SCULPTURE AS PROCESS

by

BERND KRACKE

M.F.A., Academy Of Fine Arts

Hamburg, West Germany
1978

SUBMITTED TO THE DEPARTMENT OF
ARCHITECTURE IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS OF THE
DEGREE OF

MASTER OF SCIENCE IN VISUAL STUDIES

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

June 1981

Signature of Author_____
Department of Architecture
Center For Advanced Visual Studies
May 5, 1981

Certified by_____
Otto Piene, Director
of Center For Advanced Visual Studies
Thesis Supervisor

Accepted by_____
Nicholas Negroponte, Chairman
Departmental Committee for Graduate
Students

SCULPTURE AS PROCESS

by

BERND KRACKE

Submitted to the Department of Architecture
on May 5, 1981, in partial fulfillment of the
requirements for the degree of Master of Science in
Visual Studies

ABSTRACT

Sculpture as process is rooted in the historical development of movement as a theme of art in general and of sculpture in particular since 1900. The impact of the industrial revolution and the subsequent scientific/technological boom moved sculpture increasingly from static to dynamic models of reality. Scientific research pushed beyond the natural limitations of the senses, expanding man's perception of reality and demanding an ever more encompassing world view. That which was previously unseen, unheard and unknown became tangible in the micro and macro perspectives of the "New Landscape" (Kepes). Change arrived with challenge - to integrate the "New Landscape" with the familiar - and accompanied by turbulent social transformation.

Whether rejected or embraced, the machine became an obsessive metaphor for both human progress and destruction. As a synthesis of object and process, it catalyzed the transition from static to dynamic models of reality. The initially rough 'machine aesthetic' led to the development of kinetic sculpture and towards the integration of art, audience and environment. With the introduction of electronics and the computer, movement became less fascinating as an isolated phenomenon by gaining meaning as an integral part of a whole system. Cybernetic mechanisms - regulatory functions controlling input and output of organic and inorganic systems - became important aspects of new perception and models. Processes of communication within systems and between systems came to define a dynamic scale, inversely related, of parts to the whole.

Sculpture as process, the term my thesis seeks to define and my installation to embody, generates these communication processes in the environment, materializes and records them as temporary dynamic patterns, and stores them as information in a randomly accessible memory.

Thesis Supervisor: Otto Piene

Title: Director of Center For Advanced Visual Studies

ACKNOWLEDGEMENTS

I would like to thank the 'Studienstiftung des deutschen Volkes' and the 'Deutscher Akademischer Austauschdienst' for grants, which allowed me to study at the Massachusetts Institute of Technology. Furthermore, I would like to thank Otto Piene and all Fellows at the Center For Advanced Visual Studies/M.I.T. for the encouragement and the support of my work. The Council For The Arts at M.I.T., Educational Video Resources and Architecture Machine Group helped me with substantial contributions to realize my thesis project.

Sculpture as process is based on a collaborative and participatory spirit. I would like to acknowledge many anonymous helping hands, which materialized this spirit in my installation and in particular Rita Caviglia, Sandy Folts, Ellen Sebring and Skip Tenczar for their special inspiration and support.

CONTENTS

INTRODUCTION

My thesis proposes sculpture as process towards an expanded understanding of environment. Based on my experiences working in environmental art since 1973 I became aware of the complex, dynamic relationships maintained by the various elements of the environment. These elements are more correctly understood as processes in constant transformation than as static entities. Thus, the natural and the man-made world, as well as the person and the society are interrelated in a composite system of organic and inorganic processes. These processes, visible and material or invisible and nonmaterial, generate the environment.

Environmental art, intentionally or not, often becomes an obstacle to these vital processes, resulting in public reactions of rejection, destruction, graffitti, etc. I consider this collision-point where the art work meets the environmental system open for change and transformation, while the closed system of an "art object" remains inflexible and stable. Sculpture as process proposes to respond with the flexible, communicative qualities of an open system.

Chapter One:
MOVEMENT IN SCULPTURE SINCE 1900

1.1 Dynamic Models of Reality

Man's evolution is interdependent with a steadily growing capacity to process information. He experiences the world via his senses, gathering perceptual information which is then processed into images and ideas of reality and finally, stored in the memory of the brain. As the known collides with the unknown, memory records the process of perceptual transformation. Man's "Weltanschauung" - based upon processed perception of reality stored in the memory - is continuously updated by encounters with new information. This process requires and fosters a dynamic perceptual pattern in the memory, which has become increasingly complex in order to accommodate an ever greater volume of information.

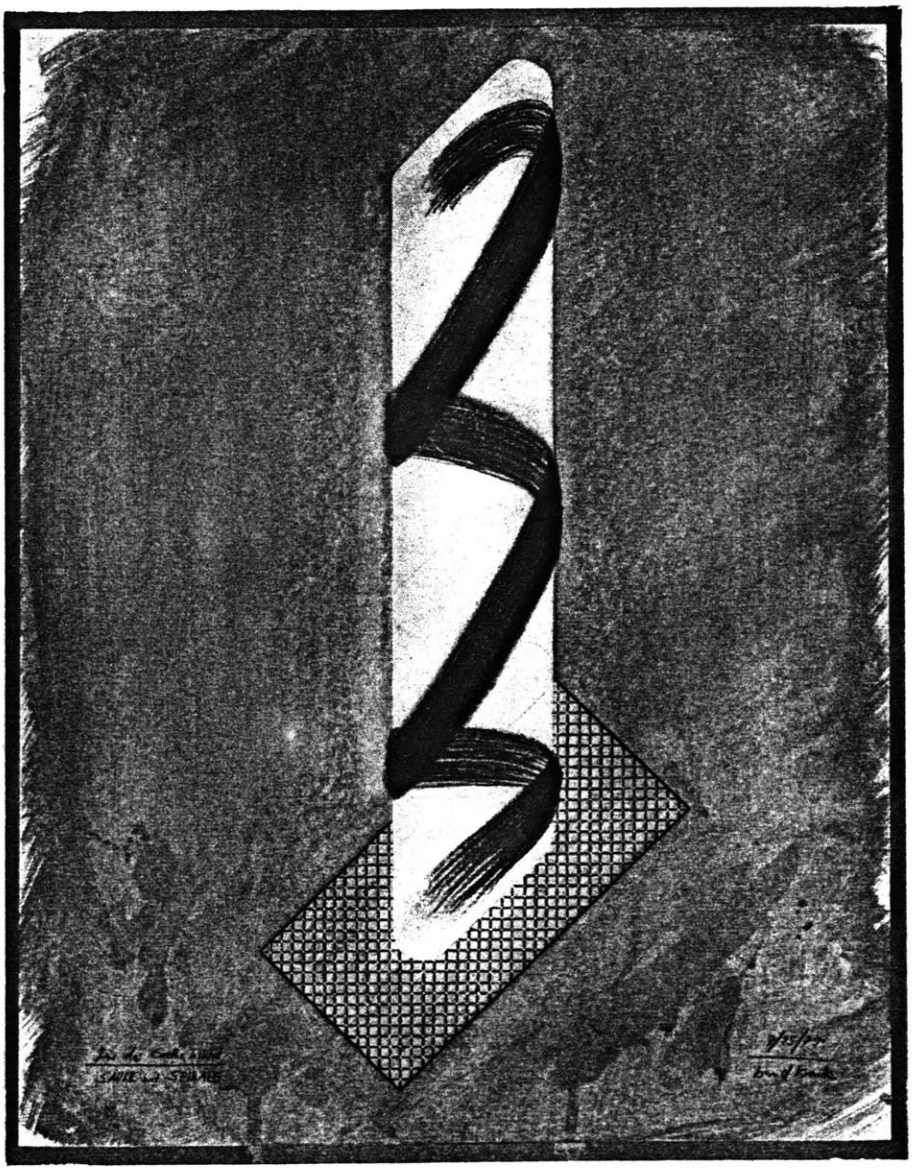
In order to maintain continuity with past experience, individual and collective memory is passed on from generation to generation in various forms: as genetic information in biological evolution and as external knowledge in the sociocultural tradition. The external knowledge of the sociocultural tradition appears in the form of theoretical and practical models of reality. Theoretical models are form-

ulated as philosophy and in their nonmaterial state represent mind. Practical models emerge in the material presence of matter. Theory and practice, or material and nonmaterial presence, converge when models of reality are externalized in the form of objects. Shelter, weapons, tools and other objects represent externalized models of reality which are consistently updated concurrent with our expanding perception and growing knowledge. In the socio-cultural tradition sculpture emerged as an increasingly autonomous model of reality beyond the role of design and decoration of functional objects. This development caused the traditional definition of sculpture as 'object'; and as Jack Burnham wrote, "above all the object occupies a space: it has place, remaining inert and stationary."[1]

Under the influence of the dynamism of scientific progress and social transformations the static object character of traditional sculpture has gradually opened to dynamic processes. We can follow this development from sculpted totemic objects in tribal communities through free standing figurative sculptures in Greece to mechanized robot sculptures in the '60s, and computerized environments in the '80s.

The models of reality represented by sculpture have changed considerably, reflecting the increased influence of science and technology on the world. Rapid change in the perception of reality (e.g. the correlation of mind and matter) resulted in

the automation of models of reality. Real and illusory movement as a function of mass in time and space became important themes in art in general and in sculpture in particular.



"COLUMN WITH SPIRAL", FOR THE GOETHE INSTITUTE BOSTON, 1979 - CRAYON AND GOUACHE ON GRAPH PAPER - 18 x 24 inches

1.2 Movement in Sculpture before World War II

Constantin Brancusi, a key figure in the transition from traditional to modern sculpture, introduced conceptualization of material and form with works such as 'endless column' (year 1918/37). In his work, the perception of the viewer is led up and ultimately beyond the materially present column, which is designed to suggest a continued nonmaterial presence. Brancusi evokes 'endless' perceptual movement on what Jack Burnham calls a "spiritual plane".

The Cubists dealt more directly with movement by combining different views of the same object. Picasso's sculptures 'Construction: Bouteille de Bass, verre et journal' (1914) and 'Construction: Violon' (1915) are examples of how the Cubists broke down an object's coherent form. The cubist description of movement was continued and radicalized by the Italian Futurists. They were fascinated with the dynamic machine aesthetics of the industrial age and saw the world being transformed by "victorious science". Severini declared the "end of picture and statue"[2] (1913/14) as "art" would align itself with the "magnificent radiance of the future".[3] The Futurists' techno-fantasy culminated in Marinetti's exclamation "glorify War - the only health giver of the world".[4]

Manifestos and performances of the Dadaists were

similarly aggressive, but in opposition to the industrial age with its emphasis on war and violence. Their interest in the machine was based primarily on the urge to overcome the romantic tradition of art. Marcel Duchamp declared prefabricated machine products to be sculptures which he called 'ready mades', i.e. 'Bicyle Wheel' (1913). He also built machines with moving parts, which displayed perceptual mechanisms, i.e., 'Rotary Glass Plate' (1920) and 'Rotary Demisphere - Precision Optics', (1925). The German Dadaist, Kurt Schwitters used organic instead of mechanical movement in his work. He conceived a 'total theatre', as an expanding and contracting environment of solid, liquid and gaseous surfaces. Comparable to Schwitters' unrealized plans for a 'total theater' are his 'Merzbau' projects. He assembled the first 'Merzbau' over several years (1923-1937) completely filling his apartment in Hannover with found materials and specially prepared objects. The apartment/environment and the sculpture slowly grew together to form an inseparable unit. Consequently, Schwitters planned his second 'Merzbau' in Lysaker near Oslo in Norway (1937-46) as a transportable combined unit of studio and sculpture. The 'Merzbau' projects incorporated the time process of the organically growing assemblage to articulate a close relationship between sculpture and the surrounding space. They can be considered

environmental process sculpture. Schwitters was also an excellent performer of his poems (i.e. 'Ursonate'). He would combine live action, the environment and the public with the dadaist aim to provoke public scandals and to stimulate social change. In 1928, Schwitters contributed an opera to a "festival of technology" organized by Dadaists and Constructivists in Hannover. "Sparks! Lightening! Fire! Light! Machines! Machines! Iron..."[5]

Dada's attempts to redefine the relation of art and life by means of irrational and provocative activities were paralleled by ultra-rational Russian Constructivists, who considered scientific/technological progress a necessary condition for social change. Backed by the success of the October Revolution in 1917, the Russian Constructivists worked on combined aesthetic and social problems with the whole nation as their environment and their audience. Mayakovsky demanded, "Let us make the street our brushes, the squares our palette". He worked with many other artists on designs such as, 'Agit-trains' and 'Rosta-Windows' (1919-23), a news-poster project in store windows all over the Soviet Union. Dynamism in post revolutionary art in the Soviet Union was directly related to social processes. Tatlin's 'Monument For the Third International' (1920) used revolving spiral communication towers as a model for the projected

combination of social and scientific progress. Sculpture in this case was consciously designed as an anticipatory model of reality which combined traditional object qualities with dynamic processes in a sculptural system of socio-cultural scale. Although Tatlin's model was never realized it helped to expand the dimensions in which sculpture has been thought of up to the present time. 'Monument for The Third International' was an imaginative anticipatory synthesis of art and science for the benefit of society. Tatlin's expansive vision of sculpture was modified by El Lissitsky's more contained 'Proun' concepts (starting 1920; sculptural environments which used all surfaces of a room;) and by Naum Gabo's first autonomous kinetic sculpture, 'Standing Wave' (1920). Gabo's pragmatic engineering aesthetic extended into the German Bauhaus.

The German Bauhaus founded by the architect Walter Gropius in Weimar in 1920 included Constructivists El Lissitzky and Moholy-Nagy as teachers as well as diverse artists such as Kandinsky, Feininger, Schlemmer and Klee. One important aim of the German Bauhaus (similar to the Dutch group De Stijl) was to revitalize the tradition of arts and crafts. The Bauhaus artists wanted to merge artistic imagination, scientific rationality and social concern into functional industrial design. For this purpose sculpture was strongly

reintegrated into its original pragmatic context of architecture, tools and artifacts as demonstrated in Groupius', Mies van der Rohe's and Breuer's architecture and furniture and Schlemmer's wall reliefs. At the same time, however, Schlemmer treated sculpture as a more autonomous model of reality in his work as set and costume designer for the 'Bauhaus Stage'. He animated his sculptural costumes for such works as'Triadisches Ballett' (1922/23) through actors and also in his own performances (which included 'Space Dance', 'Dance of Slats', 'Dance of Hoops' and 'Baukastenspiel') occurred between 1925 and 1927 combining sculptural elements and movement in unique time-space synthesis.

Moholy-Nagy, Schlemmer's colleague at the Bauhaus, experimented at the same time with motorized kinetic sculpture. His 'Light-Space Modulator' was a mobile metal construction (1922-1930); in his own words a "dynamic constructive system of force".[6] A continuation of Gabo's early kinetic work, the 'Light-Space-Modulator' pointed the way toward the future of kinetic sculpture. Moholy-Nagy's explorations of the dynamic possibilities of sculpture through interaction with movement, light and environment finally led to his use of an important new medium: film. The 'Light-Space-Modulator' became a 'Light-Prop' for 'Light Play: Black, White, Gray' (1931)

and so tied together kinetic sculpture and technological processes in a vital and complex way. Moholy's experiments triggered a combined development of art and technology and his direct or indirect influence can be detected frequently. An imaginary line of force can be drawn between Moholy and the Center For Advanced Visual Studies (C.A.V.S.) at M.I.T., whose founder, Gyorgy Kepes, assisted Moholy's film production in Berlin (1931) and he later became his teaching colleague at the 'New Bauhaus' in Chicago.

In summary, it is clear that during the first thirty years of the century different artist groups and movements were involved with developing new relationships between art and machine, art and technology, art and science, art and society. If the socio-cultural transformations brought on by the industrial revolution were reflected in this work, they may be most cogently evident in a single pervasive theme: movement. Formerly static models of reality were automated and opened up to dynamic processes. "Static figurative sculpture", in Jack Burnham's words, "moved away from the classicism of Euclidean proportions and toward the Faustian dynamicism of the mathematical function."[7]

1.3 Movement in Sculpture after World War II

World War II continued the pattern of this development

in a most inhuman way. Automation-obsessed socio-cultural fantasy envisioned and realized a fatal world-wide war scenario, using the most technologically advanced machine of destruction yet seen in human history. The spirit of socio-cultural progress based on advanced science/technology became irrevocably entangled with the human tragedy of the war.

However, some of the artists mentioned previously, especially from the Bauhaus circle, were able to continue their work in America. Moholy founded the 'New Bauhaus' in 1937 in Chicago (later the 'Institute of Design' until 1946). Gropius and Breuer taught at Harvard University and Mies van der Rohe at the Illinois Institute of Technology. With the migration of these and other artists, the focus of art and technology shifted temporarily from Europe to America. Despite important personalities in influential positions, it took until the early and mid-50's to regain the momentum of prewar vitality in the interaction of art and science/technology. Gyorgy Kepes began teaching at M.I.T. in 1946, where between 1951-56 he published a series of books on The New Landscape in Art and Science. Kepes, a strong proponent of art and science collaboration and later founder of the Center For Advanced Visual Studies at M.I.T. (1967), introduced scientific micro and macro views of the world as the 'New Landscape'. At the time of publication abstract expressionism

dominated the American art scene and it was not until the '60s that his vision received widespread attention.

American sculpture after 1945 slowly recycled the steps of European prewar development from object to process. David Smith's work mirrored the outside world by using industrial materials like iron and steel for his non-representative static sculptures inspired by Constructivism ('Tank-Totem series', 1952). Robert Rauschenberg integrated found objects like knives, radios, doors, etc., following a dadaist collage technique in his 'Combine Paintings' ('Bed', 1955 and 'Broadcast', 1959). His work was inspired by the composer John Cage, who became an influential figure, in the development of happenings, as he incorporated the real world into his musical performances by using radio sounds and real time processes ('Imaginary Landscape, No. 4', 1952). Cage and Rauschenberg cooperated in 1952 on a theatrical performance at Black Mountain College, an event which has come to be known as the first happening. Cage and Rauschenberg transformed the audience's expectation by the use of all white paintings and the silent composition 4'33" into a form of perceptual participation. Allan Kaprow continued the integration of the audience, real time processes and the outside world in his environments ('Words', 1958), which as

part of his happenings, became a combination of theatre, game and art.

Parallel to these developments in America, European artists recovered from the war shock, issued manifestos and formed new groups. Movement was again a central theme of this 'new tendency'. The Italian, Fontana called "color, sound and motion" as early as 1946 in his White Manifesto, the "fundamental elements of the new art." His fellow countryman Munari argued in his Manifesto del Machinisimo (1952) for the use of "jetflames, chemical reactions, rust, thermal changes".[8] Artists of the 'new tendency' dealt with phenomena of movement in a wide spectrum, ranging from real to illusory movement, from material to nonmaterial and from organic to inorganic processes.

The French artist, Yves Klein, a key figure in the 'New Tendency', searched for 'immateriality' as a medium for his art. He acted as a provocative performer taking bodyprints of naked models as "marks of life" and painting with fire. His environment 'Le Vide' (The Void), a white empty room, realized one part of Klein's dream. In 1961 he wrote: "Wouldn't the future artist be he who expressed through silence, but eternally, an immense painting lacking any sense of dimension?"[9]

In contrast to Klein's projection of anti-gravity art

that would float through space as an immaterial image or an idea, Jean Tinguely rendered movement through the mechanized 'down to earth' aesthetics of his absurd machines. Playful, ironic, sometimes self-destructive ('Hommage to New York', 1960), his machines functioned as ambivalent metaphors for blind belief in technological progress and the necessity of dynamic evolution. Between the extreme polarity of Klein's 'immaterial' and Tinguely's 'mechanical' exploration of movement the wide field of kinetic art developed, which will not be discussed in close detail. (See Frank Popper, Origins and Development of Kinetic Art, New York Graphic Society, 1968 and Jack Burnham, Beyond Modern Sculpture, George Braziller, New York, 1969).

For the purpose of this thesis it is sufficient to trace the main lines along which movement became part of sculptural models of reality. Kinetic art as self-contained, mechanically or electronically animated, object-display sculpture on pedestals or walls has limited influence on sculpture as process. However, aspects of kinetic art with interactive and/or responsive tendencies, which encompass the audience and the environment reflect the transition from object to system in sculpture as process.

The French artist, Nicolas Schoeffer was among the first to experiment with a cybernetic concept of complex environ-

mental light-sound kinetics. His mid-50's 'Luminodynamic Spectacles' - audio-visual towers which reacted with light and sound to the proximity of crowds and changing weather patterns - developed into visions of 'Cybernetic Cities', planned as sensitive environments generating light and sound patterns. Less science fiction and more human qualities were emphasized in the use of kinetic concepts by the artist groups Zero and GRAV.

Zero, founded in Germany in 1957 by Otto Piene and Heinz Mack and joined in 1961 by Günther Ücker, wanted to "reharmonize the relationship between man and nature". 'Zero demonstrations' involved large audiences and outdoor environments (i.e., hot air balloon events, 1961 etc.). Piene's early indoor light-kinetic performances of 'Light Ballets' developed into outdoor events (i.e. 'Ein Fest für das Licht 2', 1966) and later sky art events with large scale inflatables, laser projections and sound. The French group GRAV, Groupe de Recherche d'Art Visuel, was founded in 1960 by Julio Le Parc, Horacio Garcia-Rossi, François Morellet and Yvaral (Vasarely's son) emphasizing anonymity, research and team effort. GRAV's kinetic work was less poetic than Zero's approach and more directed towards audience participation (i.e., 'Labyrinth', 1963).

Besides similar group efforts like 'nul' in Holland,

gruppo t in Milan, gruppo n in Padua, and Equipo 57 in Spain, the Independent Group, Center For Advanced Creative Studies and the Center For the Studies of Science in Art in England, the German Hans Haacke and the Korean Nam June Paik should be mentioned. Haacke, also connected to the Zero group, concentrated increasingly on movement in organic systems. His understanding of kineticism was based in biological mechanisms rather than technological hardware (i.e., 'Ice Stick', 1966, 'Grass Cube', 1967, 'Hydraulic Circulation Systems', 1969). Haacke's work can be based on what Jack Burnham calls "an environmental systems philosophy" represented by "cyclical processes which manifest evidences of natural feedback and equilibrium."[10]

Nam June Paik, loosely connected with the German Fluxus movement, was the first to discover the visual kineticism of electronic media. In 1963, he exhibited his first manipulated TV sets in Wuppertal (Galerie Parnass). Using the most advanced technology and collaborating frequently with engineers (e.g., 'Paik-Abe synthesizer', 1970), Paik maintained an ambivalent tension of human and technological scale in his man-idea-machine symbiosis ("Direct-Contact-Art"/"Electronic Zen", 1967).

When the strength of articulate groups in Europe faded in the mid-60ies, individual artists like Piene, Haacke, and Paik continued their work increasingly in America, where they

found more understanding, support and technical know-how for progressive projects. The 'new tendency' in Europe had regained the leading role in the development of kinetic and technology-oriented art from America for the period between the mid-50ies and the mid-60ies. Then the focus of art and technology shifted for a second time back to America.

The American happening movement, initiated by Cage, Rauschenberg and Kaprow, was expanded by multi-media research and performances (i.e. Stan VanDerBeek, 'Movie Drome', 1963; Merce Cunningham in collaboration with Billy Klüver, John Cage and Stan VanDerBeek, 'Variations V', 1965). This development paved the way for the formation of EAT (Experiments in Art and Technology, 1966). Billy Klüver, engineer at Bell Labs, and Robert Rauschenberg, both founders of the project, organized 'Nine Evenings: Theater and Engineering' in New York in October, 1966. The sophisticated multi-media performances represented a view of artist-engineer collaboration never demonstrated before. Although art and technology seemed to have caught up with each other, audience reation was critical, particularly about the interruption of performances due to technical difficulties. Klüver later defended 'Nine Evenings' in an interview with Douglas Davis: "The relationship between art and technology should be experimental and intuitive, in the same sense that scientific research is .....

and therefore full of risk."[11] This statement illustrates the differing expectations of the audience - for a functioning end product - as opposed to the engineers'/artists' willingness to go for the risk of an unpredictable process, a difference which reflects the inherent problems in the transition from object to process in sculpture. Despite the public criticism, EAT continued successfully to promote collaborations by bringing artists and engineers together, organizing shows, launching corporate projects (Pepsi Cola Pavillion, Expo '70, Osaka), and artists-in-residence programs with industry and engineer-in-residencies within the museum world.

Gyorgy Kepes, who founded the Center For Advanced Visual Studies (C.A.V.S.) at M.I.T. in the fall of 1967, reached beyond EAT's aim of practical collaboration between artists and engineers to connect art and science in a closely related research situation. The Center (C.A.V.S.) was to provide "close, ongoing contact with the man who sees the vista, that's what we are beginning to develop; so that the artist makes friends with more than a man: an idea".[12] Based on his knowledge of the Bauhaus in Germany and in America, Kepes planned the Center (C.A.V.S.) as a "...laboratory where the most advanced technological tools can be tested for their applicability in the newly emerging scale of artistic tasks."[13] EAT and the Center For Advanced Visual Studies revitalized the

Futurists' techno-fantasy, the Constructivists' engineering aesthetic and Moholy's vision of environmental multi-media kineticism. From the '60s on, America's social dynamism and rapid scientific/technological progress provided a fertile ground for the continuation of European developments in technologically oriented kinetic art. In contrast, the socio-cultural climate in Europe since the late '60s has favored rather 'low tech' art with aspects of human or social kineticism. The initial distinction between 'fast' American and 'slow' European kinetic art evolved into the general problem of whether and how technology can be integrated into dynamic models of realty.

1.4 Sculpture as Process

Sculpture in its transition from object to process increasingly included the audience, the environment, and real time space relations. The models of reality, which sculpture offered, became participatory, interactive, responsive and dynamic. With and without the use of technology, sculptures developed more and more into perceptual tools which relate us to ourselves and the world around us. We became part of organic and/or inorganic cybernetic systems of sculpture, which can be seen as "structures for behavior" (Roald Nasgaard). The modes of behavior evoked and stimulated differ with the

structure. Franz Erhard Walther's fabric books or steel pieces involve the audience in a different perceptual process than James Seawrights' 'high tech' viewer controlled computer-generated environments (i.e. 'Network III', 1971). What both concepts of 'sculptural models of reality' have in common is that each initiates a perceptual process via a material structure.

Sculpture as process is neither just small or large scale, neither just high or low tech, neither just static or dynamic display, but emphasizes interaction of material/nonmaterial structure and human perception and behavior. Sculpture as process materializes and dematerializes models of reality based on memory and is constantly updated by new information. Movement is not merely depicted or displayed by sculpture as process. The "dialectics of transformation"[14] represent the vitality of sculpture as process as an interactive, responsive model of reality. Its character depends on the perceived reality processed by the artist in his work.

Joseph Beuys' 'Honey Pump' in combination with 100 days of discussion, and C.A.V.S.'s 'Centerbeam' (both Documenta 6, Kassel, 1977) represented extreme examples of the range of possible 'sculptural models of reality'. Both projects emphasized process as their central theme: predominantly socio-cultural process in Beuys' work and techno-cultural

process in C.A.V.S.'s. Beuys' 'Honey Pump' offered a low tech structure consisting of 2 tons of honey, 220 lbs. of margarine, 2 ship's engines, a steel container, plastic tube and 3 bronze pots to link together his 100 days of discussions and the museum space. "The work 'is complete only with people' (Beuys). It needed communication, coordination and cooperation to have any meaning...Placed in the context of Documenta 6, it suggested a criticism of the one-sided relationship between artist and public, and proposed an alternative to the painfully isolated and marginal position of culture in society."[15] Beuys injects a material and organizational structure to initiate the oscillating "social sculpture", which utilizes the "process of living" as the "creative act". "My objects should provoke thoughts about what sculpture can be and how the concept of sculpting can be extended to the invisible materials used by everyone."[16]

While Beuys' work stimulates and materializes the interrelation of people via human interaction C.A.V.S.'s 'Centerbeam' articulates the interconnectedness of individuals in our societies via imaginative use of science/technology. 'Centerbeam', a collaborative effort of 14 artists and numerous science and engineering advisors consisted of a 144-foot long environmental structure which was conceived as "a very long bundle of pipelines of elements and energies".[17]

Otto Piene describes the combination of a 144-foot long water prism, programmed steam emissions and laser projections, solar-tracked holograms, light, sound, video and sky events as a "temporary, adaptable installation of a kinetic performing, participatory sculpture/system".[18]

Referring to the history of art and technology and the development of kinetic art, Manfred Schneckenburger (organizer and curator of Documenta 6) calls 'Centerbeam' an "art machine". "Projects like 'Centerbeam' are not aiming at the technical standardization of our imaginative faculties, but seek rather to open new areas of visual fantasy and participation."[19] Schneckenburger's reference to the machine aesthetics of our century might be seen as the binding element which bridges the different materialization of comparable intentions in both projects: communication and creative exchange of energies through the process of collaboration and participation. Beuys uses the machine, 'Honey Pump' to express "... the principle of the Free International University working in the bloodstream of society."[20] Piene sees 'Centerbeam' as "a metaphor of the community of volunteers forming daily symbioses (the relationships of a democratic society)."[21]

Beyond opinions about which vision is right or wrong, both models of reality radiate strength, as their form and content are based on vital processes of our socio- and techno-cultural

context. Beuys as well as the C.A.V.S. artists recognize the importance and necessity to formulate models of reality based on a collaborative and participatory spirit. The models they offer are not finished products, but they are based on facts, desire and imagination: anticipatory blueprints of the future. Beuys' intention to stimulate everybody's creative energies for the "Social Sculpture" and the practical interaction of C.A.V.S. artists with scientists and engineers reveal that this future lies in more than one individual's hands. It requires strong individuals and a willingness to communicate with others to do what Dennis Gabor calls "invent" the future. Artists and their participatory models of reality become catalysts to simulate and evoke collective fanatasies. Sculpture as process becomes the transmitting and receiving generator of "imagination", that which Gyorgy Kepes calls "the key to pre-experiencing alternative futures."[22]

The question remains of how the generated imagination is transformed into a perceivable reality, how the participatory process is materialized? Tatlin's monument was never built and Beuys' "Social Sculpture" is a concept. 'Centerbeam' was performed twice in Kassel and Washington D.C., and now rests in storage. The improvised wooden model of Tatlin's vision and its later reconstructions functioned only as temporary sculptural injections which left traces in the

environment and our mind. The event enters our consciousness and is stored as a pattern of information in our memory. The material sculptural process is transformed into a nonmaterial mental process which can influence future behavior. Beuys uses - similar to Tatlin - temporary sculptural injections like the 'Honey Pump' to catalyze the process of "Social Sculpture". "Social Sculpture" is not an "object with a place", but a time-based process: individuals materialize creatively and collectively dynamic patterns of their socio-cultural consciousness and unconsciousness. 'Centerbeam' draws from the same dialectics of material/nonmaterial and conscious/unconscious processes. Otto Piene states referring to Hegel's "Aufhebung" ..."cancellation, storing and elevation in one act - which adds to the states of aggregate through which the 'bundle of energies and media' (Burgess) keeps passing."[23]

The transition of information between various material states and the interrelation of spatial/temporal continuity and discontinuity cause the dialectic process of transformation, to which I refer in the following description and discussion of my M.I.T installation representing sculpture as process.

Chapter Two:
SCULPTURE AS PROCESS - TRANSLOCATION/TRANSMISSION, 1980

2.1 Center for Advanced Visual Studies (C.A.V.S.) at the Massachusetts Institute of Technology (M.I.T.)

The basic philosophy of M.I.T.'s Center for Advanced Visual Studies (C.A.V.S.) is to bring artists, scientists, and engineers together with the aim of generating dialogue, ideas and work by integration of art, science and technology. The Massachusetts Institute of Technology provides fertile ground for these objectives with its rich scientific and technological resources, including faculty and staff. The campus itself is utilized as an extension of the C.A.V.S. studios, functioning as an expanded laboratory for experiments and collaborations in art and technology, with the emphasis on evironmental art.

The staircase and lobby of M.I.T.'s building 7 - the locale of the Department of Architecture - have frequently been chosen as sites for environmental art projects since 1973. Lobby 7 housed collaborative C.A.V.S. exhibitions such as 'Weather' (1973) and 'Food' (1975). Staircase 7 has been used to display various projects and installations developed by graduate students of Otto Piene, who succeeded Gyorgy

Kepes as C.A.V.S. director in 1974. The location of staircase 7 draws together artists and architects, recalling their interdependence and stimulating them towards solving the complex problems of designing our environment together. In this way the site emphasizes the interdisciplinary aspect of environmental design. No one project is a final solution for the staircase; instead, each successive proposal reveals the staircase as environmental design in progress.

2.2 Sequence of Events - October/November 1980

My proposal for staircase 7 was a sculpture as process piece consisting of several phases:

Phase I: October 1-10, 1980

Video-Announcement

My videotape, 'Ornament der Masse' (7 minutes) was shown daily on the M.I.T. cable-TV, to inform the M.I.T. community about the upcoming installation and the intended audience participation.

Phase II: October 10 - November 3, 1980

Staircase 7 installation and interactive video link between staircase 7 and Center For Advanced Visual Studies (C.A.V.S.)

I installed a 66-foot high white fabric column in the center of staircase 7, suspended from ceiling to floor

through the 4-flight stairwell. This site and a room at C.A.V.S. were connected by an interactive video link, established via the M.I.T. cable-TV. The users of staircase 7 were invited to participate in the sculpture as process by depositing personal objects, photos, written notes, etc., in the 500 plastic bags attached to the surface of the fabric column. During the three weeks of the installation, I used the interactive video link to talk to people in staircase 7 about the installation and to stimulate their participation in the collection of materials. While we talked, I took polaroid pictures of my conversation partners off the video monitor. These polaroid pictures were mounted on computer cards and arranged in an ascending line on the wall at C.A.V.S. The line of photos and cards in this wall installation recorded, like a diary, the progress of my project.

I also made photo copies of the polaroid pictures and inserted them into the plastic bags on the fabric column in sequence. Over the three week period of the installation, my diary-like publications and the contributions of staircase 7 users merged in a dense deposition of materials, forming a spiral line - following the progression of steps - on the fabric column.

Phase III: October 19, 1980

Transmitted sculpture staircase 7-C.A.V.S./ M.I.T. to Kunstverein Hamburg, West Germany

The simultaneous use of sculptural elements and electronic media resulted in a dialectic juxtaposition of material and nonmaterial presence in the installation. I sought to expand and emphasize this dialectic relation by the integration of a telecommunication event connecting the M.I.T. sites with the Kunstverein in Hamburg, West Germany via slow scan TV. The interactive connection was established by the use of two long-distance telephone lines: one for the transmission and reception of still video frames at a rate of one every 8 seconds and the other for constant audio communication. The public in Hamburg was invited to the Kunstverein to participate in the installation at M.I.T. via telecommunication. Their images were transmitted and recorded from the monitor on polaroid film. The polaroid pictures were then integrated into the wall installation at C.A.V.S. and into the collection on the fabric column. In return, the fabric column in staircase 7 at M.I.T. was transmitted in the form of 84 single frames to monitors at the Kunstverein in Hamburg and recorded there on polaroid photographs. My collaborators at the Kunstverein, the group AG horizont, reconstructed the

column as a three dimensional model from these polaroid pictures.

Phase IV: November 4-30, 1980

Translocation

Staircase 7 to Lobby 7, M.I.T.

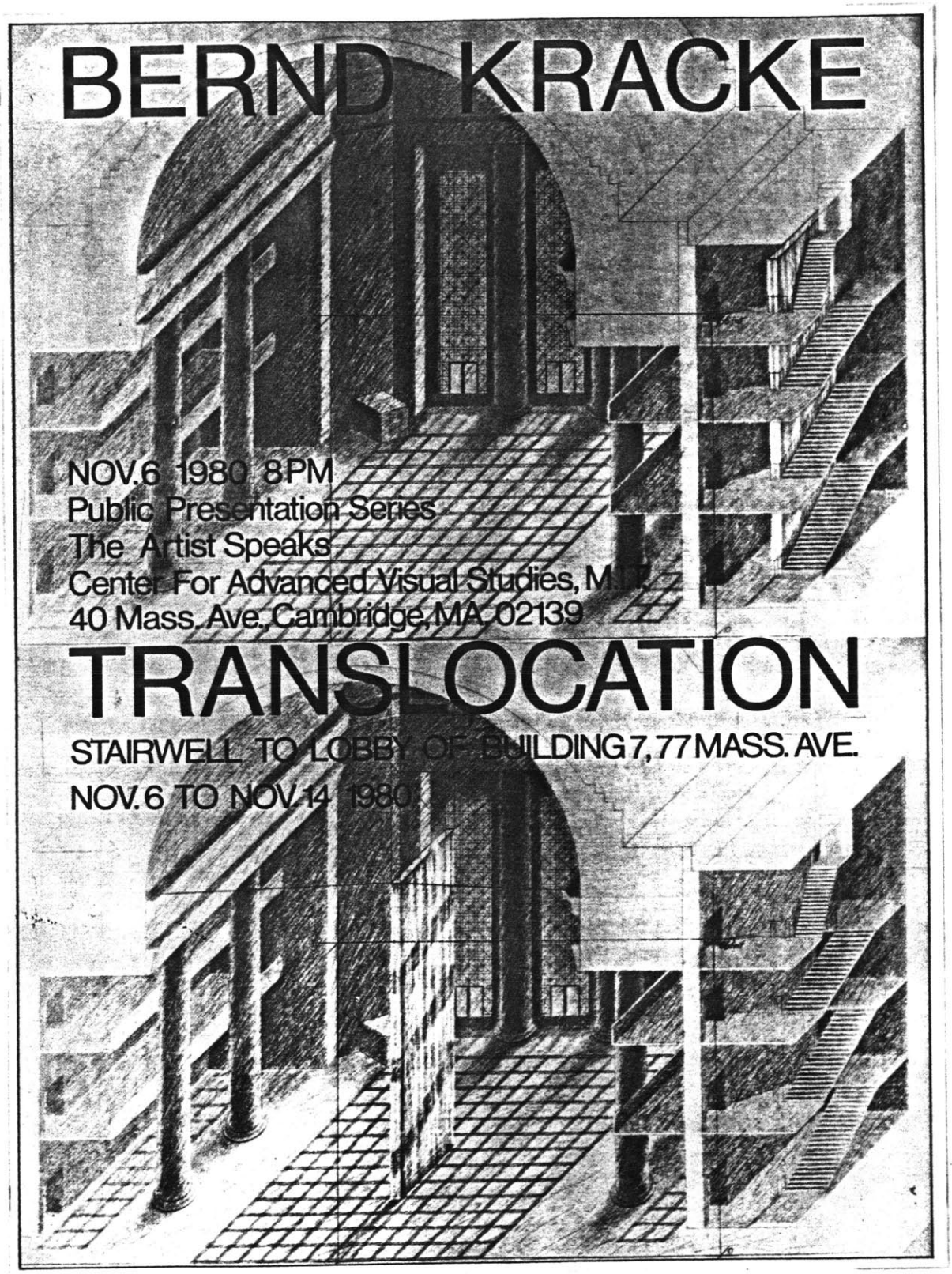
In an analogy to the nonmaterial translocation/electronic transmission to the Kunstverein, the final public phase of my installation was to move the fabric column from staircase 7 to the center of Lobby 7, in a process of material translocation. The column was on display for one month, after which it was removed.

Phase V: December 1, 1980 -

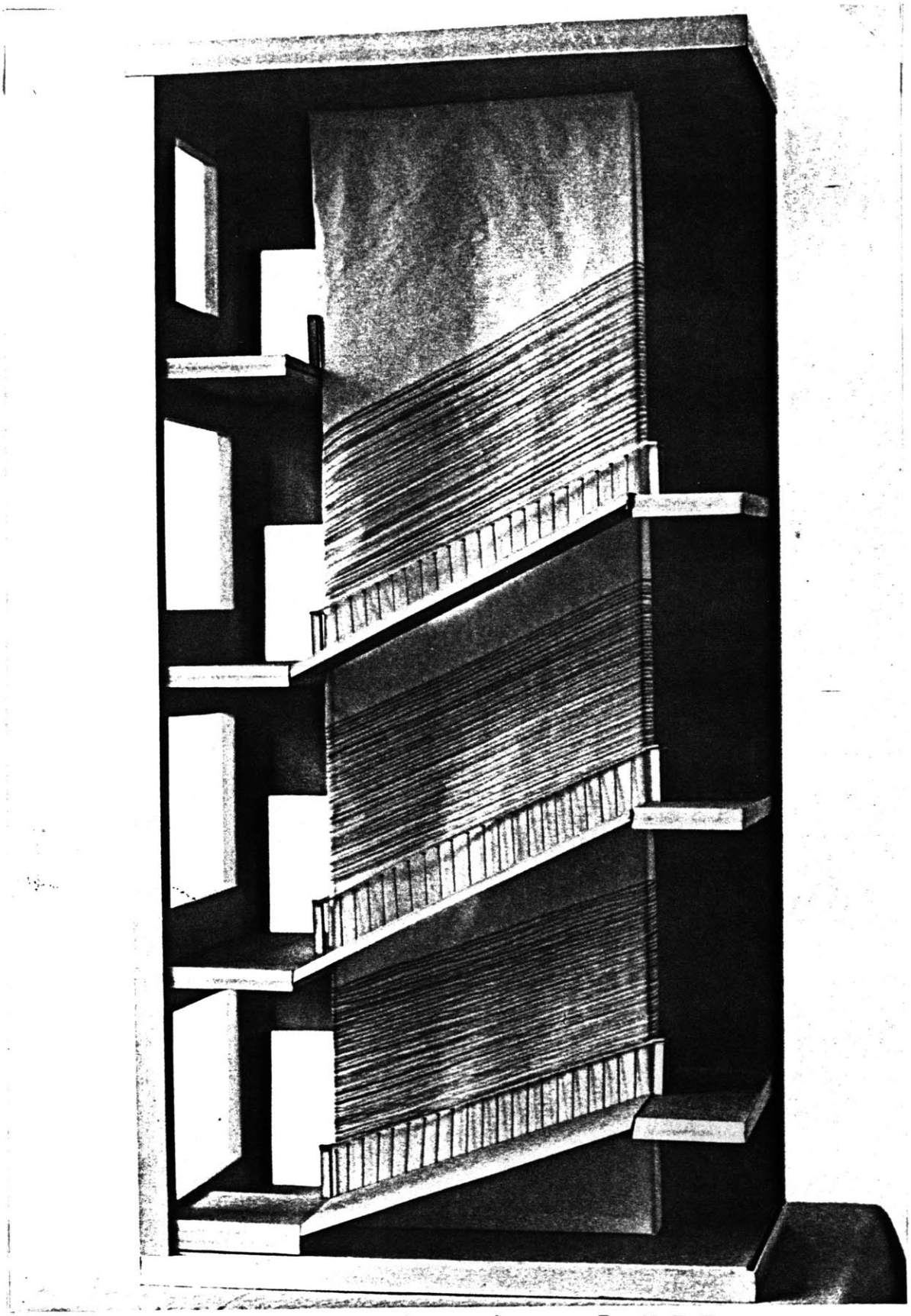
Storage

The collected information is stored in a randomly accessible archive/memory.

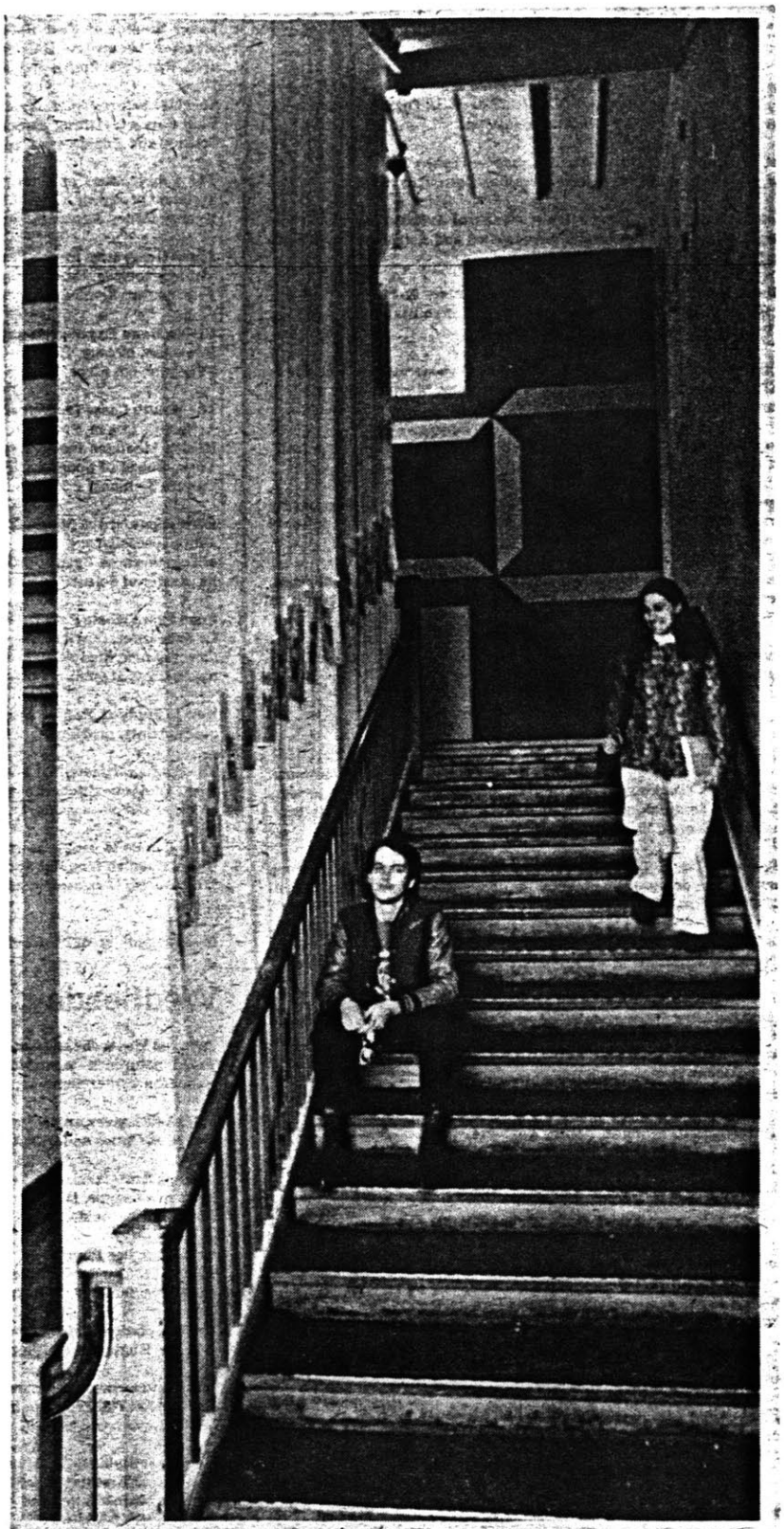
The concepts and conclusions behind my process sculpture, which developed during the two years of preparation and two months of execution, are discussed in the following section of this paper.



Announcement of the M.I.T. installation, 1980

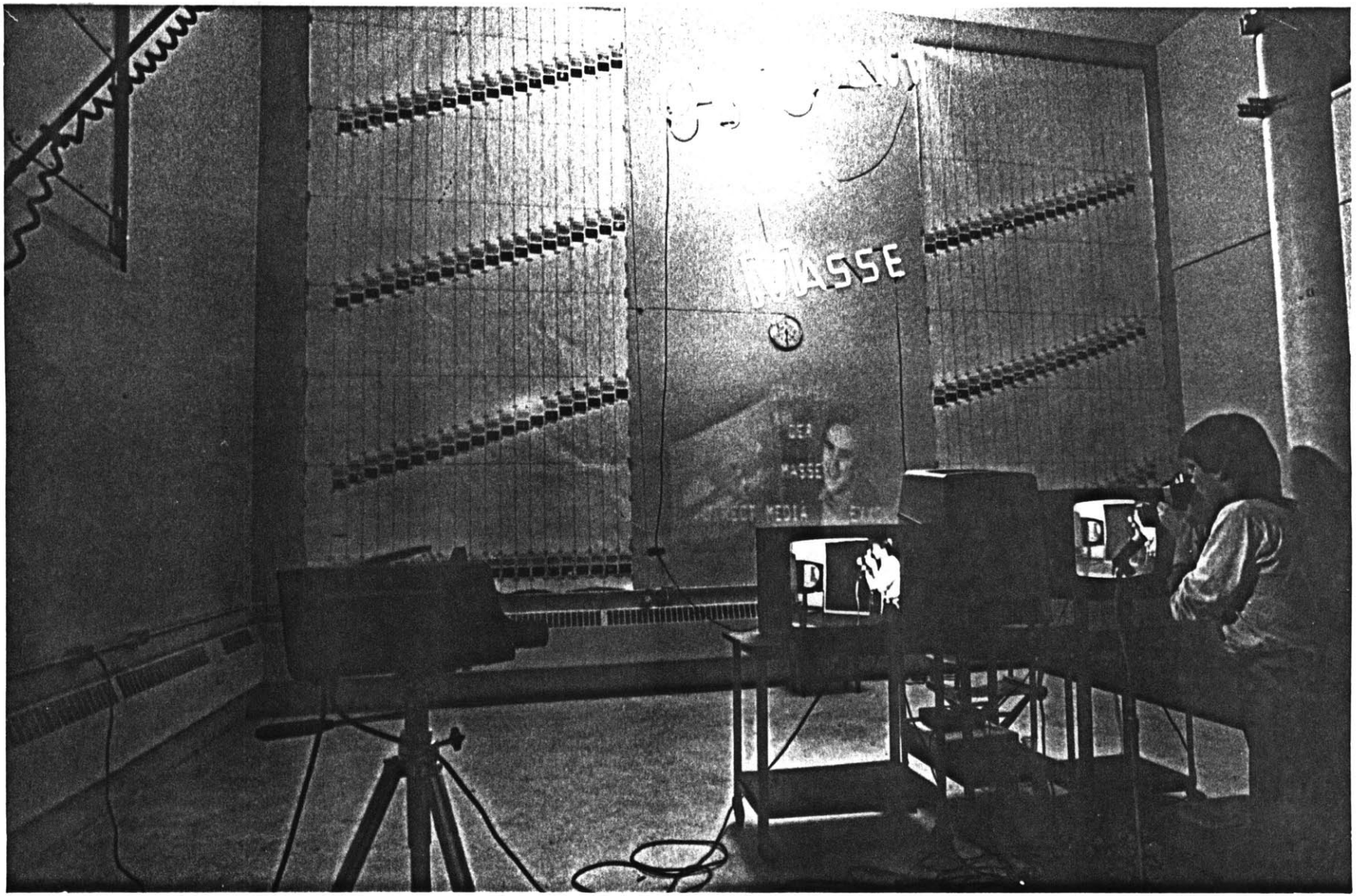


Model of the installation in staircase 7, M.I.T.

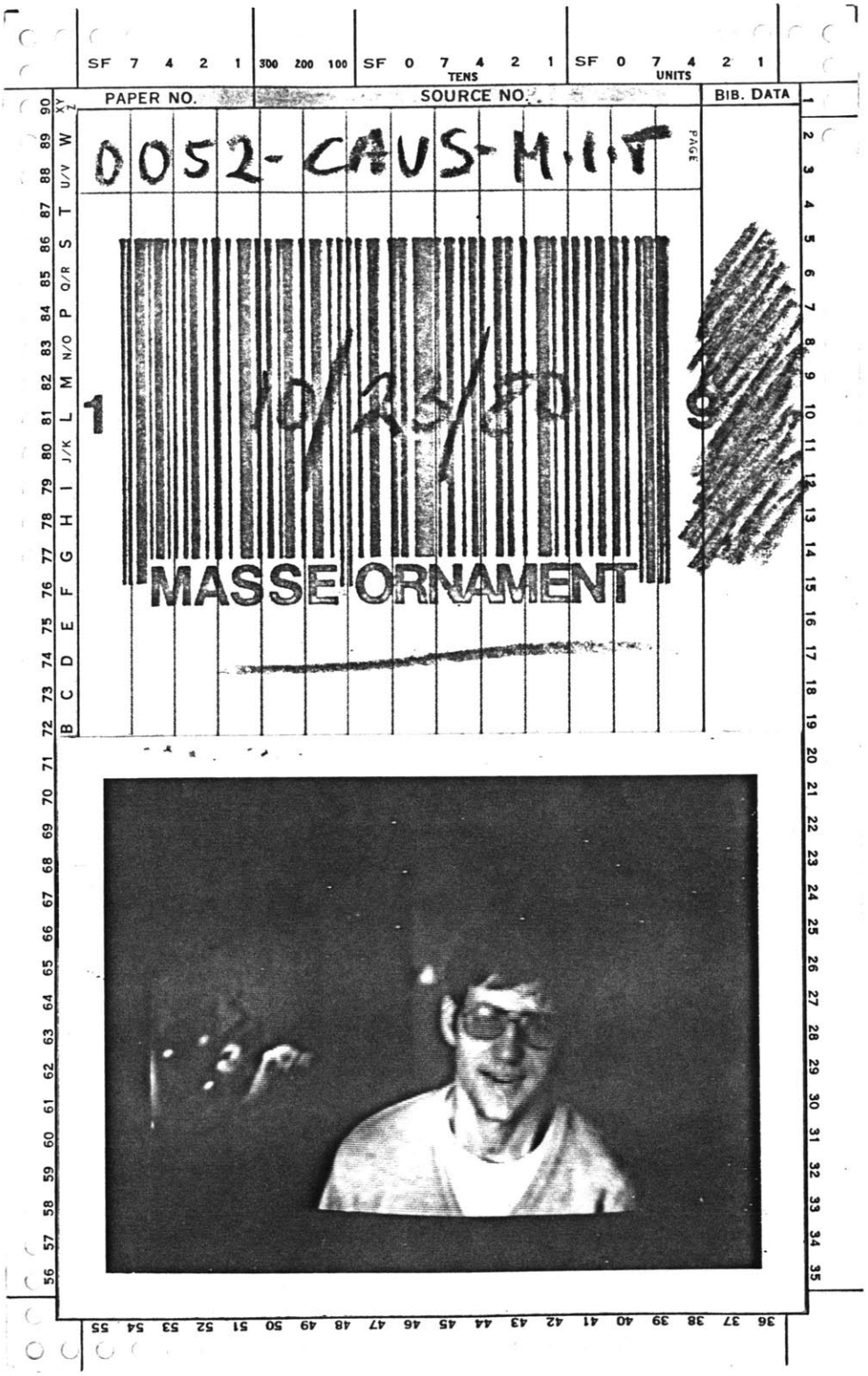


Artist Bernd Kracke, graduate student at the Center for Advanced Visual Studies, is seated next to his work, "Ornament der Masse," in Stairwell 7. The curtain is part of a multi-media installation inviting public interaction until November 3, when the completed work will be moved to Lobby 7 for display.

TECH TALK, M.I.T., 10/22/80



C.A.V.S. site with wall installation and interactive video link



Polaroid picture taken off the monitor at C.A.V.S. and mounted on computer card: frame 52, 10/23/80

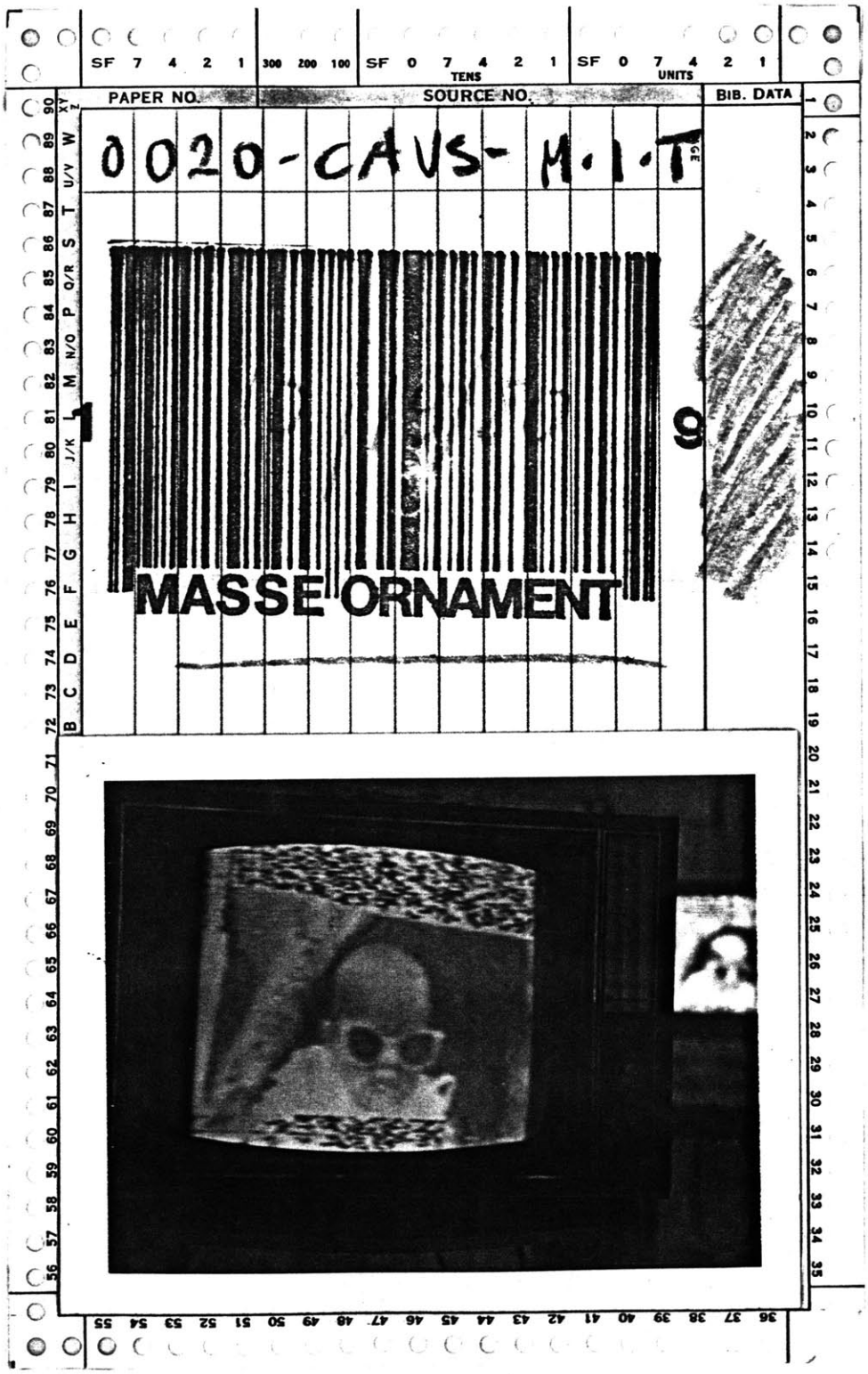
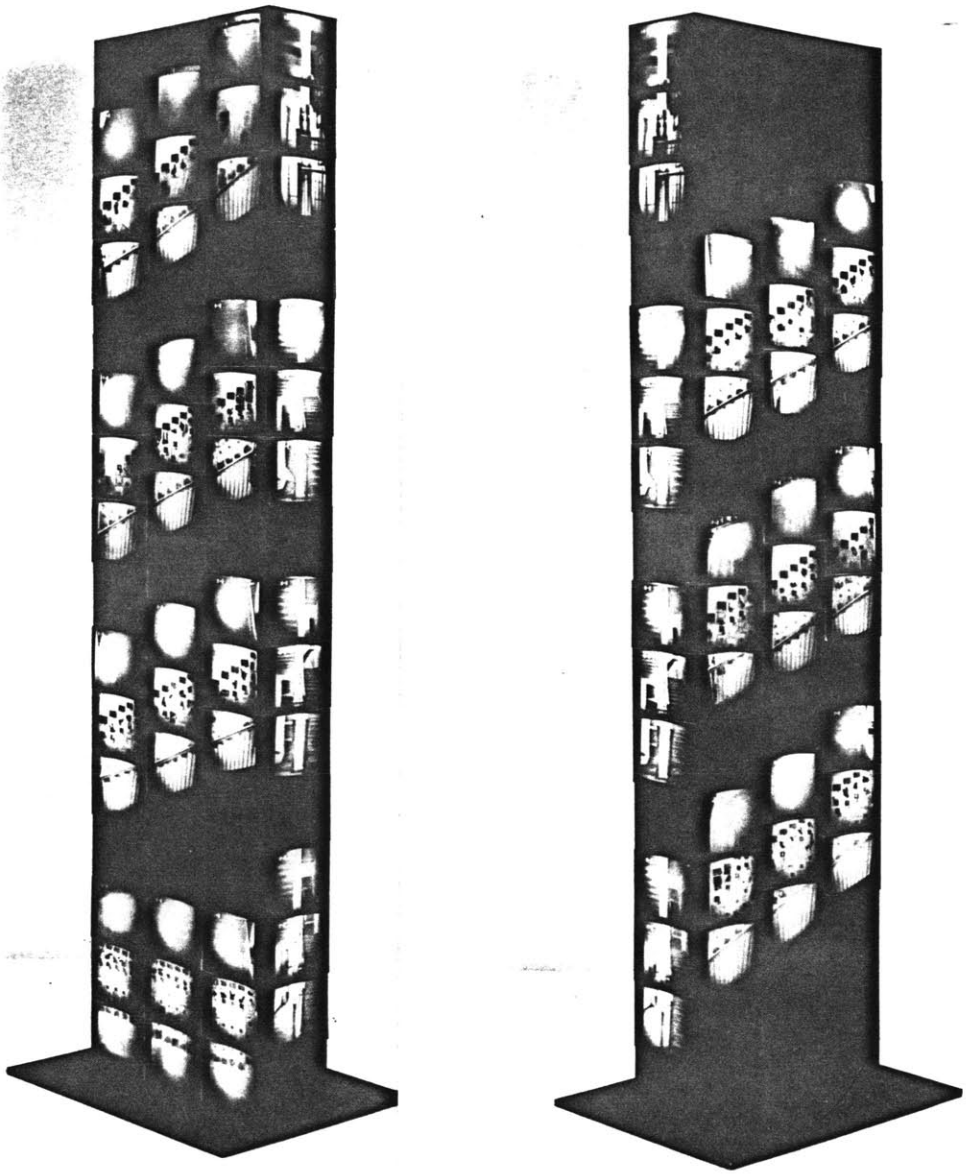
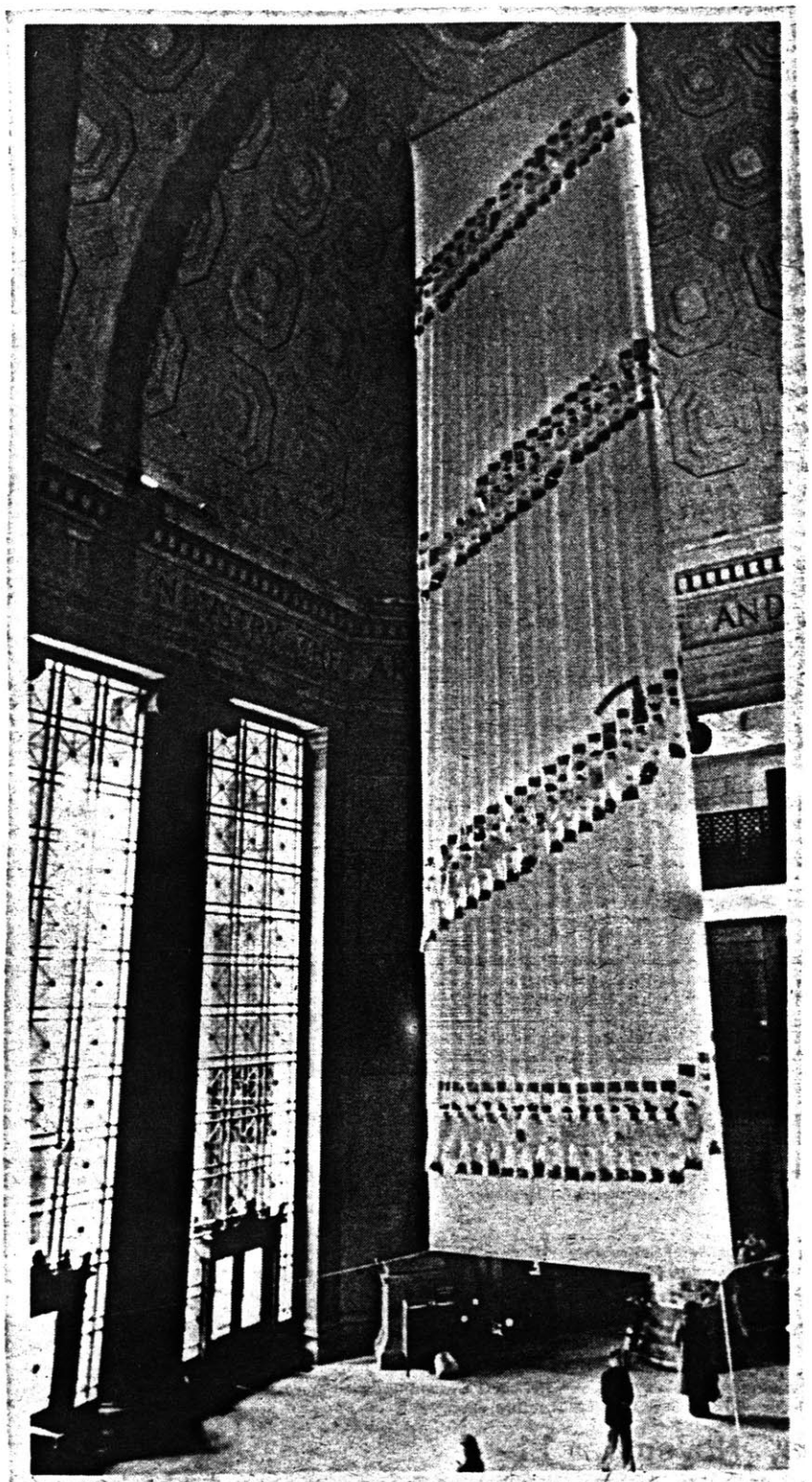


Image from slow scan telecommunication event C.A.V.S./M.I.T. - Hamburg:transmitted audience member in Hamburg



'Transmitted Sculpture 2'
slow scan transmitted and reconstructed column C.A.V.S./M.I.T.
- Hamburg



Translocated from Stairwell 7 complete, the "Ornament der Masse"—subject of the gazers on page 1—is now on display in Lobby 7 through November 14. The artist, Center for Advanced Visual Studies graduate student Bernd Kracke, will discuss his work, Thursday, Nov. 6, at 8pm in Lobby 7, as part of the CAVS Series "The Artist Speaks."

—Photo by Calvin Campbell

TECH TALK, M.I.T. 11/4/80

2.3 Staircase 7, M.I.T.

The specific architectural function of staircases as zones of transition bears rich archetypal connotations. Throughout history stairs have been charged with a wide range of political, religious and cultural meaning beyond their functional purpose. Stairs connect private and public spaces and thus connect individuals and groups. In popular imagery, we ascend the "steps" to political power, cultural fame, or heaven; we descend into anonymity, to obscurity, to hell.
Graphically illustrating the ups and downs of our lives, stairways may be equally pointed metaphors for the collective unconscious. The desire to overcome limitations on the human capacity to move horizontally is manifest in the archetypal connotations of movement on stairways as much as in other human efforts of elevation. We jump as high as possible, climb trees and mountains to change the point of view of our horizontal perspective. To elevate ourselves and expand our view/world view we build towers, fly in balloons, airplanes and spaceships. The forces of gravity, which bind us to the earth and restrict our natural ability to move upwards, provoke our dream to get off the ground, spiritually and physically. We invent religions, mechanisms and structures to fulfill our vertical desire.

Among the sophisticated means developed throughout

history, stairways are one of the few structures which allow us to move vertically, by means of our natural forces. Moving up and down stairways, we feel the physical energy necessary to overcome the resistance of gravity. The direct sensual experience of vertical movement combined with its functional and spiritual socio-cultural implications make stairways a vital and familiar archetype in the collective unconsciousness.

"Collective unconsciousness" represents the dynamic patterns of internalized perception and experiences of individuals interrelated as a group. The dynamic patterns of the collective unconsciousness exist latently in the environment where the individuals live, gather or pass through. Latent or invisible patterns become visible when materialized in the process of individual expression, that is, amplified, commented, altered and/or confined by other individuals of the same group. Marshall McLuhan suggests: "Environments are not passive wrappings, but rather, active processes, which are invisible".[24] This definition broadens the perception of environment from spatially defined areas to time space-related processes. Landscape, architecture, climate, light, people, moods and feelings are the elements of vital processes in our environment. The intersecting of vital processes generates dynamic patterns, which we perceive as our constantly changing environment. Part of this constantly changing environment is the process

by which the invisible patterns of the collective unconsciousness are materialized. "The creative process, insofar as we are able to follow it at all, consists in an unconscious animation of the archetype, and in a development and shaping of this image till the work is completed."[25] By moving up and down stairways, which can be considered this kind of "unconscious animation", man activates archetypal energies of the collective unconsciousness. The archetype connects horizontal and vertical patterns of perception in a synthesis of pragmatic function and spiritual desire.

Walking up or down stairs (as well as taking an elevator) provides vertical access to another horizontal floor, another plane similar to the surface of the earth. Airplanes, rockets and spaceships reach a certain height and enter a horizontally curved path or orbit following the laws of gravitation. Vertical desire is often transformed by gravity into horizontal functionalism. The endless vertical movement up or down takes us to hell or heaven or beyond that to the unknown. We deal with this thought only on a conceptual level or as Jack Burnham called it in the case of Brancusi's 'Endless Column' on a "spiritual plane". Totemic columns and ascending sacrificial smoke in primitive cultures, as well as Egyptian obelisks or Gothic Cathedrals represent a similar attempt to establish a vertical connection between man and spiritual

energies.

In contrast to the vertical orientation of spirituality, our daily lives are layed out largely horizontally. Vertical elevations via stairways, elevators, airplanes, rockets, etc., are only of short duration, connecting one or another horizontal plane of functional enterprise. The current pragmatic, science/technology-oriented culture tends to emphasize the functional aspect of vertical movement as well. Skyscrapers, airplanes and even space flights are or are becoming part of functional routine. And yet, an elevator ride to the top of the World Trade Center, an airplane take-off or the astronauts' missions inspire in us an excitement beyond their functional purpose. For moments in time we are catapulted by vertical movement from the natural, earth-bound experience of space into the elusive realm of spiritual experience.

Stairways in general - and in this case, M.I.T.'s staircase 7 - provide man with a unique environmental synthesis of the conscious/functional experience and the unconscious/spiritual experience which transforms "real" space into "spiritual" space and vice versa. The functional process of ascending and descending combined with the spiritual impulse of vertical desire charge the stairway with intense environmental energies. I hoped to detect and utilize these energies in my installation.

Inspired by electrical discharge patterns and patterns of crystallization, I wanted to make the invisible environmental energies of staircase 7 visible. Invisible energies are normally perceived via the effects they evoke in visible phenomena: the wind is seen through the movement of the leaves on a tree; light is visible through reflection on surfaces. Underlying this transformation of the invisible to the visible is the intersection and subsequent transfer of energies. The result, which we see, is a pattern marking the meeting points of energies: the movement of the leaf is the pattern where wind and leaf meet; the intersection of light and surface results in a pattern of textural illumination.

Kepes remarks: "Although we see it as an entity - unified, distinct from its surroundings - a pattern in nature is a temporary boundary that both separates and connects the past and the future of the processes that trace it."[26] Pattern is the ambivalent state of transition between processes; it is static and dynamic at the same time. In reference to the development of movement as a predominant theme in 20th-century art (discussed in Chapter One) Tinquely's "Be static - only movement lasts" comes to mind, as it expresses the same ambiguity.

My intention to make visible the invisible environmental energies in staircase 7 made it necessary to for the ongoing

processes to intersect another force to evoke recognizable patterns. The white fabric column, as a temporary injection of a sculptural pole into the energy field of the environment, represented this force. It provided a surface for the characterization of the staircase's invisible environmental processes. Just as chemical reactions are elicited by the introduction of an electrode in electrolysis by the passage of electrical current through liquid (electrolyte), so the fabric column became the catalyst for the materialization of nonmaterial environmental processes.

The fabric column was a sculptural pole injected into the environment, but because of its flexible, responsive qualities, the column was itself shaped and literally "molded into shape" by the environment as well. The fabric suspended in the stairwell took on the narrow, rectangular shape of this area circumscribed by the stairs. In this way, the column materialized or made visible the otherwise open or invisible space. The plasticity of the fabric column thus emphasized the dialectic relationship of the positive and negative spaces of the environment, of its open and closed characteristics and its dynamic and static aspects. The inner space of the stairwell is a dominant negative form which functions as a light shaft in accordance with its open character of nonmaterial presence. The fabric column inverted the

negative form into a positive volume and gave the stairwell a material center which focused the movement on the stairway. The users were unable to see other people on different levels of the stairway as clearly as before. Their vista was reduced to a smaller segment of space, and time, as the ability to look back at lower levels or ahead to upper levels was restricted. The limited transparency of the stairwell caused by the fabric column emphasized the linear and directional characteristics of vertical movement on the stairway, comparable to horizontal movement in a corridor. Long, narrow corridors with low ceilings, artificial lights and glassless doors, common in many modern, functional buildings, can be a Kafkaesque metaphor for the nontransparent, impenetrable and uncommunicative architecture representing hierarchic systems. An inflexible hierarchy is reflected in solid architecture and a static perception of the environment. Nomads organize their lives dynamically, and depend on highly flexible, temporary structures. Their tents are light and can be taken down and reassembled with ease and speed.

The fabric column functioned like a soft wall in the center of staircase 7, juxtaposing the solid and static qualities of architecture with the flexible and dynamic qualities of a temporary structure. Although it interrupted the usual stream of light and the spatial constellation of the site, the fabric

column was responsive to light changes and to the movement of people or currents of air. The environmental changes affected by the installation were imbued with the 'dialectics of transformation' as they were reciprocated. The column's large scale volume transformed the staircase as much as environmental influences altered the appearance of the column. Its fabric skin was a temporary boundary that both separated and connected the interpenetrating sculptural and environmental processes. The fabric vibrated like a thin membrane excited by the intersecting energies. The sculptural and environmental energies generated were recorded at the point of intersection: the surface of the sculptural pole, (the fabric column), in a dynamic pattern of sculpture as process.

Column and staircase were dialectically interrelated providing the installation with the inherent effect of dynamism, which was amplified by movement of people up and down the stairway. Concurrent with the changing appearance of the environment and the installation, the perception of the stairway's users was also transformed. The fabric column provoked viewers to experience the staircase in a different way. They participated in the dynamic pattern generated by the installation, by comparing their former perception of the site with its new appearance.

The viewers' movement was an integral part of the install-

ation, as the column could not be seen in its entirety from any single point. Every individual defined his or her spatial and temporal perception of the column by moving up and down the stairway. The synthesis of sequentially perceived segments of the column generated a composite image or the idea of the column in the brain. Man's eye moves constantly to render an image of a phenomenon by updating its fluid pattern on the retina with views of slightly different angles. The flat image of one eye is transformed into a three dimensional image by binocular vision: the flat images of each eye compose one three-dimensional image in the brain. This internal information process of our perceptual system was externalized in my installation. Perception became a behavioral function of information compiled via body movement. The viewer updated his fluid perceptual pattern of the column by walking up and down the stairway, adding new views of the evolving column to his composite image.

The integration of real time, space and audience brings sculpture as process philosophically close to the previously discussed concept of sculpture as 'structures for behavior'. This concept introduced the idea of active perception to art with the intention of overcoming the traditional dichotomy of production and reproduction. In contrast to traditional sculptural forms based on passive perception, 'structures for

behavior' (which evolved primarily in Europe in the '60s, invited the audience to interact with the artwork as a perceptual tool. The German artist Franz Erhard Walther developed his oeuvre of usable and communicable sculptures based on a new 'Werkbegriff', which suggested that the artwork be considered an open, not closed, system. The idea of art as an open system indicates an interest in dialogue and feedback within a social culture. My installation provided an open system which involved the environment in a dialogue and generated patterns of material and nonmaterial communication. The fabric column acted as a stimulus and provided a surface for the materialization of the staircase's dynamic patterns.

2.4 'Archeology of the NOW'

The transformation of dynamic patterns of invisible processes in environmental communication into a material record can be called 'Archeology of the NOW' (Paik), that is, an effort to detect the presence of the present. 'Archeology of the NOW', does not reconstruct the past, but constructs the present as a transitory pattern between past and future. Siegfried Kracauer referred to the dynamic pattern of the present as 'Das Ornament der Masse': "The place occupied in history by a certain period is more precisely defined by the analysis of its unpretentious manifestations than by the

evaluations of the epoch about itself."[27] In Kracauer's definition ornament evolves as a process which materializes the collective unconsciousness in a dynamic pattern.

The house psychologist C.G. Jung built for himself in Bollingen, Switzerland over a period of ten years provides an interesting connection between Kracauer's 'Ornament der Masse' and Jung's theory of the collective unconsciousness. Herbert Muschamp writes about the collection of artifacts and fetishes with which Jung filled his house as follows: "Jung's work was the investigation of artifacts in which the invisible essence of world culture was made manifest....Bollingen was not a work of taste (which, as designers understand the term, is simply blind obedience to established patterns of visual conditioning), but the crystallization of years of energy spent in the psychic environment on a search for the reason why."[28] The dynamic pattern which results from the interplay of internal and external environments is manifest in Jung's house, as it is in Schwitters' environmental process sculpture, 'Merzbau'.

My installation provided an open system for the crystallization of the collective energies that exist in the staircase 7 environment. The plastic bags attached to the fabric column offered an easily accessible structure for this materialization. The users of the environment were invited to contribute any kind of material, i.e., written notes and

photos, to the collection on the column. This interactive process turned the installation into a tool for communication. Public aspects of the space and its users became private and private aspects became public. The fabric column functioned as a generator of environmental communication, both transmitting and receiving the dynamic pattern of information.

2.5 Interactive Video Link/Electronic Media

Concurrent with the local process of environmental communication in staircase 7, the site was connected with C.A.V.S. via an interactive video link. The spatial and temporal definition of the installation broadened from an exclusively site-specific setting to include multiple sites. The material and nonmaterial realities of the sites were connected via electronic media, which amplified the juxtaposition of spatial and temporal continuity and discontinuity. Users of staircase 7 were confronted with more than the material presence of the fabric column, but also with the nonmaterial (electronic) presence of the C.A.V.S. site, apparent on the monitor. Awareness of the environmental transformation brought to the staircase by the column alone, was juxtaposed against the new relationship/inclusion of the C.A.V.S. site.

The question of relationship to the C.A.V.S. site became

a matter of interpersonal relationship, as viewers in staircase 7 talked to me at C.A.V.S. and vice versa. "Who are you? Where are you? What are you doing?" was the common initial pattern of conversations via video link. The temporary electronic connection between individuals established temporal continuity despite spatial discontinuity. Staircase 7 users were electronically moved to C.A.V.S. and I appeared in the staircase. McLuhan called this effect of electronic media the "instant society", which connects every man with everybody's concern at any point in time and space. "...electronic circuitry has overthrown the regime of 'time'and 'space'..."[29]

In a recent article, Nam June Paik projected the 'Stationary Nomad' who moves his ideas without moving his body as the inhabitant of a media dominated environment, which is interconnected by a world-wide electronic network. This is not just a detached philosophical or aesthetic utopian vision, but a hypothesis, which can be based on the political and economic facts of the world-wide energy crisis. M.I.T. scientists expressed a similar concern in a 'Proposal for A Study of Telecommunication In An Energy Crisis" as follows: "Even more important, effective use of telecommunication may help maintain productivity and the quality of life, despite restriction on energy consumption."[30] M.I.T.'s Architecture Machine Group is advancing research in the field of telecom-

munication with its project "Transmission of Presence", which is commissioned by the Defense Advanced Research Projects Agency to develop a teleconferencing system for high-level decision makers. And artists such as Nam June Paik, Aldo Tambellini, Douglas Davis, Antonio Muntadas and myself experiment with telecommunication as part of new imaginative models of reality. McLuhan's prediction seems to be coming true: "The medium, or process, of our time - electronic technology - is reshaping and restructuring patterns of social interdependence and every aspect of our personal life."[31]

Our society undergoes and will be increasingly exposed to considerable political, social and cultural changes influenced by the fast development and the wide distribution of electronic media: teleconferencing systems, computerized 'Home Offices' in every home serving education, work and general data management and of course electronic leisure appliances.

In the envisioned computerized "information society" art will function as a buffer or a translator between nature and technology, between the overall concept of society determined by scientific/technological progress and the "human condition" of the individual. The models of reality provided by artistic imagination in contact with the driving forces of socio- and techno-cultural evolution will be faced

with the task of processing complex information on a human scale. A buffer in a computer is a "temporary storage unit, ...that accepts information at one rate and delivers it at another" ('Webster's New Collegiate Dictionary', pp. 143). It is the connection between information stored in the memory and the viewer display on a Cathode Ray Tube (CRT). The buffer interrelates access of input and output between man and machine.

Artistic models of reality can function as an interrelating buffer or a two-way link between human imagination/desire and scientific/technological progress. Scientifically and technologically "everything" seems to be possible. We are able, more than ever, to destroy the world and ourselves slowly in ecological catastrophy or with the fast blast of nuclear holocaust. What seems to be missing in our "formalist society", obsessed with HOW? rather than WHAT? or WHY? is as Charles Jencks remarked, the "quest for truth".

"The greatest problem today is that with the disappearance of God, or a regulative idea of truth which transcends man, there is little check on temporal power or relativism. All truth becomes a matter of opinion and is manipulated by one group or another, for its limited and provincial ends."[32]

Discussing a possible perspective for the future, Kepes suggested "desirability, in terms of human values" as "the

decisionmaker" for "alternative futures".[33] One important decision that will influence the image and ideas of a future world, concerns the use and the access of electronic media. The question of who will use the network of electronic media, when, why and for what purpose must be answered. Gene Youngblood predicted a totalitarian threat if electronic media are organized according to an "industrial principle": "...implemented through their [the industrial corporations] structure and function it becomes the principle of centralized, one-way, mass-audience, nonadaptive distribution of messages."[34] As an alternative he developed a "cybernetic organizing principle" which is "specified" and "controlled by the user". The opposing principles are characterized as follows:

Industrial Organizing Principle:	Cybernetic Organizing Principle:
Centralized	Decentralized
One-Way	Two-Way
Mass Audience	Special Audience
Nonadaptive	User Controlled
Message Distribution	Feedback Communication

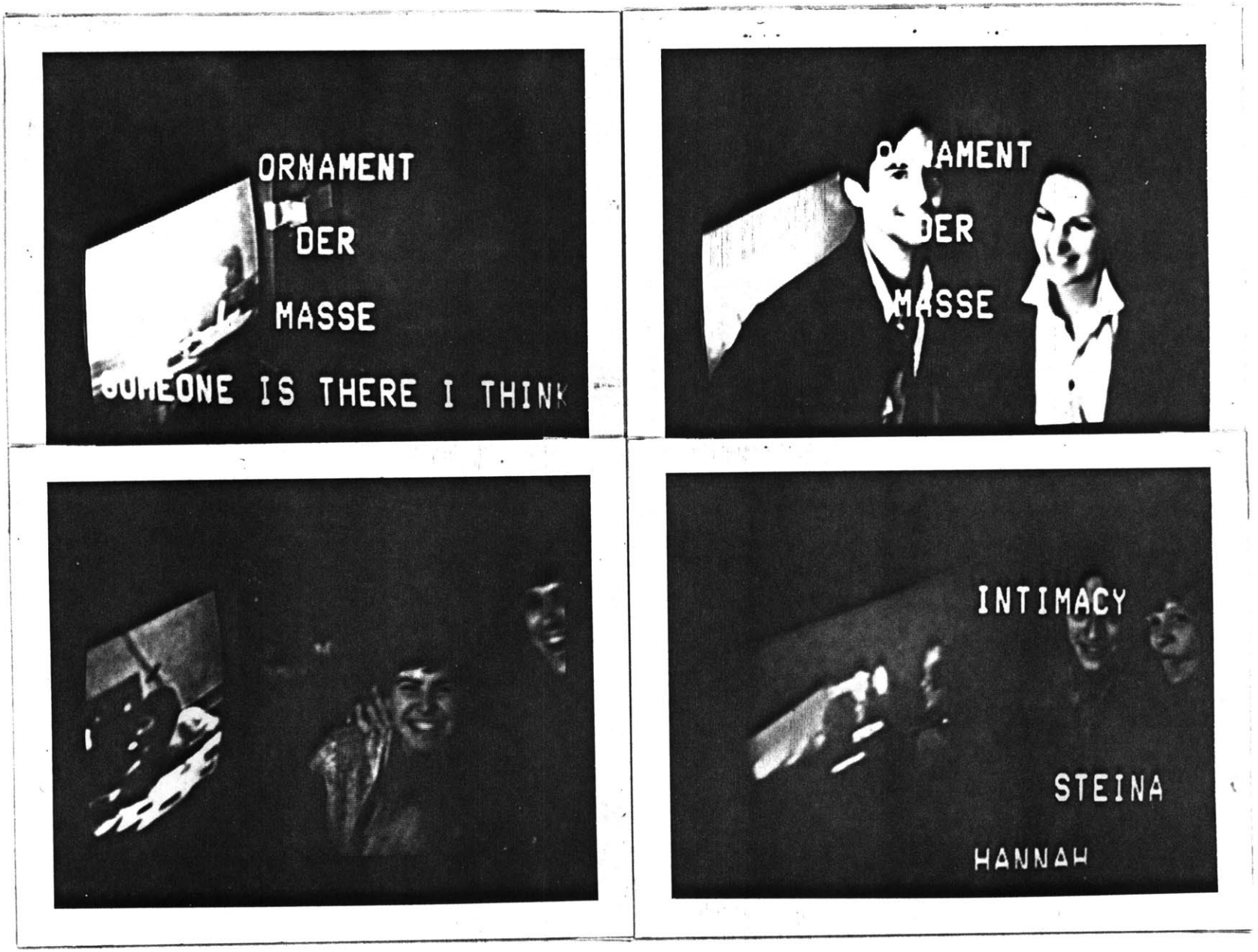
My use of electronic media in the installation tended towards Youngblood's suggestion of a "Cybernetic Organizing Principle". The video link between staircase 7 and C.A.V.S. was interactive, amplifying and stimulating processes of communication in both sites. The two sites, normally unconnected, generated temporary common borders in the form of

video images. The images, representing the dynamic electronic patterns of the environments' interplay were stopped in time and preserved by the use of polaroid pictures. The originals were displayed at C.A.V.S. and as photocopies, in staircase 7. I photographed all of my conversation partners by taking their polaroid picture off the monitor in order to materialize the process of electronic information exchange. The dynamic pattern of rapidly sequenced electronic images was slowed down and made visible as a still frame representing an isolated part of the pattern. Each polaroid picture was mounted on a time encoded card and arranged on a wall at C.A.V.S. chronologically in ascending diagonal lines. Photocopies of each card were placed in corresponding progression in plastic bags on the fabric column. The image sequences at both locations recorded the time progression of the installation.

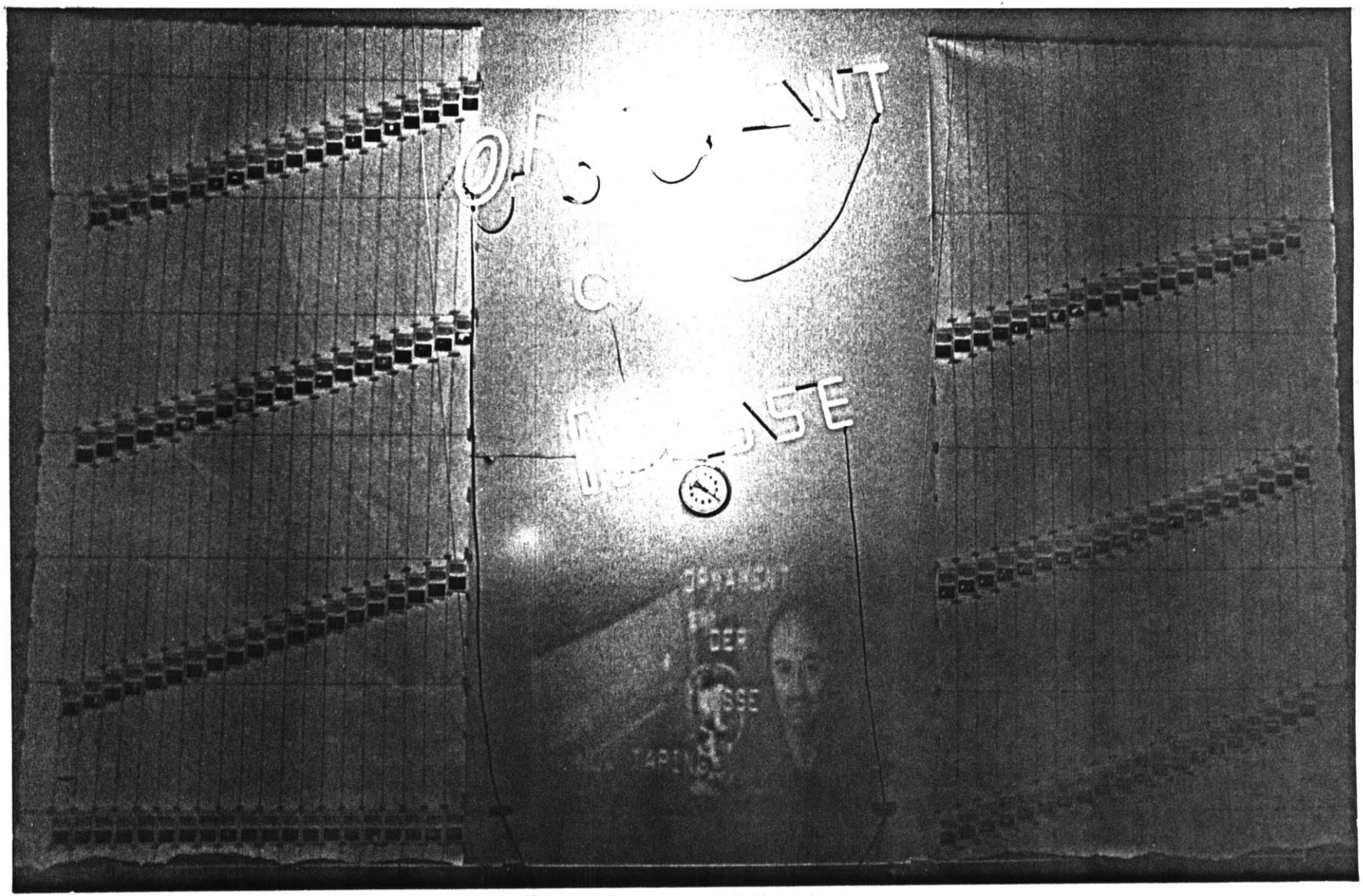
Over the three-week period these still frames, isolated instances from the electronic process, generated a pattern of their own. Stretched out in time, the two dimensional image sequence on the C.A.V.S. wall and the three dimensional assemblage of materials on the surface of the fabric column formed the scanning lines of the environmental communication processes. These lines materialized as temporary traces, the nonmaterial processes of environmental communcication in a way comparable to the on/off rhythm of the electron beam scanning

images in the Cathode Ray Tube (CRT) of a TV set. The electron beam in a CRT scans in two interlaced paths the pattern of images at a rate of one every 30 seconds. Some of these 30 second patterns isolated from the dynamic sequence of electronic images by polaroid photography became elements of the scan lines at C.A.V.S. and in staircase 7. The images were assembled into one path at the much slower rate of one per 3 weeks.

The single TV image can be seen as either a complete, recognizable pattern of objects or events or as an incomplete segment, a fragment of the dynamic image sequence. It is part and whole simultaneously, in a reciprocal and dynamic relationship. The same dynamic scale of micro and macro perception applies to the patterns assembled on the C.A.V.S. wall and the fabric column. Each fragment of the dynamic image sequences was a recognizable whole, as much as the whole pattern of the scanning lines represented only a fragment of the ongoing environmental processes. The dialectic relation of whole and parts reflected the dynamic spatial and temporal scale in the combined electronic and environmental communication processes in <u>sculpture as process</u>.



Polaroid pictures taken off the monitor at C.A.V.S.



Wall installation at C.A.V.S. with polaroid sequence and video projection from the staircase site

2.6 Transmission - Transmitted Sculpture

The telecommunication event on October 19, 1980 expanded the spatial and temporal scale of my installation further towards the idea of multiple sites, which were connected like a network of electronic media. The slow-scan connection with Hamburg extended two basic elements of the installation:

(A) transformation of different sites through physical presence and via electronic media

(B) involvement of users/viewer participation through direct physical interaction and via electronic media

The fabric column in staircase 7, the wall installation at C.A.V.S. and the video link transformed both sites, evoking a process of environmental communication and stimulating viewers to participate in its materialization. These material and nonmaterial processes of direct physical interaction and electronic information exchange were balanced between the two M.I.T. sites, as the transition between processes and sites was possible. Viewers had equal access to the collection of materials on the fabric column and to the video link. Participants who wanted to know more about the C.A.V.S. site they saw on the monitor, walked across the street to take a direct look and to talk to me in person. Physical presence and interaction matched representation and exchange of information via electronic media. The installation maintained the equilibrium

of its different elements in the same way biological systems balance their functions and input/output relations.

The telecommunication event, however, was dominated by the fast and ephemeral sequence of the electronic process, which upset the balance of the installation. The equilibrium of material and nonmaterial processes was lost in the electronic acceleration, the exchange of electronic information being so active that the translation of this nonmaterial process into material form fell behind. The material and nonmaterial processes became unsynchronized as each moved in a different tempo. As a result, the 8 second cycles of each slow-scan still had to be repeated two or three times to provide enough time for satisfactory polaroid reproduction. This repetition rendered the nonmaterial process of electronic transmission redundant in order to facilitate the material process of information/image recording. Without this repetition, the material process of photographic reproduction would hardly have been possible.

The efficiency of the material and the nonmaterial processes was inversely related: the more redundant and less efficient the electronic transmission, the more accurate and efficient the photographic reproduction; the less redundant and more efficient the electronic transmission, the less efficient and nearly impossible the photographic reproduction.

The 'fast' nonmaterial/electronic process and the 'slow' material/photographic process collided in this case, as in all previous and following telecommunication events I witnessed: either the process of electronic communication was uninterrupted and flowed well or, the photographic process was efficient and resulted in a stable document.

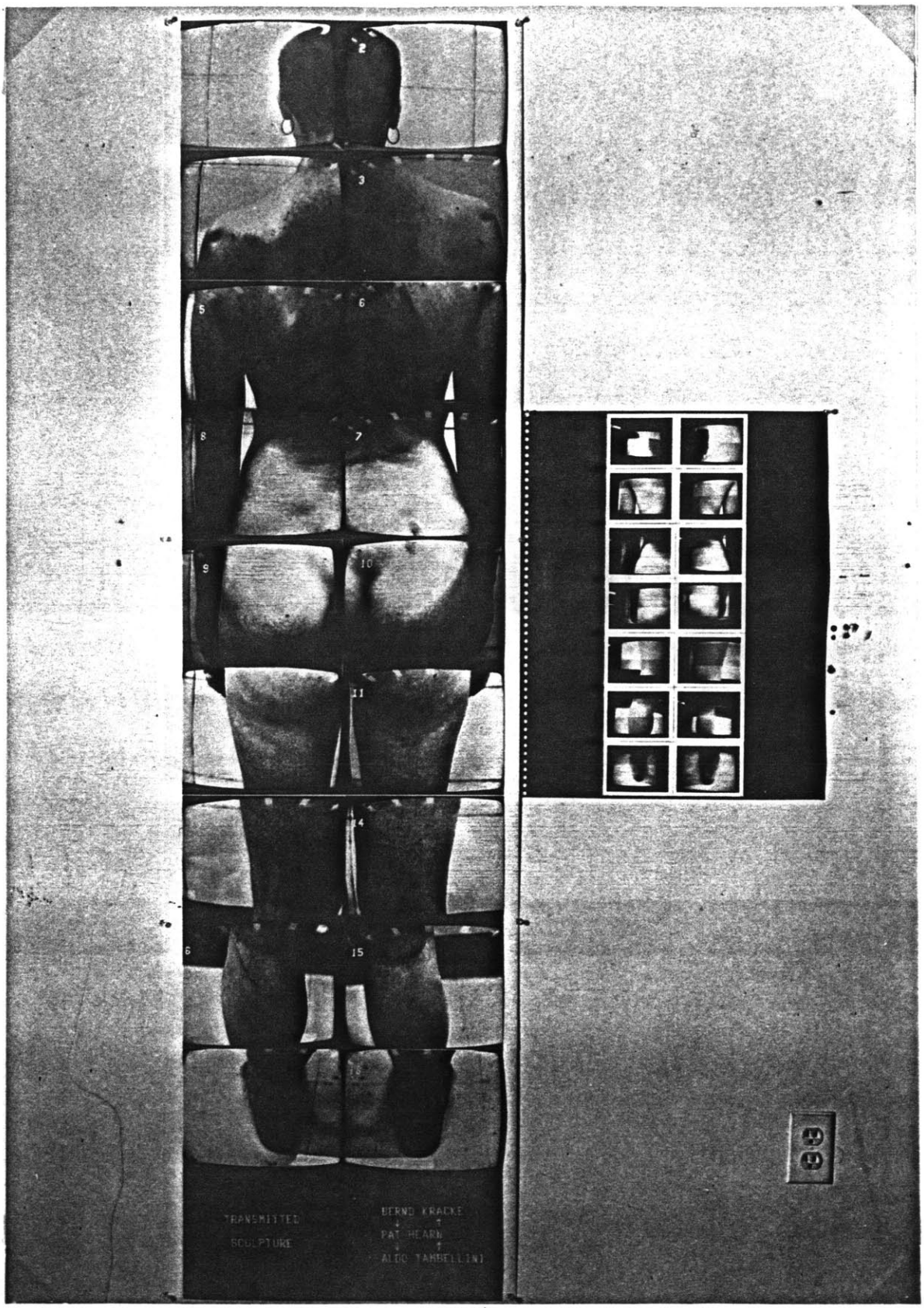
The attempt to combine efficiently both processes fragmented each of them in the M.I.T./Hamburg event. The communication between the group at C.A.V.S./M.I.T. and the audience in Hamburg was repetitious because of time delays related to the photographic reproduction. The photographic realization at both ends was neither complete nor of first-rate quality because of time limitations. Accordingly, both audience participation and the attempted photographic reconstruction of the column in Hamburg were fractured efforts, which can be viewed in alternative ways. On one hand, the event was an authentic record of two processes colliding - difficult to control according to the expectations of artist and audience. The "risk of the experiment" as Billy Klüver cited in context of EAT became part of the event. On the other hand, the fragmentation of communication and of reproductive materialization could be interpreted as a technical problem in the structure of the event - and perhaps in slow-scan telecommunication in general.

The M.I.T./Hamburg event was many-faceted and heavily loaded with ideas, which may have been difficult to realize in the available 1½ hours. Beyond the site difficulties of the telecommunication event, the reconstruction of the 'transmitted sculpture' eventually completed in Hamburg might be characterized as a fragment representing only limited aspects of the material qualities of the fabric column and its environment. At this point the capacity of telecommunication in general to convey reality seems to be at stake. The dynamic temporal and spatial scale in the inverse relation of parts to the whole (previously discussed in the context of the interactive video link) characterizes the electronic information process of telecommunication as well.

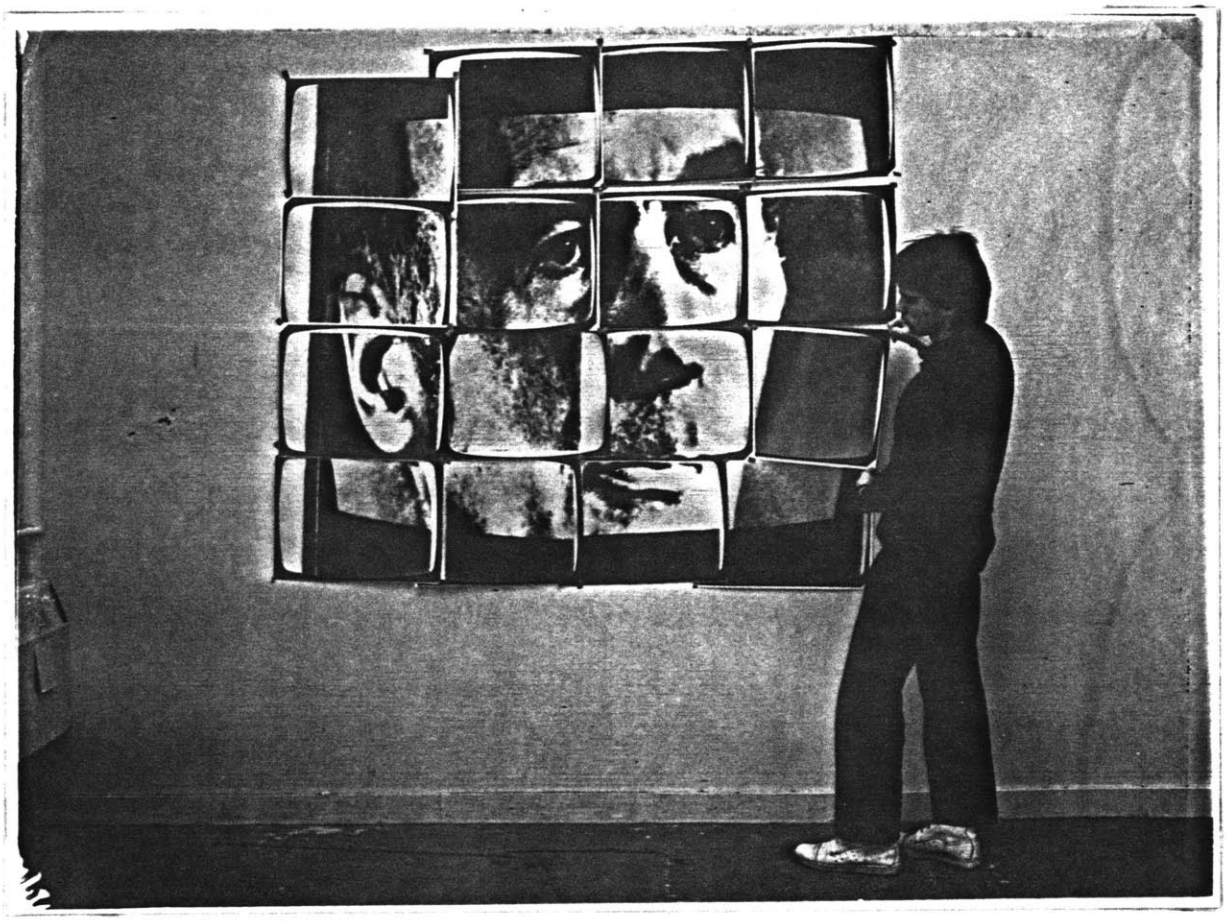
The transmitted and received information does not duplicate the material reality of its origins. It represents fragments of material reality, which can be pieced together like a mosaic forming a composite model of reality. Due to the dynamic sequence of these fragments conveyed by electronic media, this model is usually assembled in the combined perceptual processes of the senses and the brain. Consequently, the media generated model is like all other perceptual models of reality: a nonmaterial, time-based composite resulting from the mental interface of new information and memory. The idea of 'transmitted sculpture' is to externalize this mental

process by transposing it to a slower tempo of spatial materialization. The complexity of material reality to be conveyed influences the intelligibility of the model which results from the transformation. This becomes obvious when comparing the discussed project, 'Transmitted Sculpture 2', with the earlier 'Transmitted Sculpture 1' and 'Interfaces'.

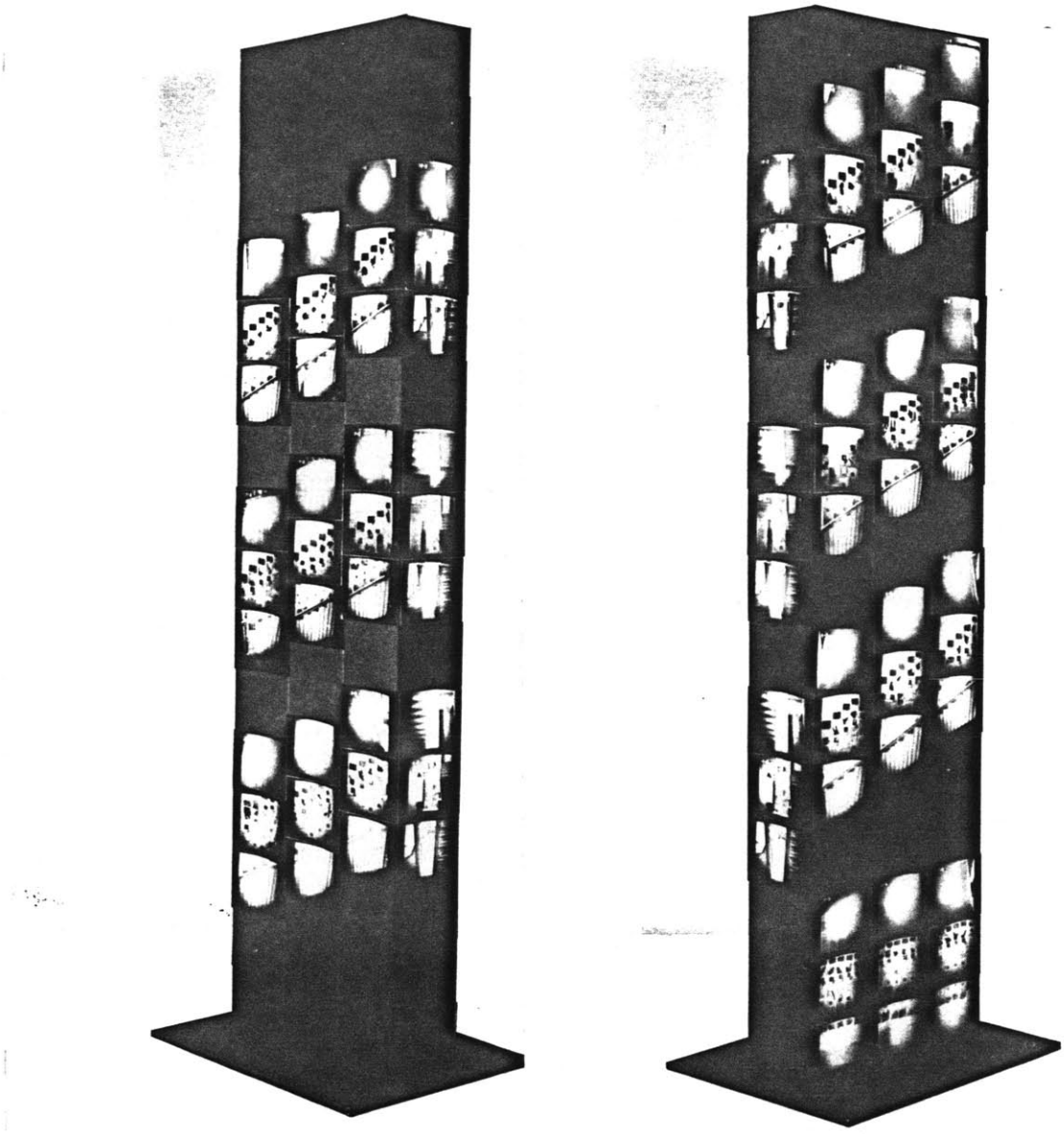
My 'Transmitted Sculpture 1' (1980), a collaboration with the group COMMUNICATION-SPHERE, utilized a telecommunication event between C.A.V.S./M.I.T. and Atlanta, Georgia to transmit and reconstruct the image of a female nude in 18 single frames. 'Interfaces' (1981) a collaborative telecommunication event of C.A.V.S. artists and the Vidéothèque de Paris for the opening of 'Centervideo' in Paris, consisted of the transmission and reconstruction of U.S. president Ronald Reagan's and French president Giscard D'Estaing's faces in 16 single frames each. The human face and body are such familiar images in our culture, that they remained perfectly intelligible despite low resolution and distortions. However, the unfamiliar and complex staircase 7 installation lost much of its coherence in the transformation. The less complex and the more familiar the conveyed material was, the clearer and the more distinct the transmitted composite model. The price for these intelligible end products was, in the case of both 'Transmitted Sculpture 1' and 'Interfaces' high redundancy



'Transmitted Sculpture 1', 1980
slow scan transmitted and reconstructed nude - C.A.V.S./M.I.T. - Atlanta, Georgia



'Interfaces', Feb. 1981 Composite "face" of French president Giscard d'Estaing, as transmitted in 16 single frames from Paris to C.A.V.S./M.I.T. during the slow scan telecommunication event



'Transmitted Sculpture 2'
slow scan transmitted and reconstructed column C.A.V.S./M.I.T.-Hamburg

and the loss of interactive qualities in the media process.

These examples of 'transmitted sculptures' which utilized telecommunication to create models of reality emphasize the dynamic scale of sculpture as process. In contrast to the fixed scale of object sculpture, the scale of sculpture as process is variable with a range of micro to macro perception. The electronic process of information exchange dissolves past, present, and future in a continuous sequence of timeless images. Image sequences and their representation of time and space can be endlessly and indistinguishably manipulated. Every media image confronts us with its ambivalent qualities of being both real and unreal, present and absent, live and recorded, big and small. "The ITSELF" as Otto Piene mentioned "changes its self because a 'media-self' is added".[34] This "media self" or what can be called a 'media reality' is juxtaposed with our self and 'reality'. Forward, backward, fast forward, fast backward, slow motion, single frame, random access, edit, erase, and 'do it all over again' are some of the options for the production of the multi-faceted 'media reality', which influences its distribution patterns as well.

The dynamic scale of production and distribution of 'media reality' are for the viewer/consumer "simulataneously intimate and monumental" effects. "Whereas it is small (even with future room-size TV) to the individual human receiver,

the distribution to receivers and the range of distribution are monumental."[35] Simultaneity of wide range distribution and one-to-one (monitor-to-individual) reception emphasize the dynamically and inversely related parts and whole of 'media reality'. Moving back and forth between a micro and a macro scale, we perceive every media image both as a unique whole and an ephemeral part of the continuous image sequence of 'media reality'. If we expand our view a little further, the electronic image sequence is simultaneously a unique whole as 'media reality' and only a fragment of 'the reality' it represents. 'Media reality' is a part of the whole 'reality' and vice versa.

All parts of the environment, encompassing every aspect of the visible and invisible world and ourselves, are dynamically and reciprocally related to the whole. Our perception of this whole becomes both, increasingly complex, as we learn more about its parts, and more fragmented, as the detailed knowledge shatters our naive perspective. Kepes' exploration of worlds beyond our natural perception opened up micro and macro views of a "New Landscape". What of the 'old landscape' or simply 'the landscape'? It stayed with us including all political, social, technological and cultural problems, promises and hopes. For example, the 'old' and 'new' worlds of Europe and America are nearly indistinguishable as they

have become as interrelated as the 'old' and "New Landscape" and 'reality' and 'media reality'. The dynamic scale of our lives and our perception of ever increasing micro and macro views is reflected in the dialectic relation of parts to the whole in sculpture as process.

The composite model of reality rendered by sculpture as process interrelates in a dynamic pattern subject/object, individual/group, private/public and 'media reality'/'reality'. Electronic transmissions connect people at different sites establishing a network of interactive telecommunication. The M.I.T./Hamburg nonmaterial translocation/transmission was echoed and reinterpreted by the eventual material translocation of the sculptural pole - which then connected people in different sites via physical transformation and interaction.

2.7 Translocation

The final public phase of the project consisted of the material translocation of the fabric column after three weeks in staircase 7 to Lobby 7. The physical movement of the column drew an analogy to the electronic transmission as 'transmitted sculpture' to Hamburg. The reciprocal relationship of parts to the whole affected the viewers and participants at both staircase and Lobby sites.

Removing the fabric column from staircase 7 did not

return the site/environment to its former condition, but left an afterimage of the column burnt in the collective memory. This afterimage effect was particularly reinforced by the appearance of the same column in the adjacent lobby of building 7, as it prolonged the memory of the installation at the first site. In accordance with the "dialectics of transformation" this memory was not exclusive and static, but dynamic. It was juxtaposed with the changed appearance of the column in Lobby 7. That is to say, that the translocation did not just duplicate the display of a sculpture in a traditional sense. Instead, the translocation activated another vital phase of sculpture as process by moving into a larger dimension, towards a macro view. The fabric column was moved out of the enclosure of staircase 7 into the wide, open space of Lobby 7. Through this translocation the 66-foot high column became apparent in its entire "Gestalt", which the audience could only have perceived in segments between the floor levels of staircase 7. The 'micro' perception of the column as a soft wall in staircase 7 was juxtaposed in the memory against the 'macro' view of the overwhelming vertical shape suspended from the ceiling.

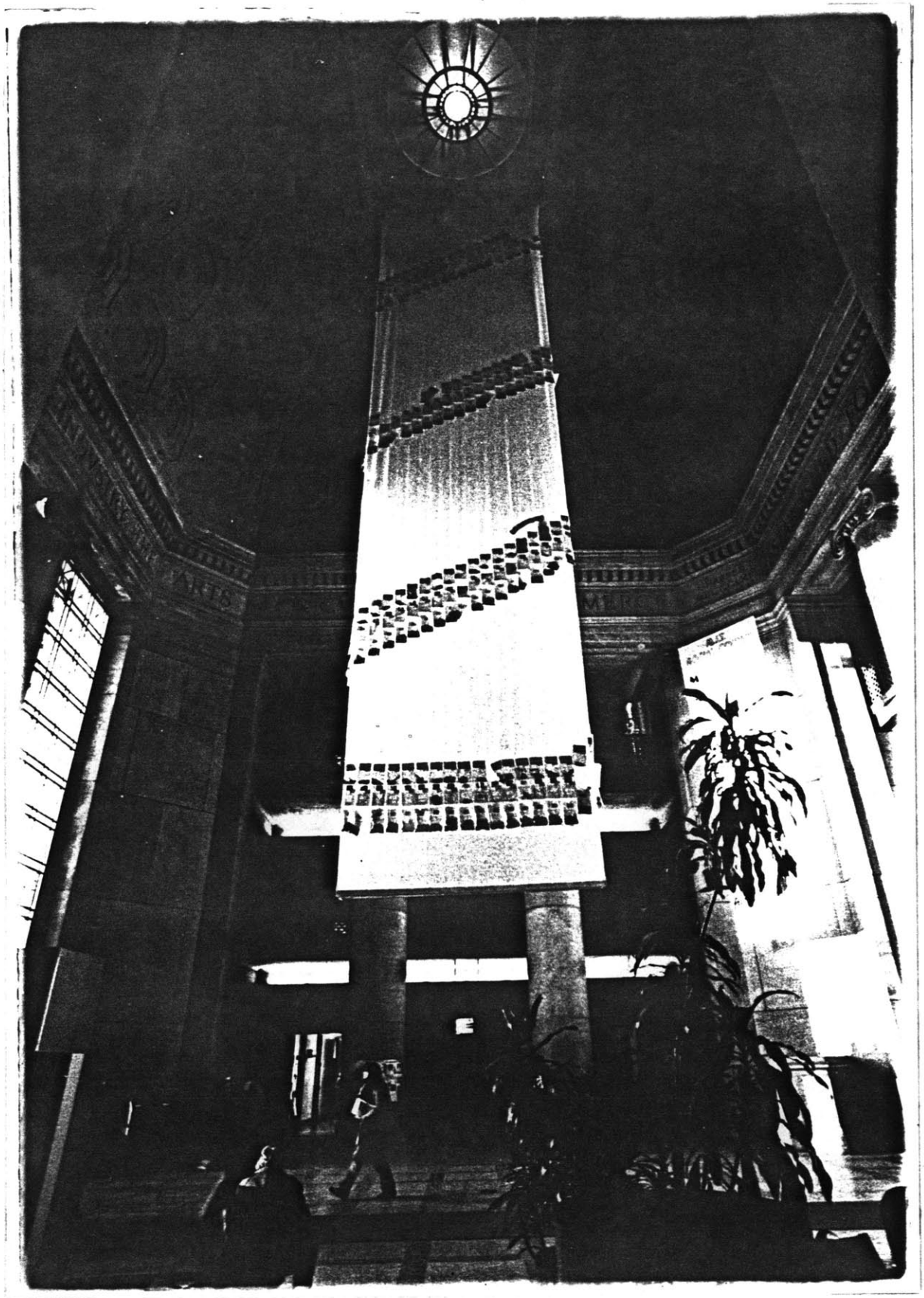
The "Gestalt" created in the staircase location emphasized individual access and spiral dynamism with a tendency towards the archetypal connotations of vertical desire. The column

amplified the function of the stairway by transforming it into a directional vertical corridor. The translocation, however, revealed the latent potential of the staircase and its users to animate and materialize the invisible archetypal energies. By participating in the collection of materials the staircase 7 population generated unconsciously a collective monument with their individual contributions. They charged the fabric column with private details concurrent with their routine utilization of the stairway. Seemingly unimportant details melted together into a rich spiral pattern of environmental communication, which became apparent through the translocation. Intimate, individual access to the plastic bags in staircase 7 was transformed into a public display or summary. Individual parts merged into the whole in the public "Gestalt".

The qualities emerging from the fabric column's translocation seemed to reflect the characteristic differences of the two sites. Both spaces serve building 7 as zones of transition. Lobby 7, with its classical architectural design and grand scale, emphasizes the representative, public face of the Institute. Whereas staircase 7, a pragmatic space, serves the Institute mainly in a funtional capacity. Staircase 7 provides a rather intimate atmosphere for the transition between public exposure and privacy, in contrast to the busy and hectic public life of Lobby 7. According to these

characteristics, the public perception of the fabric column was transformed along with its spatial and material qualities. Part of the population in Lobby 7 knew of the installation from its first phase and may even have contributed to it. Their former material 'dialogue' with the installation was continued on a nonmaterial or perceptual level. Other parts of the population had not seen the installation in its first site and had to relate to it without knowing the history of its development. These people saw the installation from a different frame of reference which could gradually be adjusted by communication with former participants and/or the artist, by reviewing published material and by looking carefully at the piece itself.

The translocated fabric column, initially a 'blank' sculptural pole in staircase 7, displayed an account of its own history as generated and recorded in dialogue with its changing sites. This history was visible on the surface of the column as a continuous spiral line of collected materials. In the macro view of the spiral line was materialized the invisible and dynamic pattern of environmental communication. In the micro view, the line consisted of plastic bags containing artifacts of the environment, the collected information which became the memory of the installation. This memory both related the



Translocation - fabric column in Lobby 7, M.I.T.

presence of the fabric column in Lobby 7 to its past in staircase 7 and its connection with C.A.V.S. and Hamburg and it provided the potential capacity to reactivate and update the process of environmental communication.

2.8 Memory - Storage and Retrieval

It can be said that dismantling the sculptural poles in Lobby 7 and at C.A.V.S. did not terminate sculpture as process, but transformed it into yet another state of materialization: the storage of compressed information as memory. This final point in the discussion of sculpture as process marks only a temporary end, as the memory is the most potent and inclusive part of the concept. Memory may not be seen as a nostalgic view back into the past, nor as a mere documentation of events, but as a powerful tool for the extension of the past via the present into the future in the dialectic sense of Hegel's "Aufhebung".

The temporary materialization of the exchange of energies traced an information pattern which was imprinted onto our 'environmental memory'. This 'environmental memory' is a dynamic composite which interrelates the individual and the group, the private and the public, the conscious and the unconscious. The temporary appearances of the fabric column in staircase 7 and Lobby 7 left impressions on the 'environ-

mental memory', which faded after a while. Other parts of the generated information will feed the 'environmental memory' for longer durations: the collection of polaroid pictures on computer cards, the collected information in the plastic bags, the video recordings of the interactive video link and the telecommunication event, the planned microprocessor coordinated storage of all generated information on a videodisc, and the mental recordings in the brains of people who perceived the installation directly or via media. These are the available data generated and recorded during the sculptural process and now stored as the randomly accessible memory of the project. This memory stores the information in the most compressed form possible, reducing the project's large physical scale to minimal size. Despite this compression, the stored information allows for the option to fully reconstruct the installation at the same or at other sites and to initiate new phases of the environmental communication process.

The 'project memory' is reciprocally related as a fragment to the whole of my installation and of the 'environmental memory'. Sculpture as process interrelates on a dynamic scale the ongoing information processes, which generate 'environmental memory', with a materialized information pattern of a specific time/space segment contained in the 'project memory'. Sculpture as process activates pulsating patterns of

information fluctuating between material and nonmaterial presence.

SUMMARY

The concept of sculpture as process, developed in my thesis, is based on my perception of reality as a constantly changing pattern of information. This information pattern is generated by the interrelation of individuals and groups, the private and the public, the natural and the built environment. Communication within and between these organic and inorganic systems correlate their input and output and their functions. Reality is dynamic and pulsating as is this information process. Both the theoretical and practical models of reality I hypothesize reflect this dynamism with dialectically related material and nonmaterial stages of sculpture as process.

Sculpting includes, beside shaping materials (wood/stone/metal etc.) and form (representational/non-representational), detecting and influencing time-space relations of information processes in the environment. Information is the material and volume of sculpture as process. Its textures are the temporary and dynamic patterns generated and materialized by intersecting energies of different information processes. The forms of sculpture as process are externalized models of random access memory, which can be continuously updated. Although using

different media, such as photography, video and telecommunication, sculpture as process is a 'manned' system emphasizing the carthartic need for human coordination of the run-away scientific/technological world and the 'human condition'. Sculpture as process generates both, transmitting and receiving, environmental communication and creative exchange of energies through the process of collaboration and participation.

REFERENCES

1. Burnham, Jack, Beyond Modern Sculpture, p. 12, George Braziller, NY, 1969.

2. Seuphor, Michel, Dictionary of Abstract Painting, NY, 1957.

3. Davis, Douglas, Art of the Future, p. 19, Praeger Publishers, NY, 1973.

4. Ibid., p. 19.

5. Schneckenburger, Manfred, Centerbeam, p.28, M.I.T. Press, 1980.

6. Wingler, Hans M., The Bauhaus - Weimer/Dessau/Berlin/Chicago, p. 276: title of a proclamation by Moholy-Nagy and Kemeny in Der Sturm, 1922.

7. Burnham,Beyond Modern Sculpture, p. 8.

8. Davis, Douglas, Art of the Future, P. 52.

9. Burnham, Jack, Beyond Modern Sculpture, p. 243.

10. Ibid., p. 349.

11. Davis, Douglas, Art in America, Jan/Feb 1968, 'Art and Technology: The New Combine".

12. Davis, Douglas, Art of the Future, p.73.

13. Ibid., p. 116.

14. Burnham, Jack, 'Steps in the Formulation of Real-Time Political Art' from Hans Haacke, Framing and Being Framed, p. 132, The Press of the Nova Scotia College of Art and Design, Halifax, New York University Press, NY. 1975.

15. Tisdall, Caroline, Joseph Beuys, P. 254, The Solomon Guggenheim Museum, NY, 1979.

16. Ibid., p.7.

17. Burgess, Lowry, Centerbeam, p. 26, M.I.T. Press, 1980.

18. Ibid., p.23.

19. Ibid., p. 29.

20. Kepes, Gyorgy, Arts of the Environment, p. 12, George Braziller, NY, 1972.

21. Tisdall, Caroline, Joseph Beuys, p.254.

22. Piene, Otto, Centerbeam, p. 5.

23. Ibid., p. 10.

24. McLuhan, Marshall and Fiore, Quentin, The Medium is the Massage, p. 68, Bantam Books, NY, 1967.

25. Philipson, Morris, Outline of a Jungian Aesthetics, p. 123, Northwestern University, 1963.

26. Kepes, Gyorgy, The New Landscape - in art and science, p. 205, Paul Theobald and Co., Chicago, 1956.

27. Kracauer, Siegfried, Das Ornament der Masse, p. 50, Suhrkamp, 1977. Translated by the author from the German original: 'Der Ort, den eine Epoche im Geschichtsprozess einnimmt, ist aus der Analyse ihrer unscheinbaren Oberflaechenaeusserungen schlagender zu bestimmen als aus den Urteilen der Epoche ueber sich selbst.'

28. Muschamp, Herbert, File under Architecture, pp. 54-55, M.I.T. Press, 1974.

29. McLuhan, Marshall and Fiore, Quentin, The Medium is the Massage, p. 16.

30. Research Program on Communications Policy - M.I.T. Proposal For A Study Of Telecommunications in An Energy Crisis, M.I.T., 1980.

31. McLuhan, The Medium is the Massage, p. 16.

32. Jencks, Charles, Architecture 2000, pp. 119-120, NY, 1971.

33. Kepes, Gyorgy, The New Landscape, p. 12.

34. Youngblood, Gene, 'The Mass Media and the Future of Desire', The CoEvolution Quarterly, P. 9, Winter 77/78.

35. Piene, Otto, Centervideo, p.28, Videocatalogue C.A.V.S./ M.I.T., 1981.

36. Ibid., p. 28.

SELECTED BIBLIOGRAPHY

ARCHITECTURE

Conrads, Ulrich, Programs And Manifestos On 20th-Century Architecture, M.I.T. Press, 1964/70.

Muschamp, Herbert, File Under Architecture, M.I.T. Press, 1974.

Negroponte, Nicholas, The Architecture Machine - Towards A Human Environment, M.I.T. Press, 1970.

Venturi, Robert, 'Complexity and Contradiction in Architecture', Museum of Art Papers on Architecture, 1979.

ART HISTORY

Adriani, Götz and Konnertz, Winfried and Thomas, Karin, Joseph Beuys, Verlag M. DuMont Schauberg, 1973.

Burnham, Jack, Beyond Modern Sculpture - The Effects of Science And Technology On The Sculpture Of This Century, Geroge Braziller, NY, 1967.

Burnham, Jack, The Structure of Art, George Braziller, NY, 1971.

Burnham, Jack, The Great Western Salt Works - Essay on the Meaning of Post-Formalist Art, George Braziller, NY, 1974.

Davis, Douglas, Art and The Future - A History/Prophecy of the Collaboration between Science, Technology, and Art, Praeger Publishers, NY, 1973.

Haacke, Hans, Framing And Being Framed - 7 Works 1970-1975, NYU Press, NY, 1975.

Herzogenrath, Wulf, Nam June Paik - Werke 1946-1976, Musik-Fluxus-Video, Koelnischer-Kunstverein, 1977.

Kepes, Gyorgy, Arts of the Environment, George Braziller, NY, 1972.

Kepes, Gyorgy, The New Landscape - In Art and Science, Paul Theobald and Co., Chicago, 1956.

Kepes, Gyorgy, Structure in Art and In Science, George Braziller, George Braziller, NY, 1965.

Lippard, Lucy, Six Years: The Dematerialization of the Art Object From 1966 to 1972, Praeger Publishers, NY, 1973.

Piene, Otto and Goldring, Elizabeth and Grabill, Vin, Centervideo, M.I.T. Press, 1981

Piene, Otto, More - Sky, M.I.T. Press, 1970.

Piene, Otto, Rainbows, Migrant Apparition, Inc., Cambridge, MA, 1971.

Piene, Otto, ZERO 1,2,3, M.I.T. Press, 1973.

Popper, Frank, Art, Action and Participation, Studio Vista, 1975.

Popper, Frank, Origins and Development of Kinetic Art, New York, Graphic Society, 1968.

Rowell, Margit, The Planar Dimension - Europe 1912-1932, The Solomon Guggenheim Museum, NY, 1979.

Schmalenbach, Werner, Kurt Schwitters, Verlag M. DuMont Schauberg, Köln, 1967

Sohm, H., Happening & Fluxus, Koelnischer Kunstverein, 1970.

Tisdall, Caroline, Joseph Beuys, The Solomon Guggenheim Museum, NY, 1980.

Wingler, Hans M. The Bauhaus - Weimar/Dessau/Berlin/Chicago, M.I.T. Press, 1978.

CATALOGUES

Eremit? Forscher? Sozialarbeiter?. Das veränderte Selbstver ständnis von Künstlern, Kunstverein und Kunsthaus Hamburg, 1979.

Picasso - OEuvre recues en paiement des droits de succession, Edition de la Réunion des musee nationaux, Paris, 1979.

MEDIA

Battock, Georgy, New Artist Video - A Critical Anthology, NY, E.P. Dutton, 1978.

Davis, Douglas and Simmons, Allison, The New Television, M.I.T. Press, 1977.

Kracauer, Siegfried, From Caligari To Hitler - A Psychological History of the German Film, Princeton University Press, 1974.

Kracauer, Siegfried, Theory of Film - The Redemption of Physical Reality, New York Oxford University Press, 1965.

Kracauer, Siegfried, Das Ornament der Masse, Suhrkamp Verlag, 1977.

McLuhan, Marshall, From Cliché to Archetype, The Viking Press, NY, 1970.

McLuhan, Marshall and Fiore, Quentin, The Medium is The Massage, Bantam Books, NY, 1967.

McLuhan, Marshall, Counterblast, Hartcourt, Brace and World, Inc., NY, 1969.

PSYCHOLOGY

Jacobi, Jolande, Complex/Archetype/Symbol - In The Psychology of C.G. Jung, Bollingen Series LVll, Pantheon Books, 1959.

Jaffe, Aniela, The Myth of Meaning, Putnam's Sons, NY, 1971.

Jung, C.G., The Archetypes and the Collective Unconscious, second edition, Bollingen Series XX, Princeton University Press, 1977.

Jung, C.G., Psychological Types, Bollingen Series XX, Princeton University Press, 1974.

Jung, C.G., Psyche and Symbol, Doubleday and Company, Inc., Garden City, NY, 1958.

Jung, C.G., Man and His Symbols, Doubleday and Company, Inc., Garden City, NY, 1964.

Merlau-Ponty, Maurice, The Role of The Body - Subject in Interpersonal Relations, Duquesne University Press, Pittsburgh, PA, 1965.

Merleau-Ponty, Maurice, The Primacy of Perception, Northwestern University Press, 1964.

Philipson, Morris, Outline of A Jungian Aesthetic, Northwestern University Press, 1963.

THESES

Johnson, Paul A. , Ornament and Collective Fantasy, Master of Architecture, M.I.T., 1979.

Kracke, Bernd, Neue Perspektiven fur die Gestaltung des Offentlichen Raums, Master of Fine Arts, Hochschule fur bildende Kunste, Hamburg, 1978.

Siler, Todd L., Reality, Master of Science in Visual Studies, M.I.T., 1980.