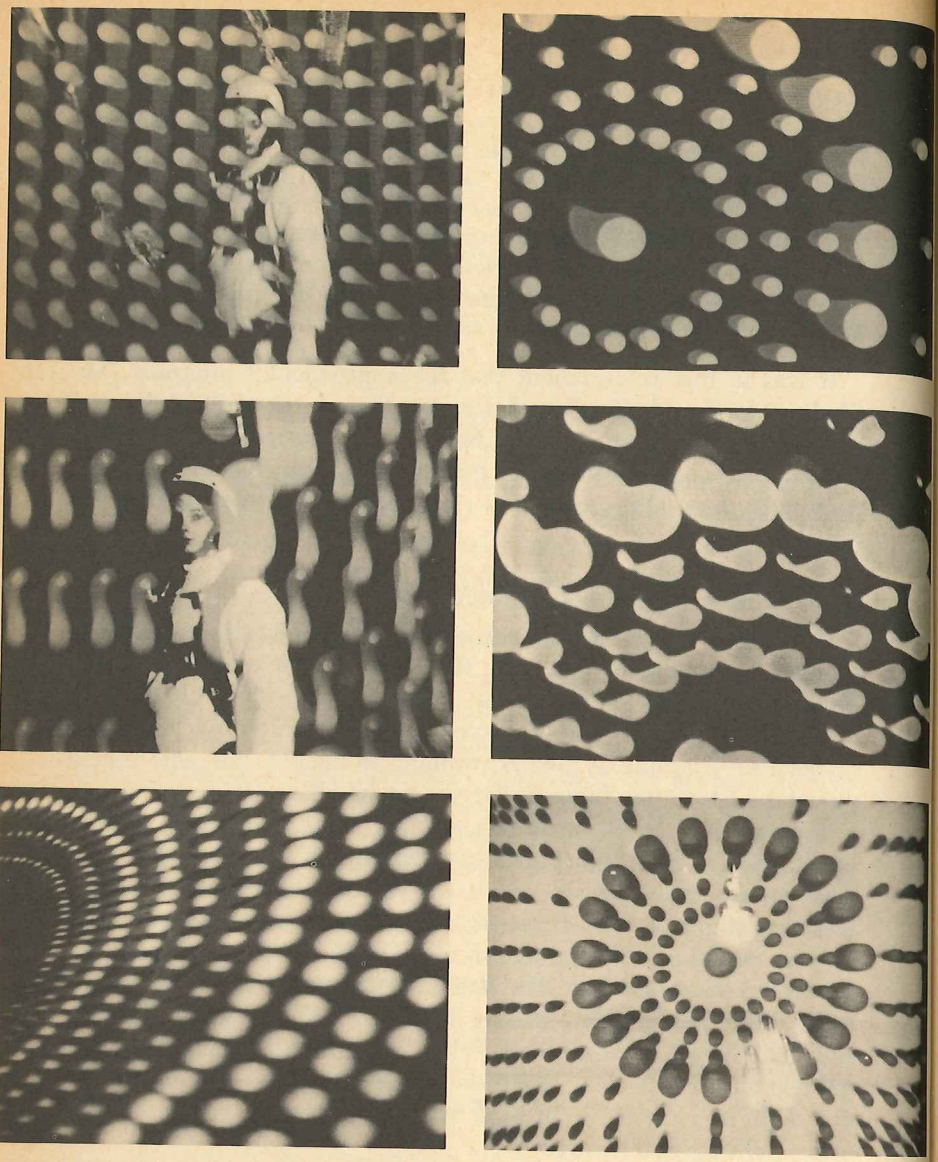



Six levels of delayed videotape superimpositions of de-beamed positive and negative images were combined in this experiment at KQED.

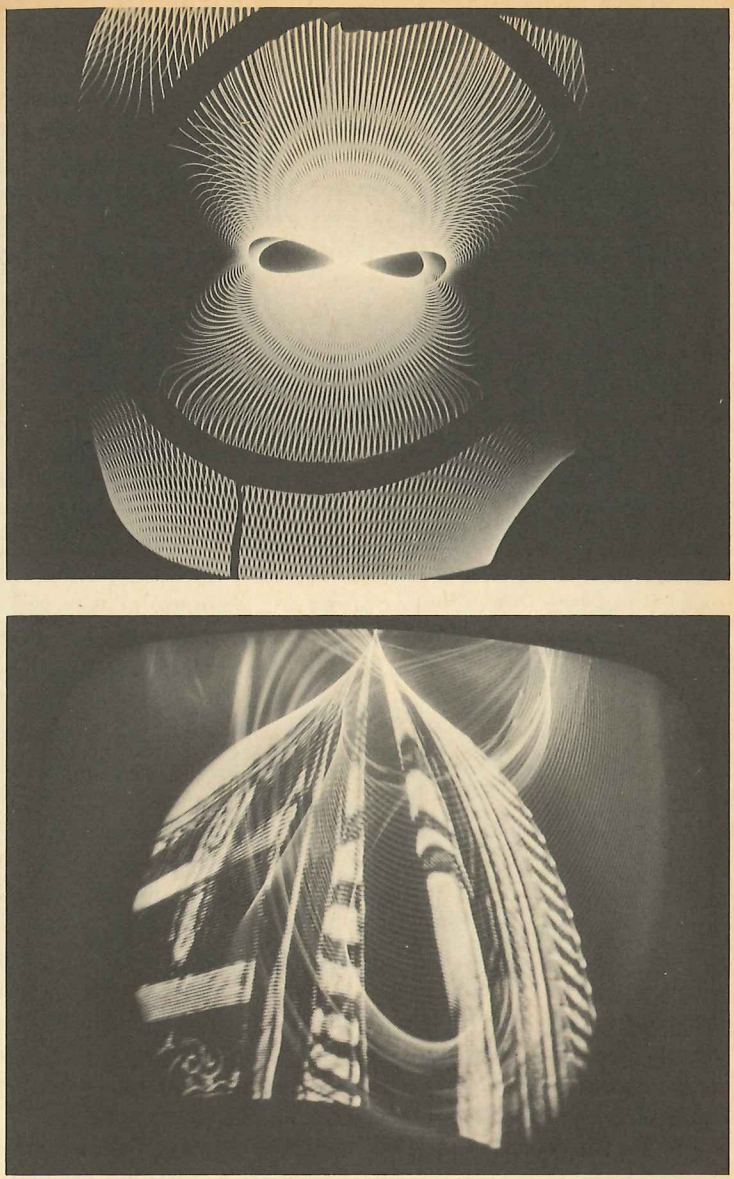




Loren Sears: *Sorcery.* 1968. VTR. Black and white. 30 min. "I wanted to express a feeling of entrapment in the electronic environment."

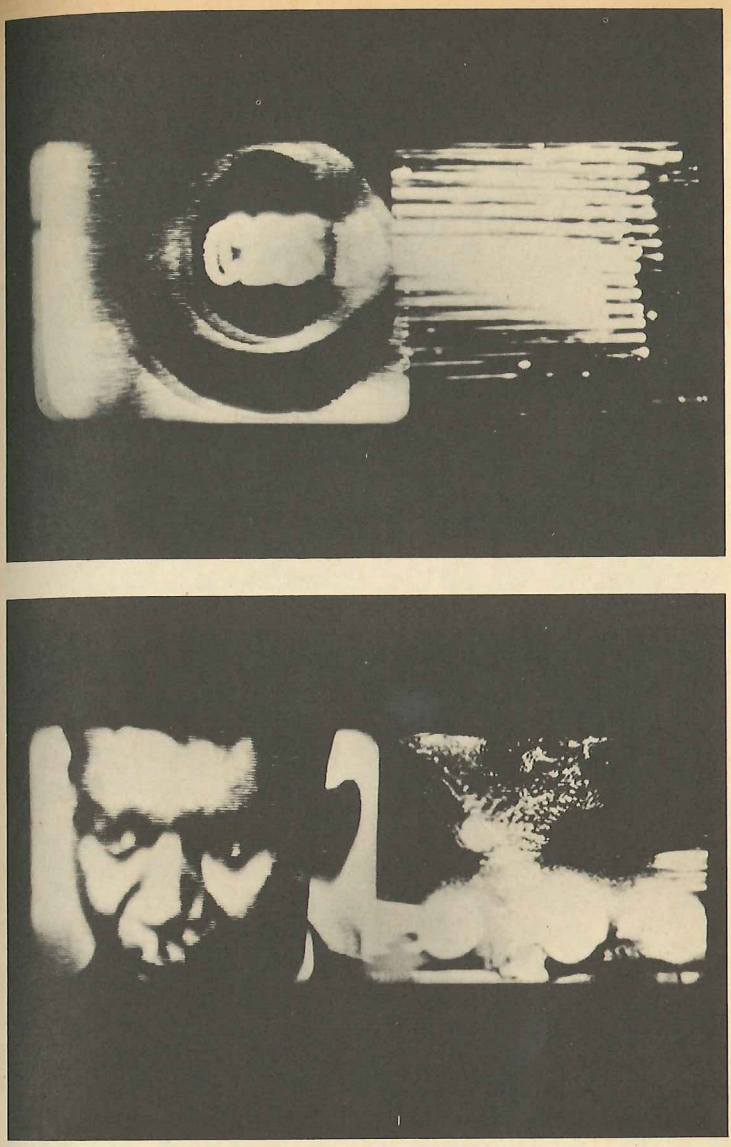


Otto Piene: *Electronic Light Ballet.* 1969.
Hi-Band Color VTR. 15 ips. 5 min.
Lighter-than-air space contrasted with vivid videospace in Piene's usual elegant fashion.

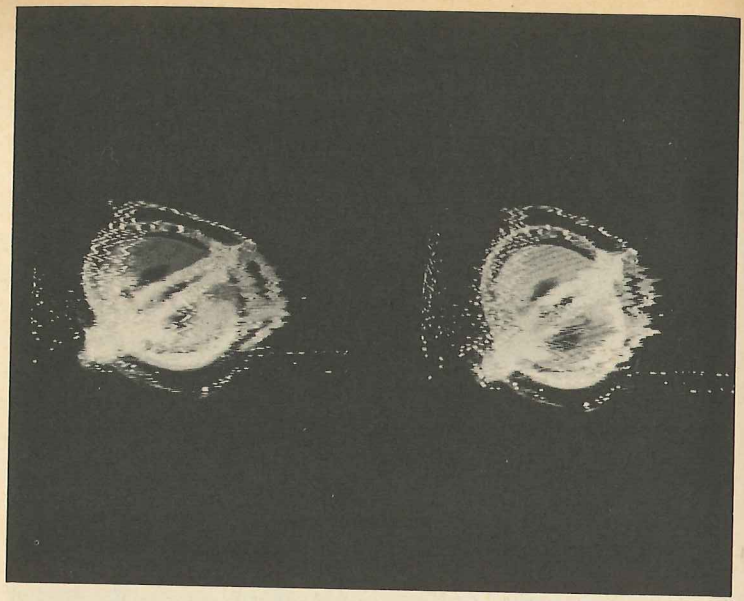


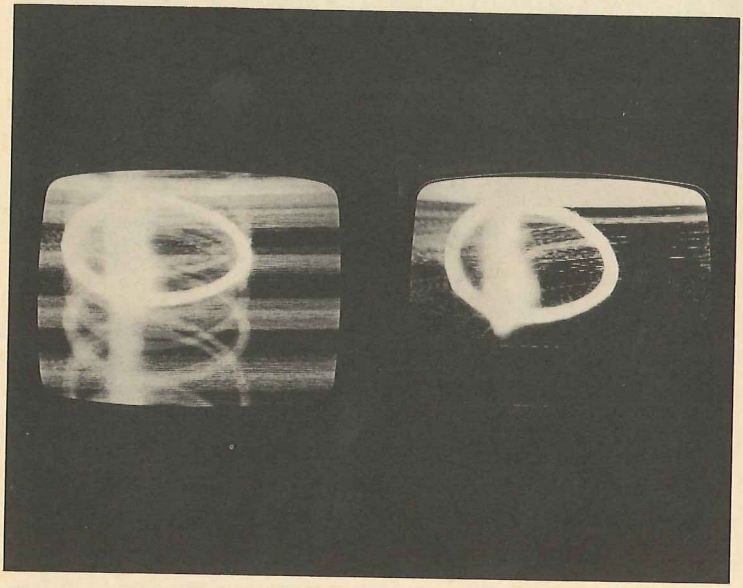
Electromagnetic distortions of the video image by Nam June Paik. "Out of this tangle of wires and boxes comes some of the most exquisite kinaesthetic imagery in all of electronic art." Photos: Peter Moore.

"Television has not yet left the breast": Nam June Paik with Charlotte Moorman in *TV Bra for Living Sculpture.* Howard Wise Gallery, New York, 1969. Images are modulated by musical tones played on the cello. Photo: Peter Moore.

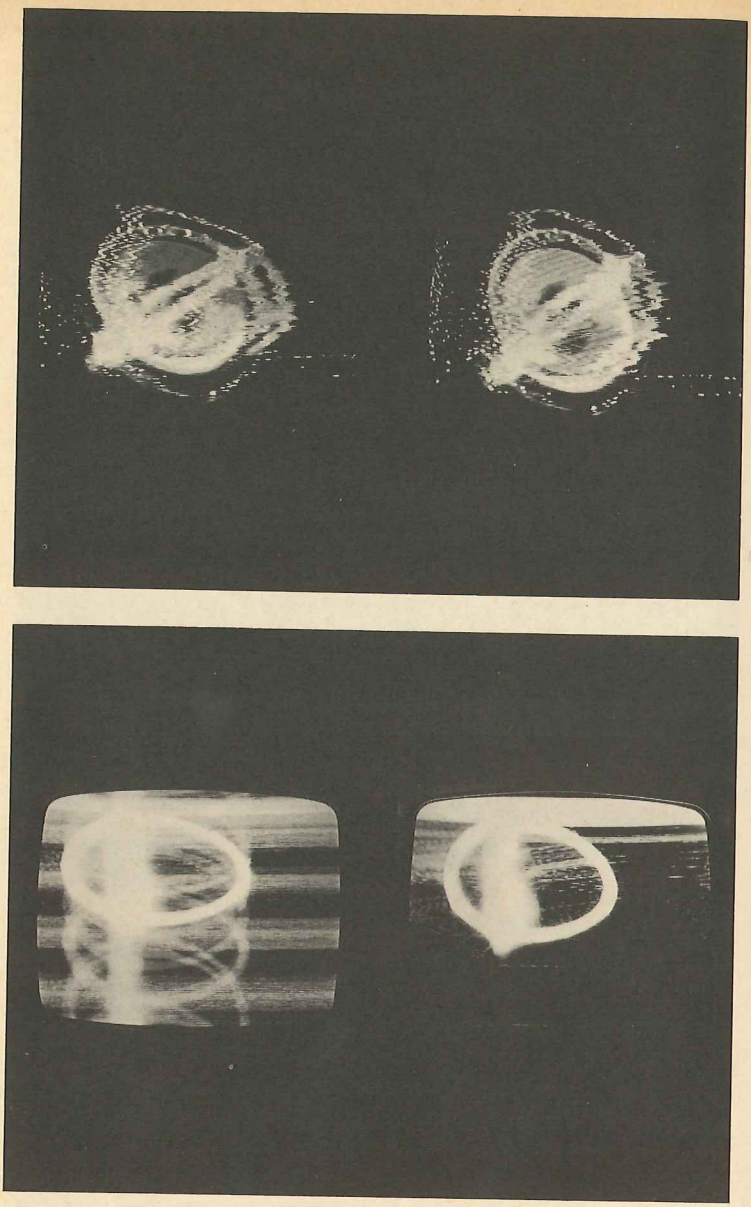


Aldo Tambellini: *Black TV*. 1964–68. 16mm. Black and white. 9½ min. Two years of TV news compressed into a staccato barrage of sight and sound.

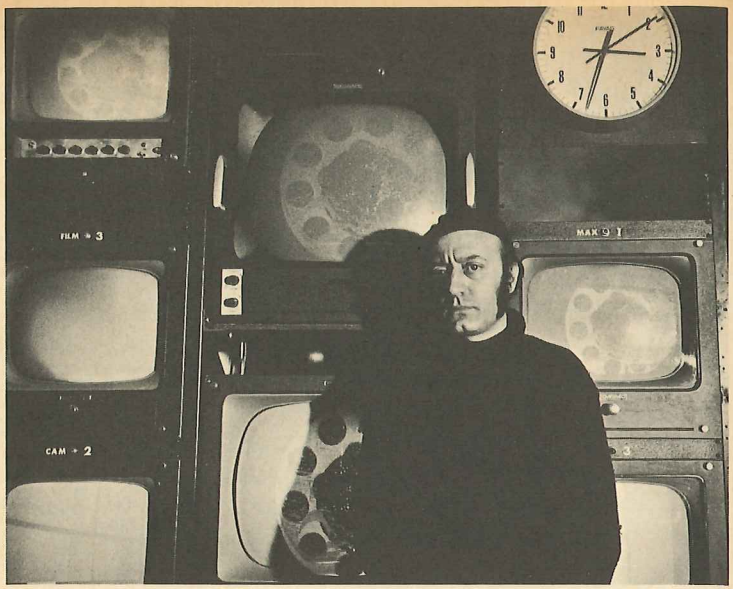


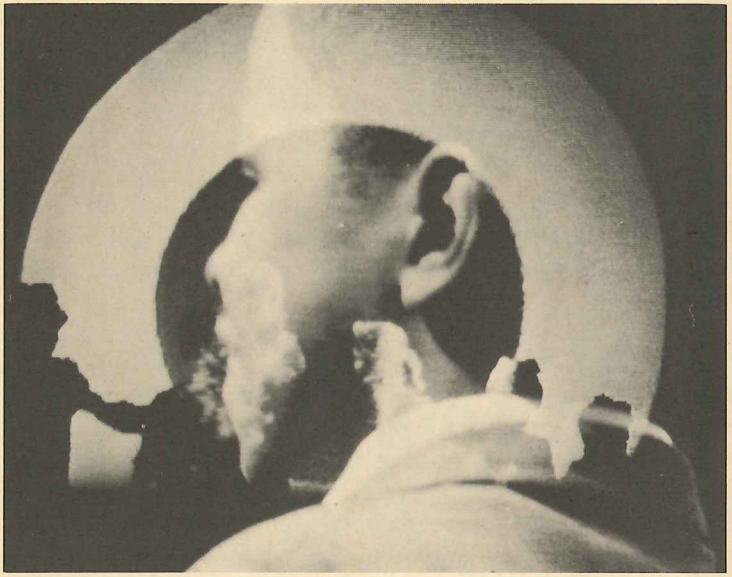


Aldo Tambellini: *Black Video Two.* 1968. VTR. Black and white. Both image and sound were generated electronically. Made in collaboration with engineer Ken Wise. Photos: Peter Moore.

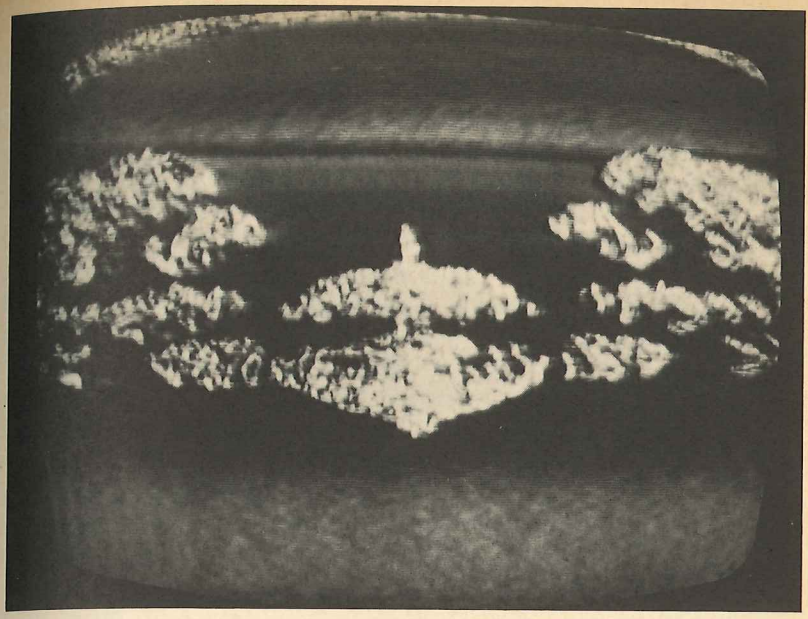


Aldo Tambellini: *Black Video Two.* 1968. VTR. Black and white. Both image and sound were generated electronically. Made in collaboration with engineer Ken Wise. Photos: Peter Moore.





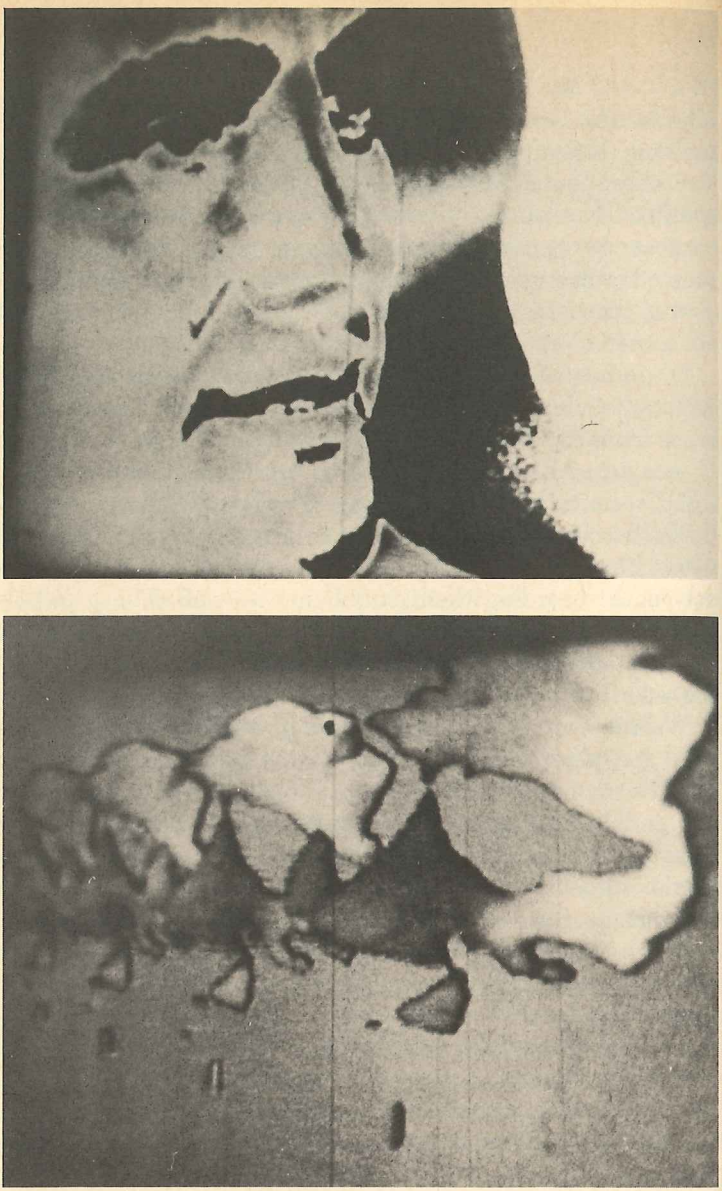
Aldo Tambellini in control room of WGBH-TV, Boston. *Below,* a scene from *Black* (1969), an experimental videotape he produced at the station with 1,000 slides, seven 16mm. projectors, thirty black children, and three TV cameras.



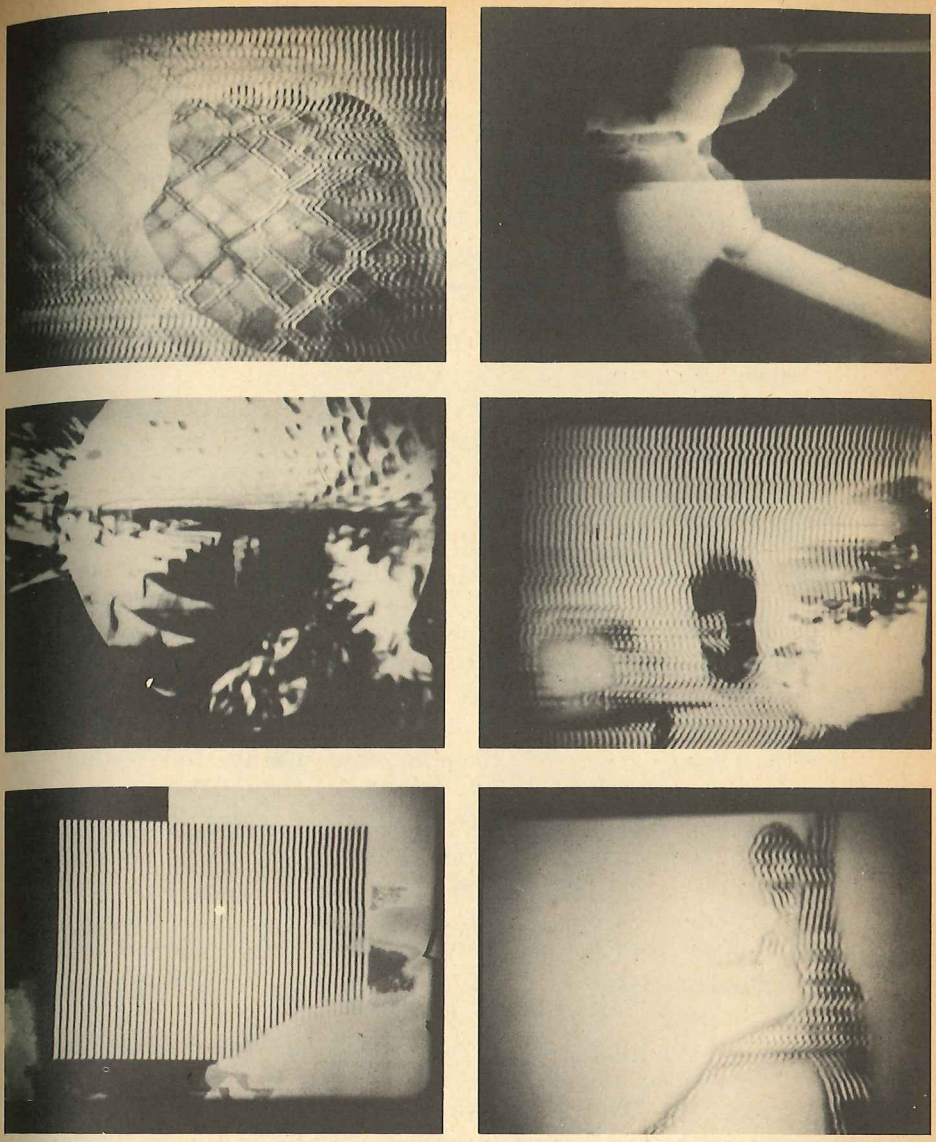
Eric Siegel: *Psychedelevision.* 1968–69. Synthesized VTR. "Great waves of curling clouds sweep under and over the viewer in turbulent fury."

show. "A work of genius," wrote video artist Peter Sorensen in a rave review devoted entirely to Siegel's tape. A reviewer for *Time* found *Psychedelevision* ". . . closer to Kubrick's *2001* than to Disney's *Fantasia* . . . a glowing visual abstraction."

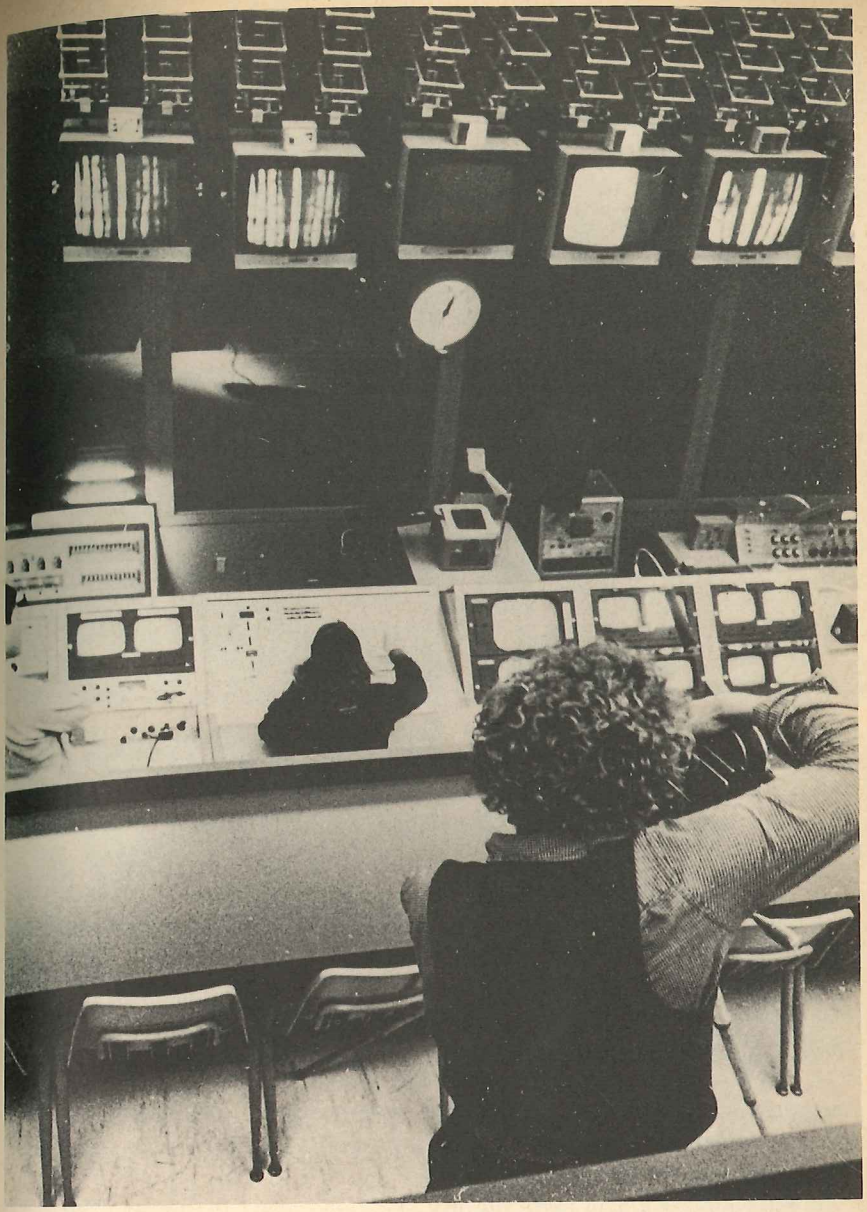
Siegel's synthesizer is a device that converts the gray scale of a video signal (in this case from a portable videotape recorder playback unit) into changes in hue on the screen of a color TV set. The results are, according to Siegel, "electronic Rorschach patterns in the context of a metaphysical statement." The statement is the tape he prepared for processing through the synthesizer, and this tape itself was recorded through special equipment that the young artist, characteristically, calls his "magic box." This device, more aptly described as a "video effects generator," processes images from a portable TV camera during the actual taping: the images are transformed during the process of moving from the camera to the videotape recorder.



Scott Barlett: *Moon.* 1969. VTR/16mm. film. Color. 8 min. ". . . A purple face appears in the sky and is fragmented into infinity . . ."



Tom DeWitt: *The Leap.* 1968. VTR/ 16mm. film. Color. 6 min. "A man seems to interact physically with videographic apparitions . . . androgynous symbols and arcane electronic voodoo . . ."



Scott Bartlett filming Tom DeWitt at work in television control room. Photo: William Bishop.

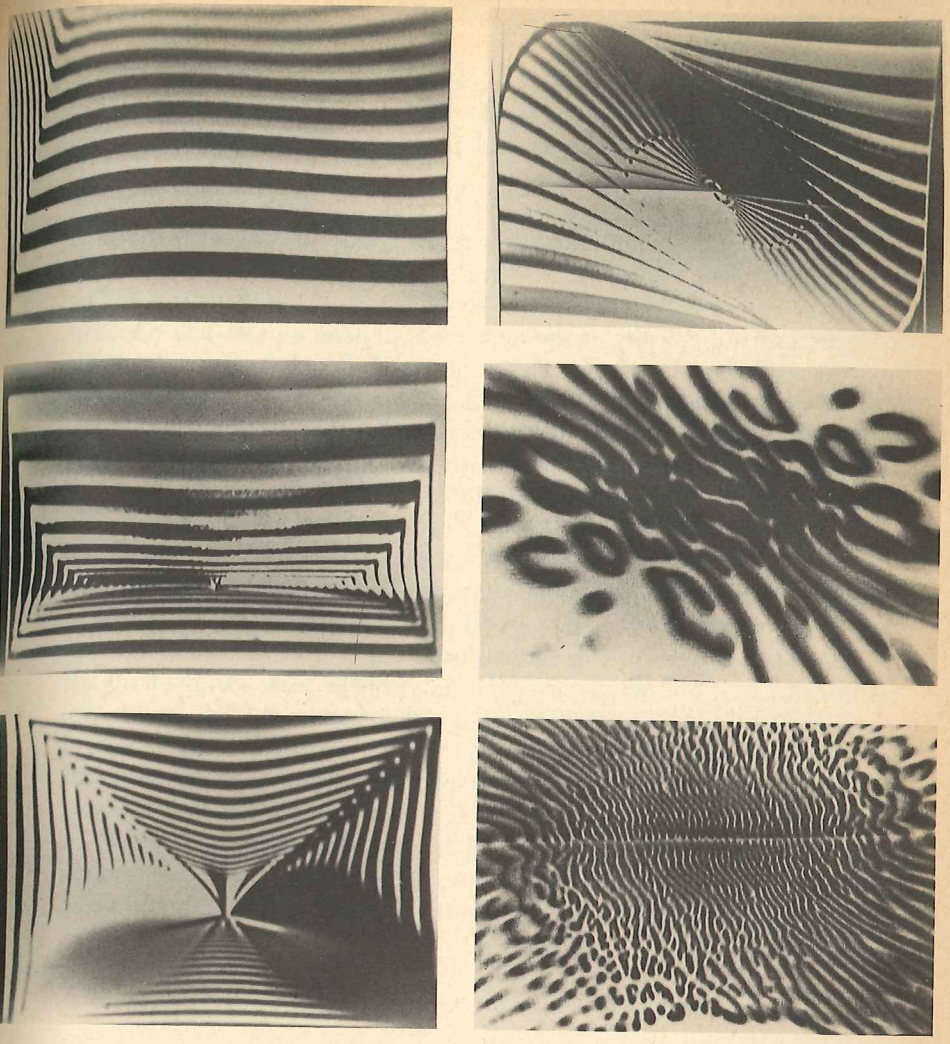
Jud Yalkut: *Paikpieces.* (*Left column*) *Beatles Electroniques.* 1967. VTR/16mm. film. Black and white. 3 min. (*Right column*) *Videotape Study No. 3.* 1968. VTR/16mm. film. Black and white. 5 min.

The King of Sweden as seen in videographic film *Monument* (1967), by Ture Sjölander and Lars Weck.

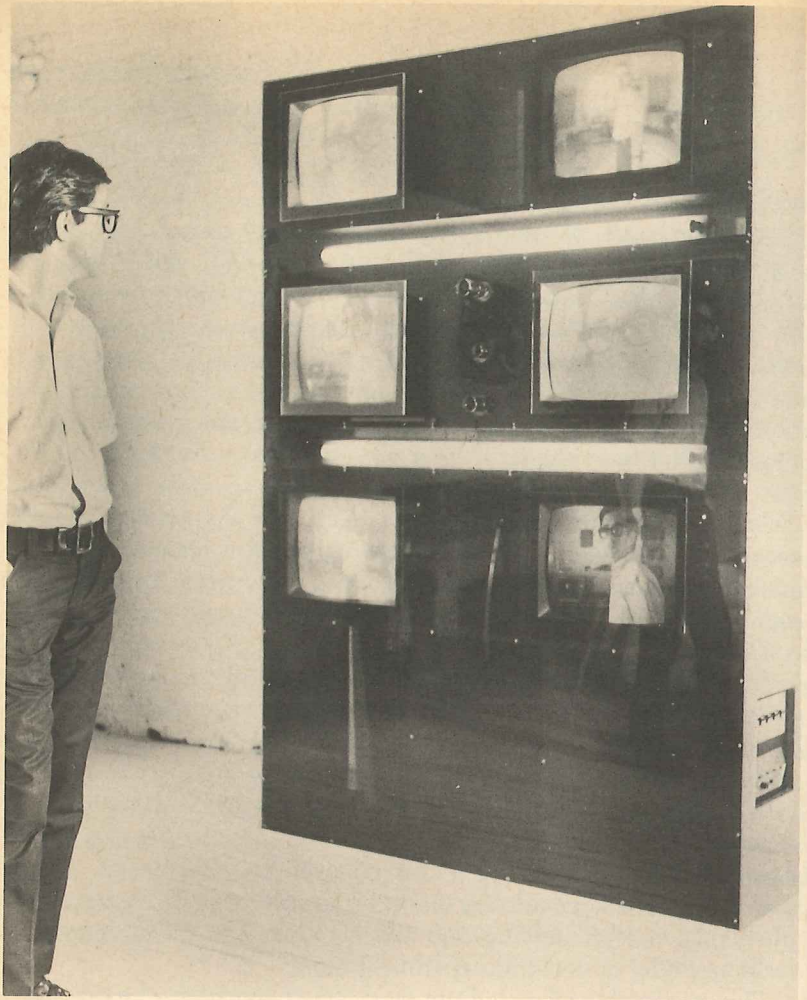
Paul McCartney in *Monument.*

sequences unlike any other video art. We see the Beatles, Charlie Chaplin, Picasso, the *Mona Lisa,* the King of Sweden, and other famous figures distorted with a kind of insane electronic disease. Images undergo transformations at first subtle, like respiration, then increasingly violent until little remains of the original icon. In this process, the images pass through thousands of stages of semicohesion, making the viewer constantly aware of his orientation to the picture. The transformations occur slowly and with great speed, erasing perspectives, crossing psychological barriers. A figure might stretch like Silly Putty or become rippled in a liquid universe. Harsh bas-relief effects accentuate physical dimensions with great subtlety, so that one eye or one ear might appear slightly unnatural. And finally the image disintegrates into a constellation of shimmering video phosphors.

More than an experiment in image-making technologies, *Monument* became an experiment in communication. *Monument* became an image-generator: newspapers, magazines, posters, record



Lutz Becker: *Horizon.* 1968. Video feedback. 16mm. Color. 5 min. Tightly controlled phasing between a TV camera and its own output monitor.



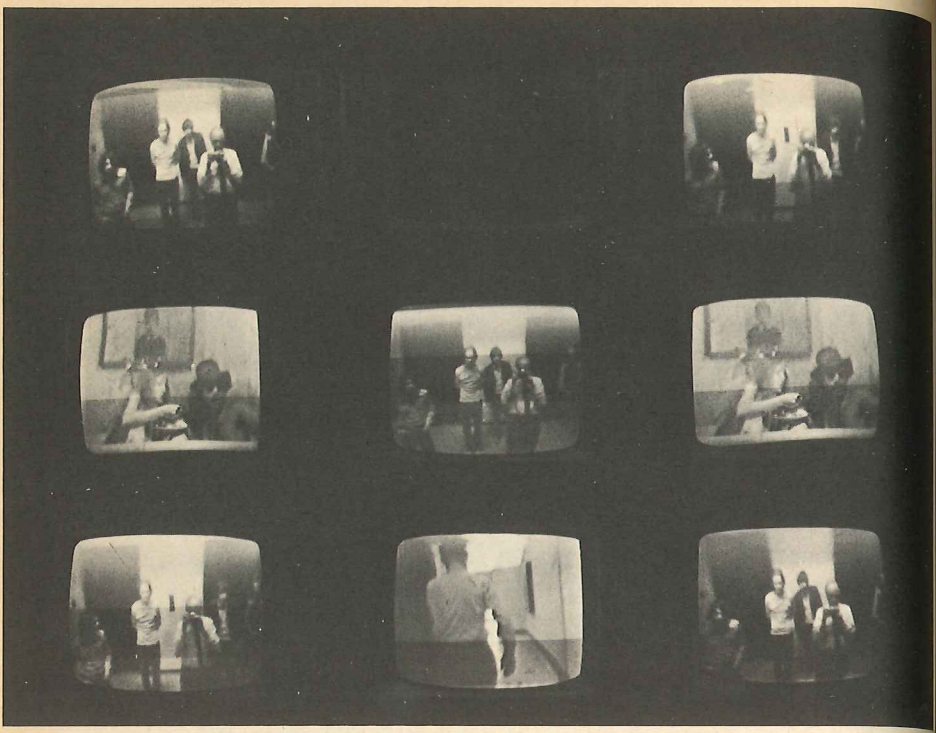
Les Levine with *Iris.* 1968. Three TV cameras and six monitors in an eight-by-five console. Collection of Mr. and Mrs. Robert Kardon, Philadelphia, Pennsylvania.

Les Levine with *Contact: A Cybernetic Sculpture.* 1969. Photo: courtesy of Museum of Contemporary Art, Chicago, Illinois.

image, no definite image. One could equate it, because of its flexibility, with looking at a person sitting in a chair: he looks as he always looks except that his behavior changes your image of him. Television has this quality: it always somehow looks the same, but it's always doing something different."

Frank Gillette, Ira Schneider: *Wipe Cycle*

Unlike Levine's work, the effect of *Wipe Cycle,* by the young New York artists Frank Gillette and Ira Schneider, was to integrate the viewer and his local environment into the larger macrosystem of information transmission. *Wipe Cycle* was first exhibited at the Howard Wise Gallery in New York in 1969. It consisted of nine monitors whose displays were controlled by synchronized cycle patterns of live and delayed feedback, broadcast television, and taped programming shot by Gillette and Schneider with portable



Frank Gillette and Ira Schneider: *Wipe Cycle.* 1969. TV camera, closed-circuit system, nine monitors, tapes, broadcasting. Photo: courtesy of Howard Wise Gallery, New York.

equipment. These were displayed through alternations of four programmed pulse signals every two, four, eight, and sixteen seconds. Separately, each of the cycles acted as a layer of video information, while all four levels in concert determined the overall composition of the work at any given moment.

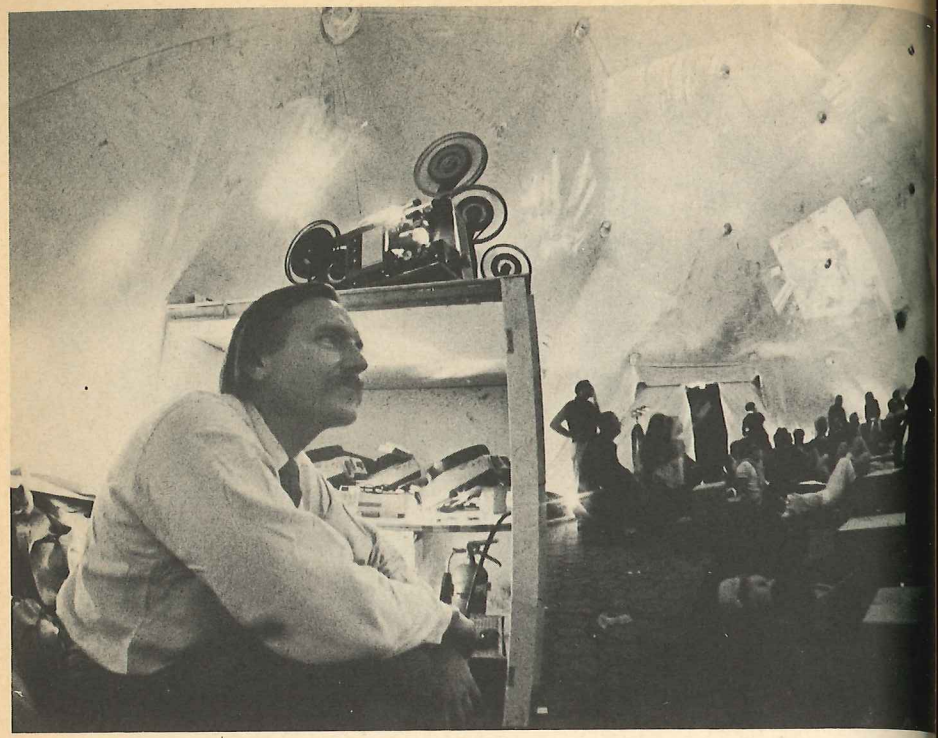
"The most important function of *Wipe Cycle,*" Schneider explained, "was to integrate the audience into the information. It was a live feedback system which enabled the viewer standing within its environment to see himself not only now in time and space, but also eight seconds ago and sixteen seconds ago. In addition he saw standard broadcast images alternating with his own delayed/live image. And also two collage-type programmed tapes, ranging from

Stan VanDerBeek with multifaceted surface for multiple-projection intermedia environment. Photo: Richard Raderman.

globe were properly distributed. We're developing all these fabulous hardware systems that soon will make life a process of continual myth-generation for the individual as well as the collective ego.

"We're just fooling around on the outer edges of our own sensibilities," says Stan VanDerBeek.

Unconsciously we're developing memory storage and transfer systems that deal with millions of thoughts simultaneously. Sooner than we think we'll be communicating on very high psychic levels of neurological referencing. It's becoming extremely rich. This business of being artist in residence at some corporation is only part of the story; what we really want to be is artist in residence of the world, but we don't know where to apply. Major



Stan VanDerBeek presides over intermedia presentation at his Movie Drome in Stony Point, N.Y. Photo: Bob Hanson.

internationalizing by artists is going to become very important, and so will the myth-making process. What we're looking for in some sociologically appropriate way is a third side to each confrontation: a way to deal with each other through a medium.

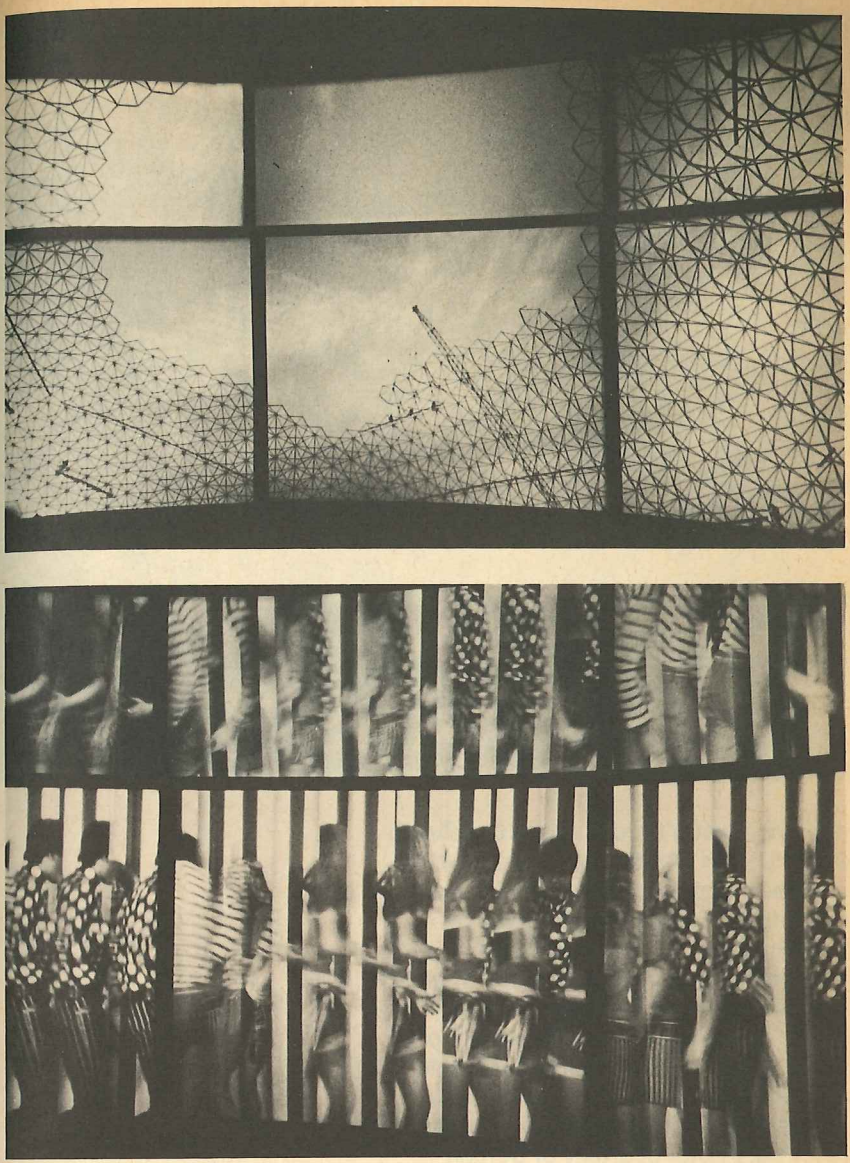
All media, like the automobile and telephone, are essentially a third party which relates us to whatever else it is we're doing. I think the student riots are a manifestation of a deep-seated awareness of this problem. There's such a contagiousness now with rioting; I think we realize that rarely do we directly deal with issues, personally, physically, intimately, with real body contact. That could easily be the cause, or at least partial cause, of the riots. We suddenly realize that riots may be the only real form of theatre left in which we're not just an audience.

But, you see, being an audience is necessary. A major factor in living in an overpopulated world is that we really *cannot* deal with each other

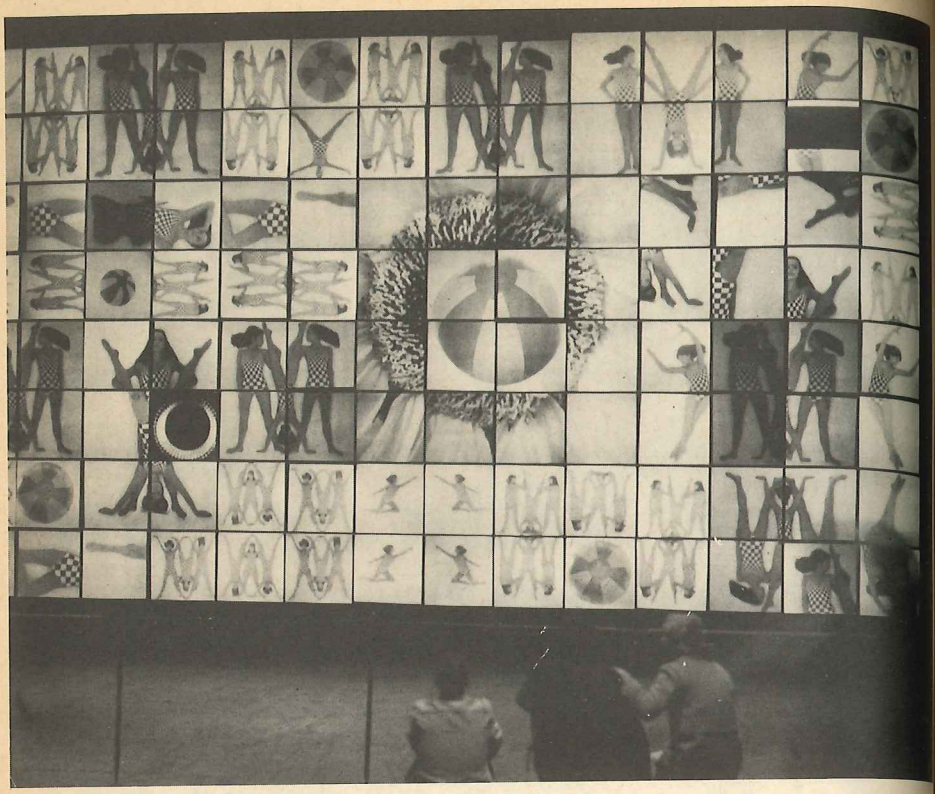
Chamber Three of *Labyrinthe,* in a five-screen cruciform arrangement. Photo: courtesy of the National Film Board of Canada.

which there'll be a tight relationship between the movie and the architecture in which it's housed. We took a step in that direction with *Labyrinthe.* A new language is going to develop. There are ways in which shaping the relationships of images cuts through the superficial realities and reaches for something deeper."

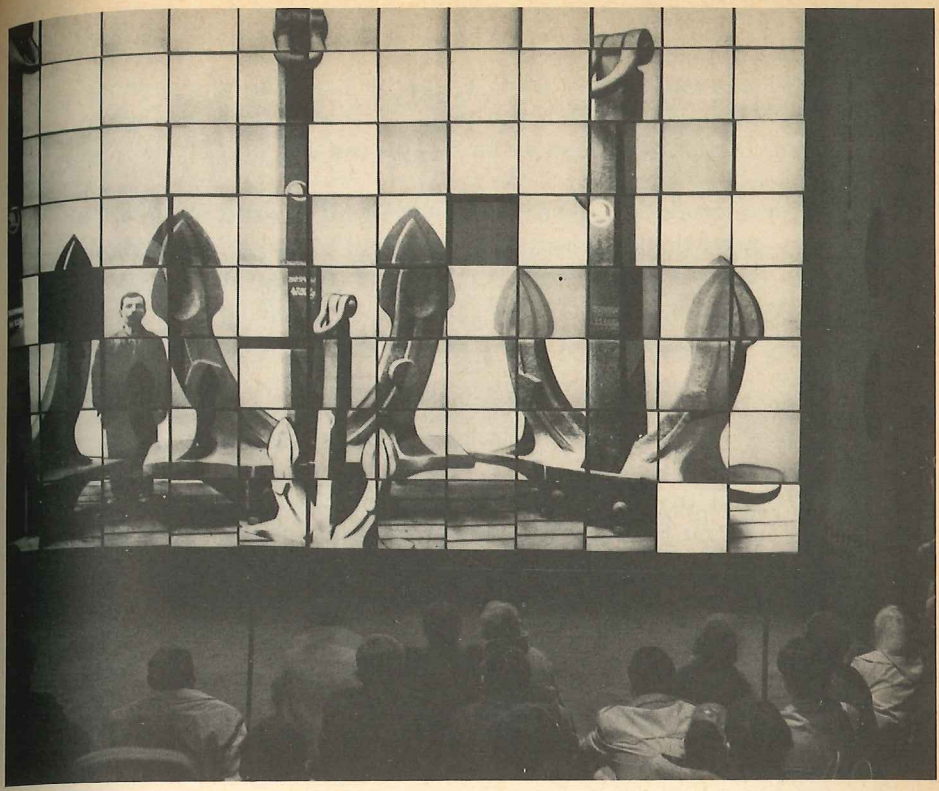
Francis Thompson, a pioneer in large-scale multi-image film techniques, currently is working toward both micro- and macro-environmental experiences. "We're interested in films expanding and swallowing a huge audience," he said, "but we're also interested in pictures the size of a wristwatch. We would like to make the world's smallest motion picture as well as the largest. As regards the idea of expanded cinema, I would like to make a theatre that would be a huge sphere, as big as Radio City Music Hall or larger, and seat the



Two scenes from Francis Thompson's *We Are Young* for the Canadian Pacific–Cominco Pavilion at Expo '67. The six-screen arrangement covered a total area of 2,952 square feet. By comparison, normal commercial theatre screens average 450 square feet.



The Diapolyceran Screen at the Czechoslovakian Pavilion at Expo '67. The 32 by 20 foot screen was composed of 112 rear-projection cubes containing two slide projectors each. In turn, each slide projector was equipped with a tray of eighty slides that could be changed in half a second. Thus each cube was capable of displaying 160 images in eighty seconds. The entire wall could be one picture, or sections of it could be delayed or speeded as desired. Photo: courtesy of Bergen Motion Picture Service.



The Diapolyceran Screen, Expo '67. Photo: courtesy of Bergen Motion Picture Service.

Cerebrum: "All the senses were stimulated in various subtle ways." Photo: Ferdinand Boesch.

by most of the guests. The nature of Cerebrum is such that it would be difficult to create an unpleasant scene.

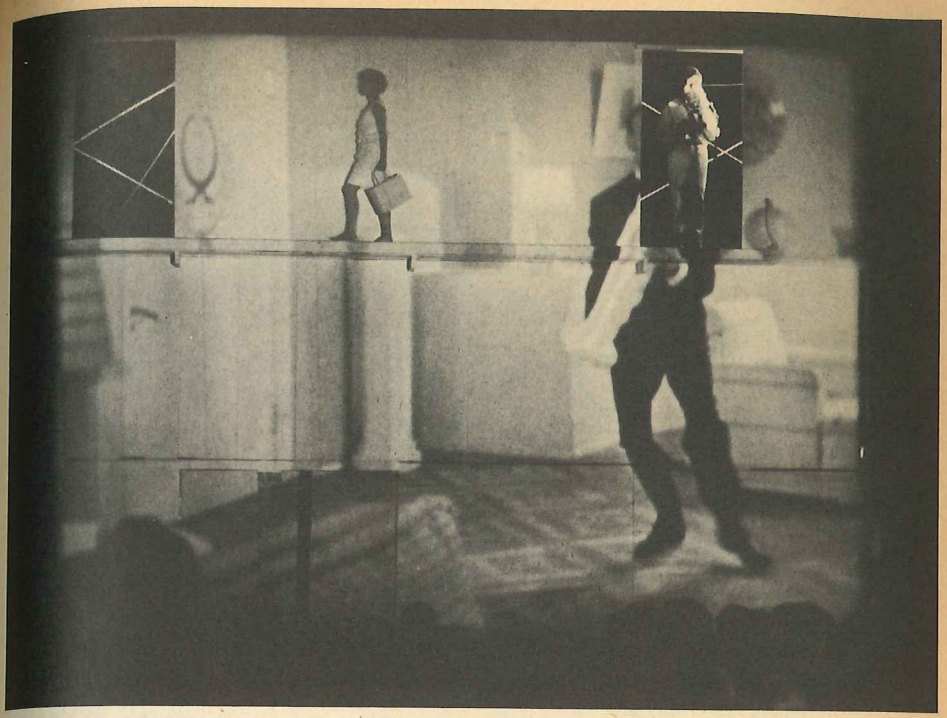
I found the unisex effect of the gowns quite stimulating. At one point male guides came around with mint-flavored menthol ice that they smeared on our lips with their fingertips. "What does it taste like?" they inquired softly, as though not expecting an answer. This intimate contact with a complete stranger in a relatively "public" setting was a challenging experience, particularly for men, who are not as disposed as women to physical intimacies in public. The young men were followed by girls who daubed our foreheads with a similar skin-tingling substance. These sensual encounters had an ethereal, gentle, transcendental effect. One appreciates the delicacy and poise necessary to accomplish them without embarrassment.

Carolee Schneemann: *Night Crawlers.* Expo '67. Live performers (*right*) contrasted with film projection.

little Volkswagen that drove in front of the film and stopped. It was stuffed with foam rubber. My partner and I performed a complex of physical handling on top of, and inside the VW while another person was pulling all the foam out. It was a very intimate and humorous event in front of this horrifying Vietnam film. Before it began, a girl and I went through the audience and stepped on their shoulders and knees and gave each person candy and cake. We spoke to them. They got very turned on by the whole thing. At the end we brought them into the performance area and played lights and sound around them. They found elements of the environment that they could start to tear down. They began rather hesitantly, but after they ripped a couple of

Carolee Schneemann: *Illinois Central.* 1968. "I've always thought that I'm creating a sensory arena . . . we must deal directly with the audience itself as performers." Photo: Peter Holbrook.

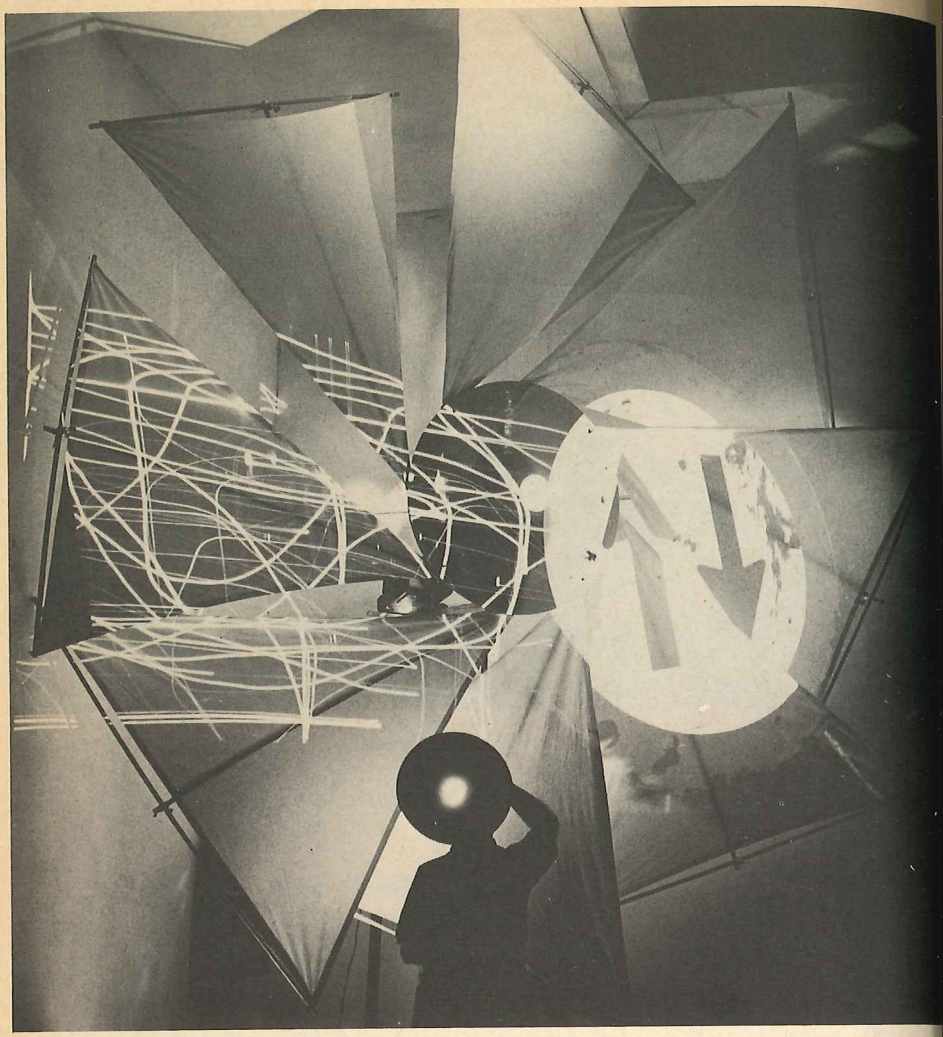
Centers: A Ritual of Alignments, as performed by Milton Cohen in his Space Theatre. 1969.



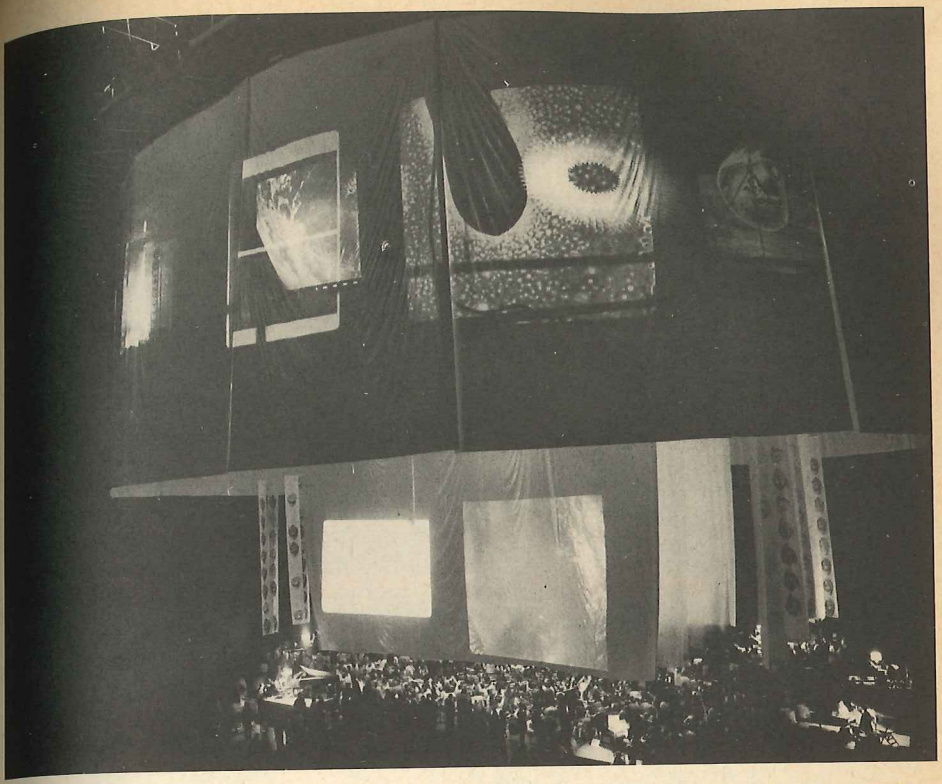
ONCE Group: *Unmarked Interchange.* 1965. Live performers interact with projection of *Top Hat,* starring Fred Astaire, Ginger Rogers. Photo: Peter Moore.

HPSCHD (computer abbreviation for Harpsichord) at the University of Illinois in May, 1969. Computer-written music consisted of twenty-minute solos for one to seven amplified harpsichords, based on Mozart's whimsical *Dice Game* music (K. Anh. C 30.01), one of the earliest examples of the chance operations that inform Cage's work. Computer-generated tapes were played through a system of one to fifty-two loudspeakers, each with its own tape deck and amplifier, in a circle surrounding the audience. Cage stipulated that the compositions were to be used "in whole or in part, in any combination with or without interruptions, to make an indeterminate concert of any agreed-upon length."

The university's 16,000-seat Assembly Hall in which the event was staged is an architectural analogue of the planetary system: con-



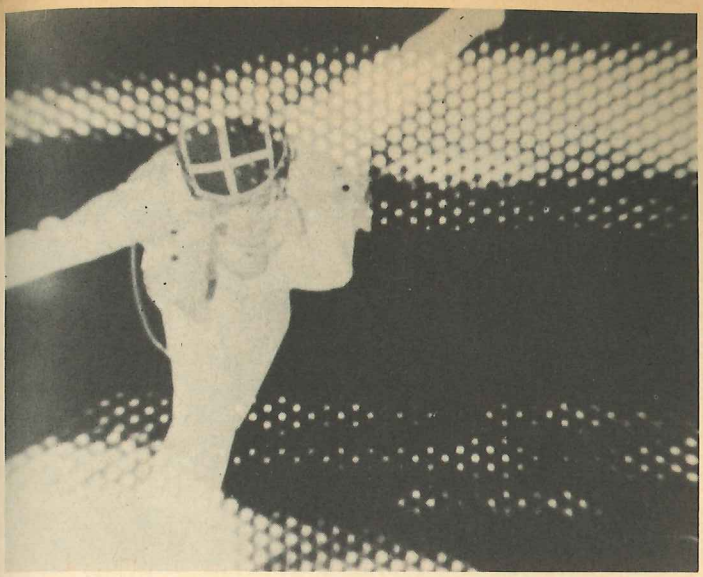
Milton Cohen's Space Theatre, Ann Arbor, Michigan. 1969. Sight and sound move in complex trajectories through a maze of shifting, revolving, faceted surfaces, seeking the target.



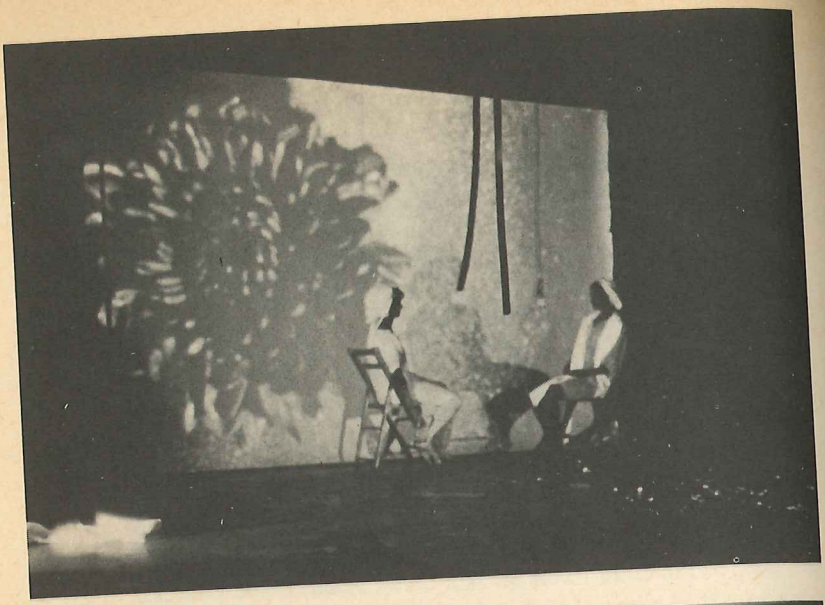
John Cage and Ronald Nameth: *HPSCHD.* 1969. Assembly Hall, University of Illinois, Champaign-Urbana. Fifty-two loudspeakers, seven amplified harpsichords, 8,000 slides, 100 films. Photo: courtesy of Ronald Nameth.

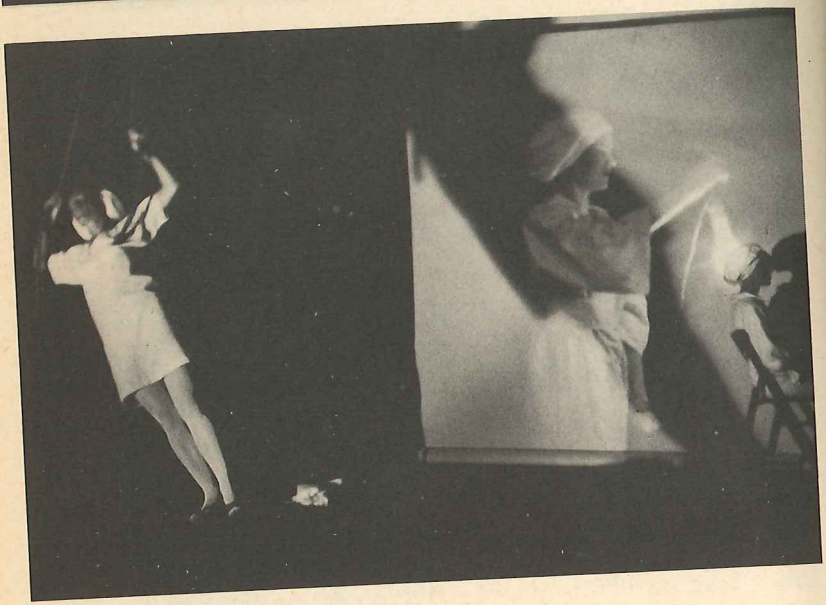
centric circular promenades and long radial aisles stretching from the central arena to the eaves of the domed ceiling. Each of the forty-eight huge windows, which surround the outside of the building, was covered with opaque polyethylene upon which slides and films were projected: thus people blocks away could see the entire structure glowing and pulsating like some mammoth magic lantern.

Over the central arena hung eleven opaque polyethylene screens, each one hundred feet wide and spaced about two feet apart. Enclosing this was a ring of screens hanging one hundred and twenty-five feet down from the catwalk near the zenith of the dome.

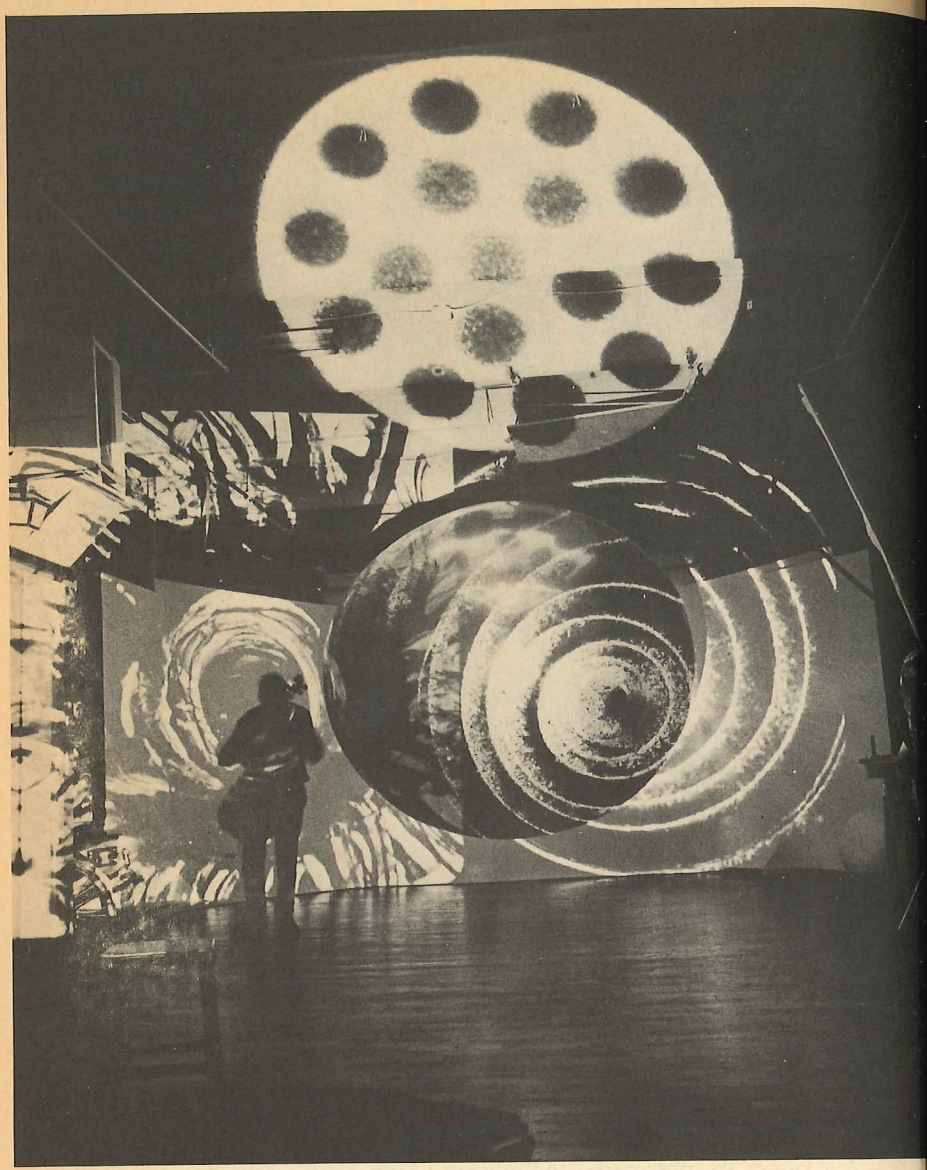


Two scenes from Ronald Nameth's triple-projection film *As the World Turns* for intermedia presentation *L's G.A.* 1968–69.



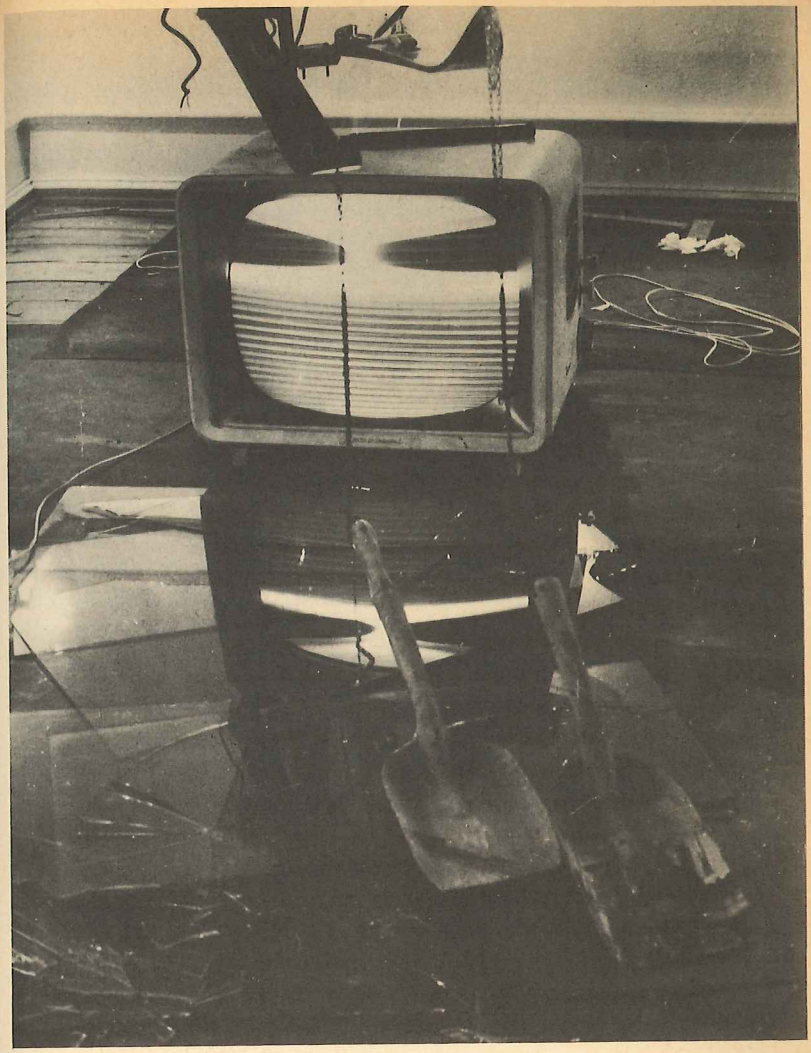


Two scenes from Robert Whitman's *Prune Flat.* 1965. Performers' actions were synchronized with their film versions. Photos: Peter Moore.

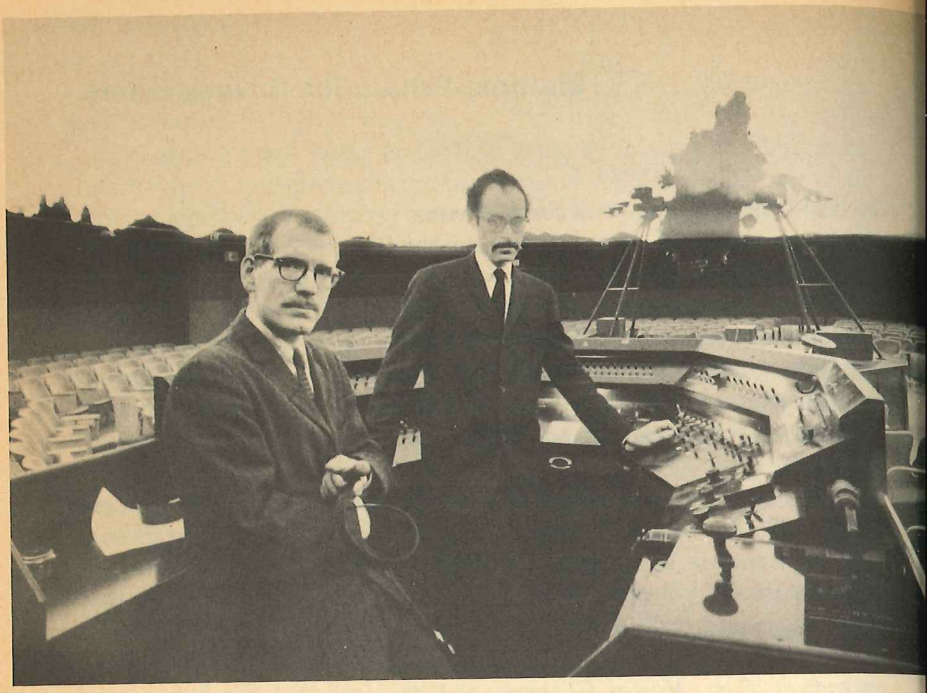


Aldo Tambellini: *Black Zero.* 1965. Shown at the artist's Black Gate Electromedia Theatre in New York.

Aldo Tambellini and Otto Piene: *Black Gate Cologne.* 1968. Tambellini's electromedia environment combined with Piene's helium-inflated polyethylene tubing at WDR-TV in Cologne, West Germany. Photos: Hein Engelskirchen.



Wolf Vostell: *Electronic Happening Room.* 1968. One of Vostell's de-collaged TV sets in a multiple-projection intermedia environment designed to generate an awareness of man's relationship to technology. Photo: Rainer Wick.



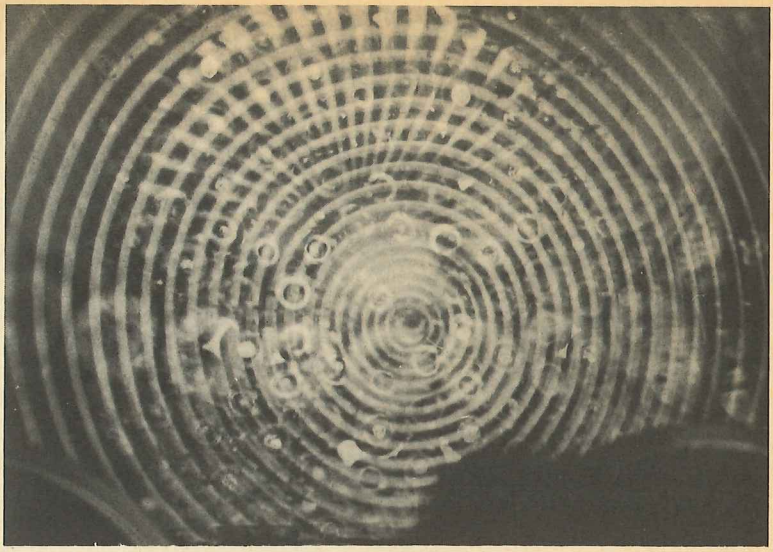
Henry Jacobs (*left*) and Jordan Belson at Morrison Planetarium in San Francisco, California, for Vortex Concerts.

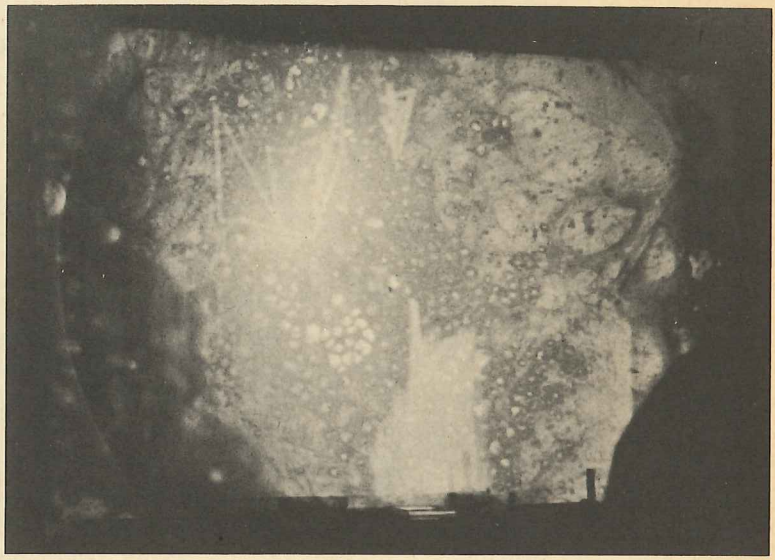
The Vortex Concerts

The legendary Vortex Concerts conducted by Henry Jacobs and Jordan Belson at Morrison Planetarium in San Francisco's Golden Gate Park from 1957 to 1960 were quintessential examples of lumia art integrated with sound in an intermedia environment. By present standards one could not ask for a more perfect setting. "Simply being in that dome was a holy experience," said Belson. "The entire theatre was like an exquisite instrument." And Jacobs recalls: "It was such an absurdly perfect situation that we just stopped altogether after we left the planetarium; when you begin with the ultimate there's nowhere else to go."

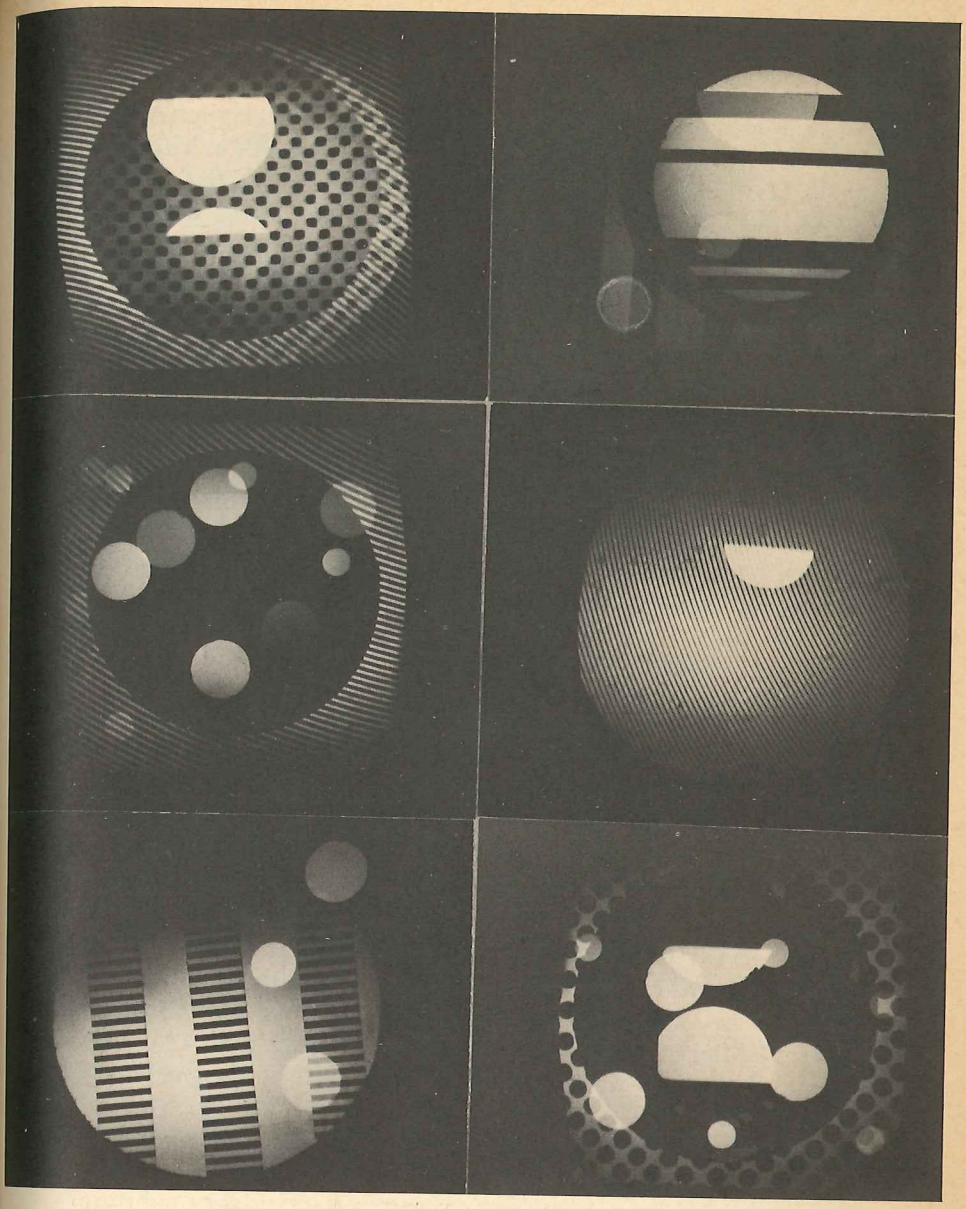
Vortex began in May, 1957, as a series of experimental and ethnic music concerts from tapes owned by Jacobs, a poet and composer of electronic music. Within a few weeks, however, he was joined by his

Planetarium projector shown equipped with two interference-pattern projectors (*top right*) for Vortex Concerts.





Two images from the constantly-evolving lightworks of the Single Wing Turquoise Bird in their studio at Venice, California. Photo: Gene Youngblood.



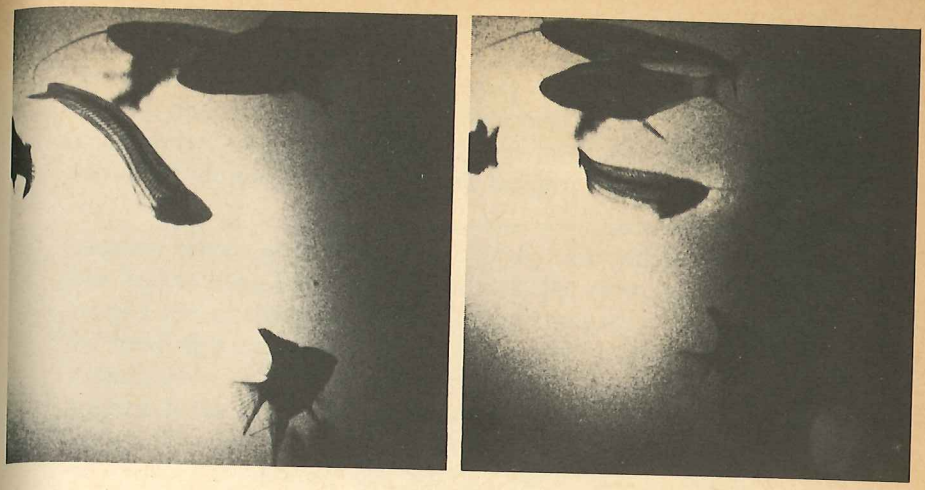
Sequence of images from *Circles,* a kinetic composition by Jackie Cassen and Rudi Stern, Theatre of Light, New York, 1969. Photo: Roy Blakey.

Diffusion of a laser beam in a project sponsored by Experiments in Art and Technology (EAT), New York, 1967. Photo: Peter Moore.

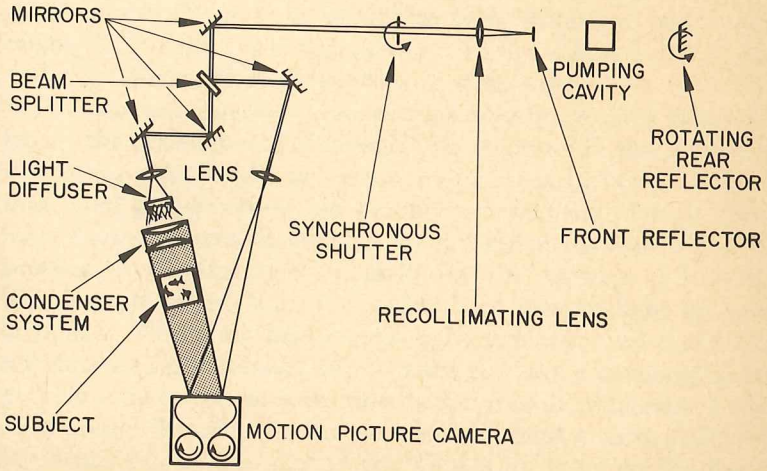
Greek root *holos* meaning whole, since they recorded a whole picture—both intensity and frequency.

In 1960 Dr. Theodore Maiman of the Hughes Aircraft Company in California invented an instrument called the *laser,* named from the initials of *L*ight *A*mplification by *S*timulated *E*mission of *R*adiation. As the name implies, the laser generates a beam of light that is totally coherent since it is all one wavelength. Then in 1965 Emmett N. Leith and Juris Upatnieks of the University of Michigan used the laser in a modification of Dr. Gabor's original holographic technique to produce the first completely successful three-dimensional image. Instead of using one beam like Dr. Gabor, Leith and Upatnieks used a prism to derive two beams from one laser. The subject beam was used to illuminate the object, while the reference beam was

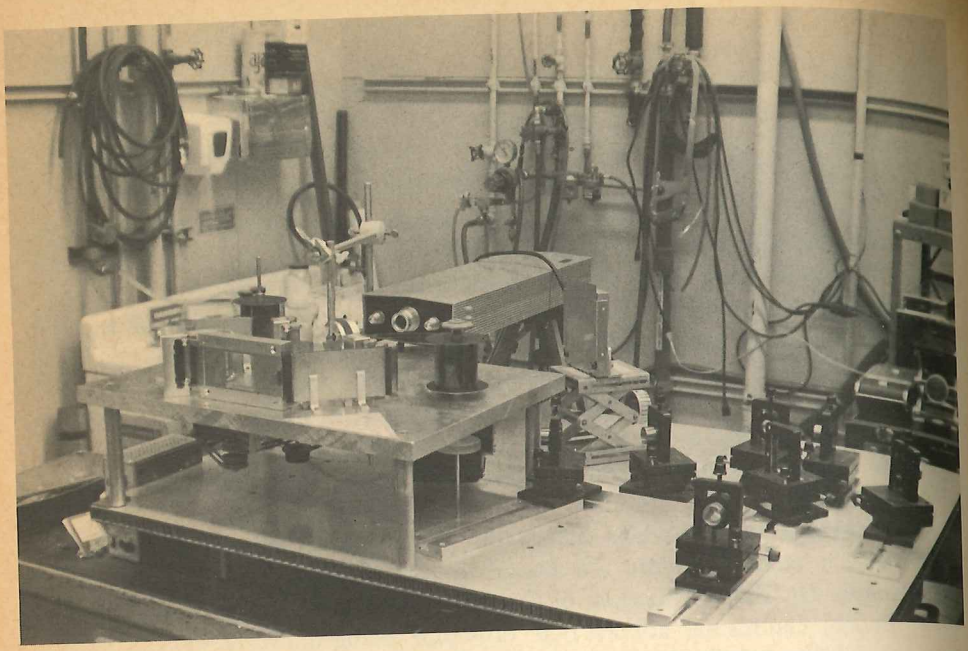
Multiple-exposure photo approximates what a viewer would see in animated hologram made at Bell Telephone Laboratories. Either the plate is moved across a laser beam, or it remains stationary and the viewer moves his head from left to right. The figure appears to rotate in full three dimensions. Photo: Bell Telephone Laboratories.



Two photos from a holographic movie of tropical fish made by Alex Jacobson and Victor Evtuhov at Hughes Research Laboratories, Malibu, California. 1969. Laser light was shined through the aquarium at camera. Dark area at right of photos does not appear in the actual movie. Photos: Hughes Research Laboratories.



Schematic diagram of Hughes holographic movie system. Laser is indicated as "pumping cavity."

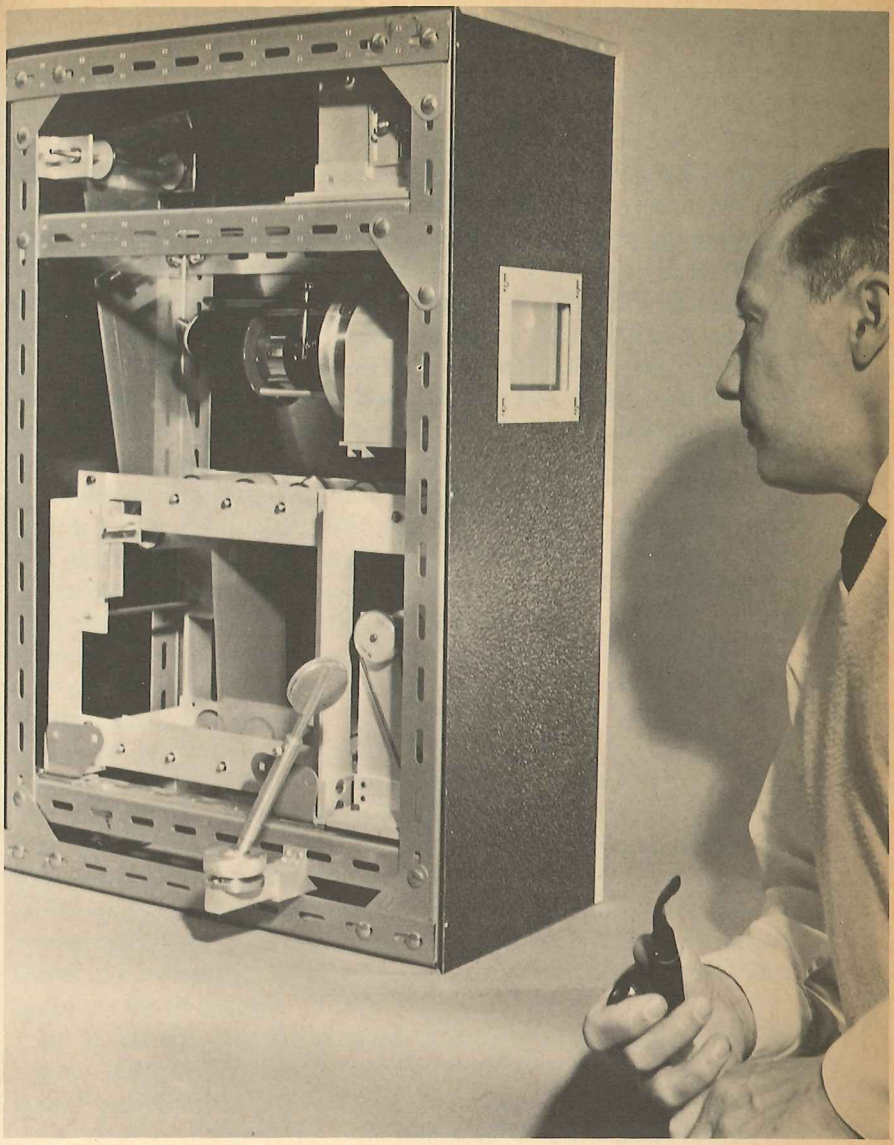


Hughes holographic projection system. Viewer must peer through 70mm. aperture of film transport table. Photo: Gene Youngblood.

powerful Grand Coulee Dam is, but that's a large portion of its output."

Seeking a solution to this problem, for the last few years several firms have been working on white-light holography, in which ordinary illumination sources are used both to make and view the hologram. Optical systems are used to overcome the incoherence of white light. Another proposal is the technique called *integral photography* in which many ordinary photographs from different perspectives are combined in holographic form. The resulting image, although synthetic, gives all the properties of a true hologram of the same scene. And since the image is formed by conventional photography, any type of illumination can be used. The process is extremely complex and tedious, however, and it is practically inconceivable that a movie could be made in this manner.

Both Dr. Jacobson and Dr. Wuerker insist that holography depends on the use of laser light in recording as well as viewing the



Holographic movie viewing system developed by North American Philips Corporation. Laser inside the box shines through 70mm. film as it passes viewing aperture. Photo: North American Philips Corp.