Generative Art

George Legrady © 2021
Experimental Visualization Lab
Media Arts & Technology
University of California, Santa Barbara

Sequence of Automation Complexity (p.10-11)

1) Full human participation, activating software (Adobe software applications?)
2) User provides various attributes/parameters, software generates results automatically (like fractal designs)
3) Generative: Encode artist style into rules and algorithms (Cohen?)
4) Transformational: New image is created out of an existing image which is reformulated algorithmically (image processing filtering)
5) AI: Collection of existing images are analyzed then iteratively processed, then reduced dimensionally to produce a new image

https://link.springer.com/article/10.1186/s42492-018-0006-1

“Generative art refers to any art practice where the artist uses a system, such as a set of natural language rules, a computer program, a machine, or other procedural invention, which is set into motion with some degree of autonomy contributing to or resulting in a completed work of art.”

What is Generative Art?

Complexity Theory as a Context for Art Theory

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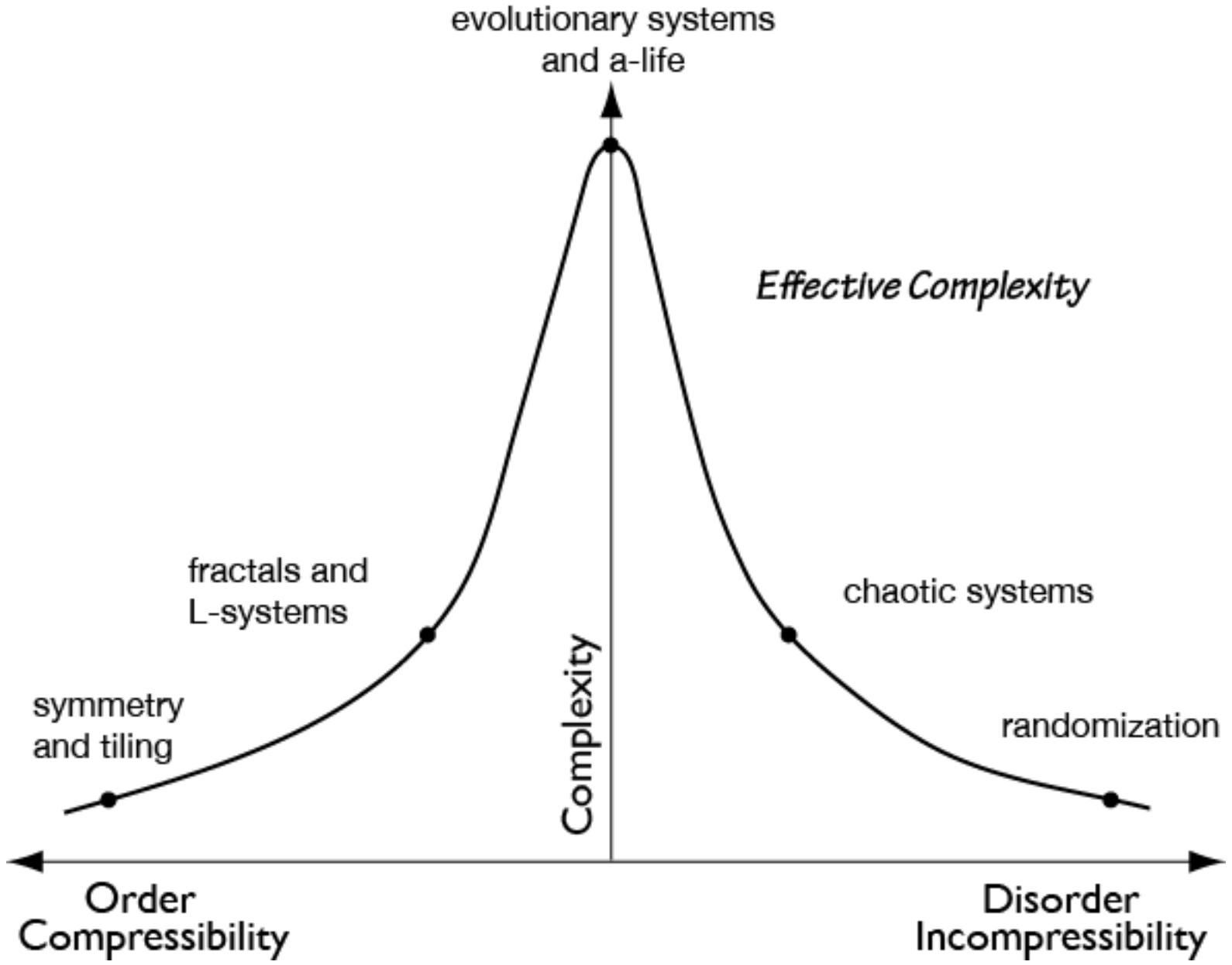
Abstract

In this paper an attempt is made to offer a definition of generative art that is inclusive and provides fertile ground for both technical and art theoretical development. First the use of systems is identified as a key element in generative art. Various ideas from complexity theory are then introduced. It is noted that systems exist on a continuum from the highly ordered to the highly disordered. Citing examples from information theory and complexity science, it is noted that highly ordered and highly disordered systems are typically viewed as simple, and complex systems exhibit both order and disorder. This leads to the adoption of effective complexity, order, and disorder as organizing principles in the comparison of various generative art systems. This inclusive view leads to the somewhat surprising observation that generative art is as old as art itself.

“Systems in Art Making and Art Theory….”, Philip Galanter



http://median.newmediacaucus.org/caa-edition/systems-in-art-making-and-art-theory-complex-networks-from-the-ashes-of-postmodernism/

Randomized Autonomous Systems

- In 1787, Mozart wrote “Dice Game” each sequence selected from 11 precomposed segments selected by dice throw
- “According to the Laws of Chance”, Jean Arp (1933) https://www.tate.org.uk/art/artworks/arp-according-to-the-laws-of-chance-t05005
- Cut-up technique eat author William Burroughs and Brion Gysin: https://en.wikipedia.org/wiki/Cut-up_technique
- “Music of Changes”, John Cage, indeterminate music, composition through random selection of sounds compositions, and the I Ching (a symbol system used to identify order in chance events) https://en.wikipedia.org/wiki/Music_of_Changes

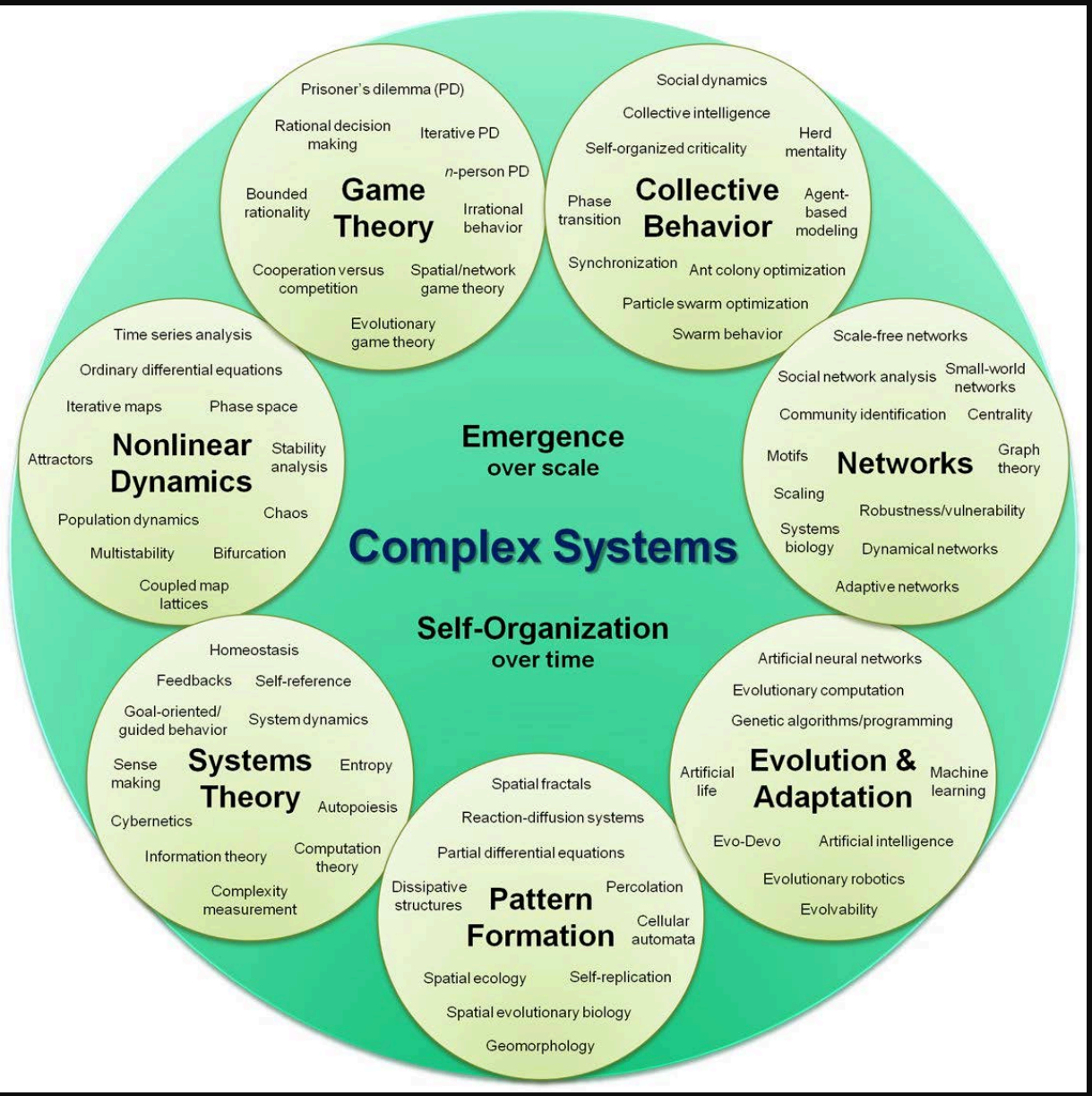
https://en.wikipedia.org/wiki/Systems_art (Related methods)

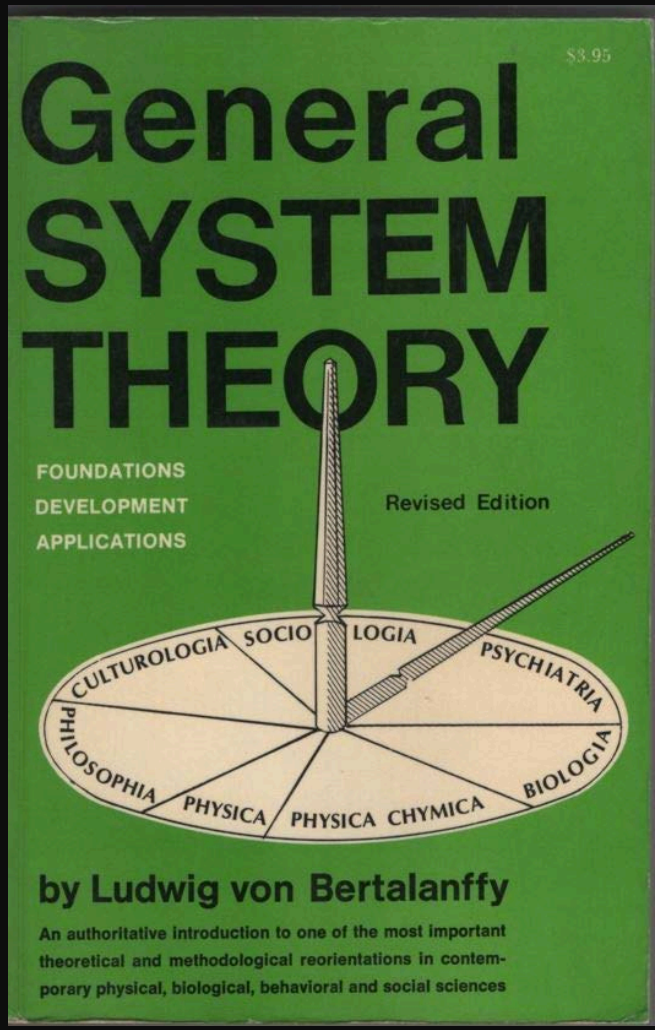
System Art & Related Methods

- System Art (Subset of Conceptual Art), influenced by cybernetics and systems theory.
- Cybernetics: Explores regulatory systems, their structures, constraints and possibilities, such as feedback https://en.wikipedia.org/wiki/Cybernetics
- Systems Theory: The study of interrelated and interdependent parts https://en.wikipedia.org/wiki/Systems_theory
- Emergent behavior: Properties or behaviors which emerge only when the parts interact (school of fish, beehive, water crystals/fractals) – functioning as a collective https://en.wikipedia.org/wiki/Emergence

https://en.wikipedia.org/wiki/Systems_art

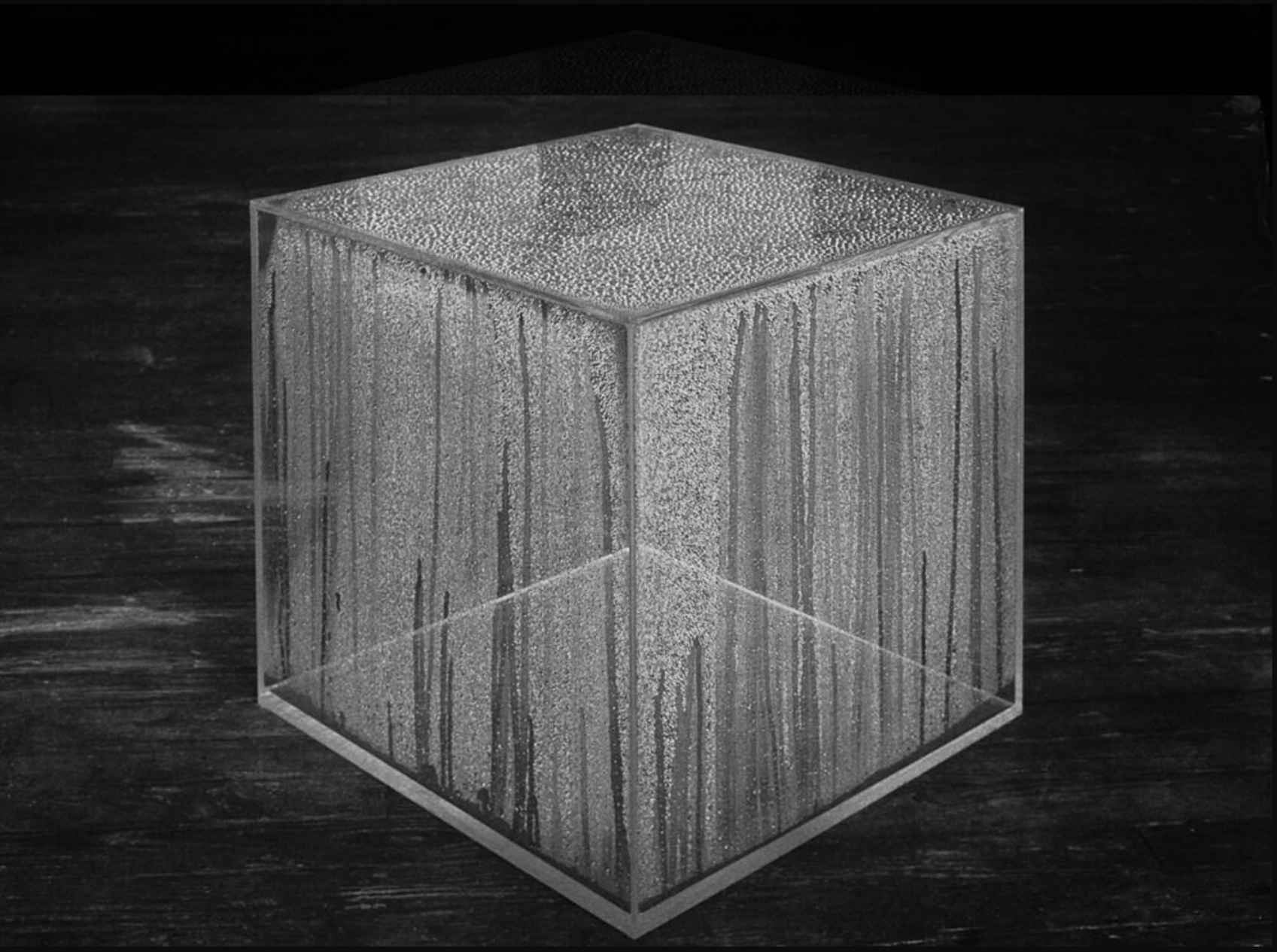
“General Systems Theory”, Ludwig von Bertalanffy (1968)





https://en.wikipedia.org/wiki/Systems_theory

“Condensation Cube”, Hans Haacke (1965)



https://www.macba.cat/en/art-artists/artists/haacke-hans/condensation-cube

A. Michael Noll, Béla Julész at Howard Wise Gallery, NYC (1965)

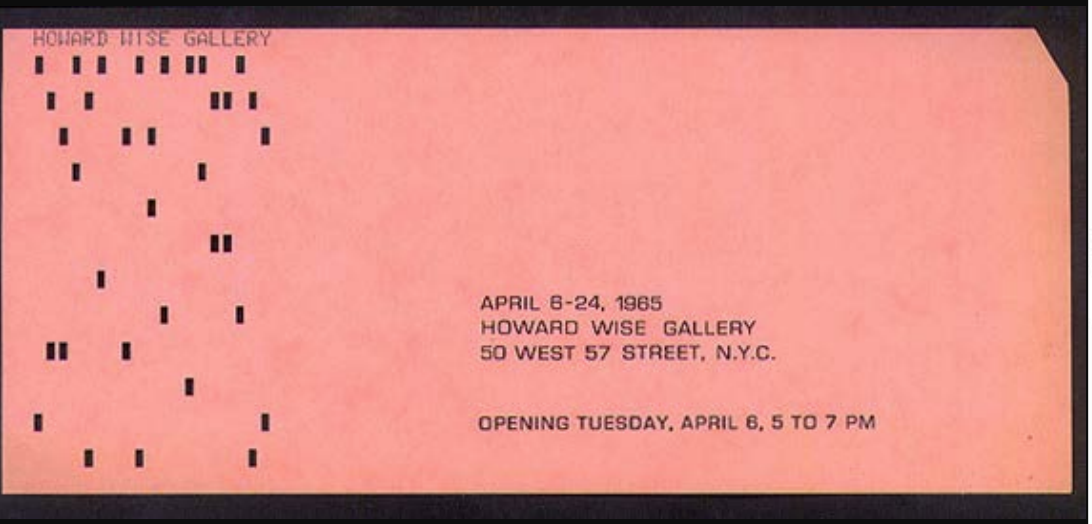


Fig. 3. *Gaussian-Quadratic* (© A. Michael Noll) is on the left, while two of Bela Julesz's pictures (© Thomas V. Papathomas) are on the far wall. (Photograph courtesy of A. Michael Noll)

Fig. 4. Stereoscopic transparent pictures by Michael Noll and Bela Julesz were suspended from a platform in front of the far wall. (Photograph courtesy of A. Michael Noll)

Noll, *The Howard Wise Gallery Show* Computer-Generated Pictures (1965)

https://direct.mit.edu/leon/article/49/3/232/46073/The-Howard-Wise-Gallery-Show-Computer-Generated

“Software”, Exhibition at Jewish Museum, NYC curated by Jack Burnham

SOFTWARE

Information technology: its new meaning for art

Gerbils match wits with computer-built environment

Contents

Exhibition staff

Jack Burnham: *Curator*
Joanne Lupton: *Exhibition Coordinator*
James Mahoney: *Exhibition Designer*
Theodor H. Nelson: *Technical Adviser*
Deborah Bretzfelder: *Assistant Exhibit Designer*
Skip King: *Organization Consultant*
Peter Finn: *Organization Assistant*

Robert Jakob: *Catalogue Designer*
Judith Benjamin Burnham: *Catalogue Coordinator*
Shunk-Kender: *Catalogue Photographers*

Special Consultant to American Motors Corporation: Ruder & Finn Fine Arts

https://monoskop.org/images/3/31/Software_Information_Technology_Its_New_Meaning_for_Art_catalogue.pdf

“Software”, Exhibition at Jewish Museum, NYC curated by Jack Burnham

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Software is an exhibition which utilizes sophisticated communications technology, but concentrates on the interaction between people and their electronic and electromechanical surroundings. This is the same exploration, in human factors, which we use in the engineering design of our automobiles as a human environment.

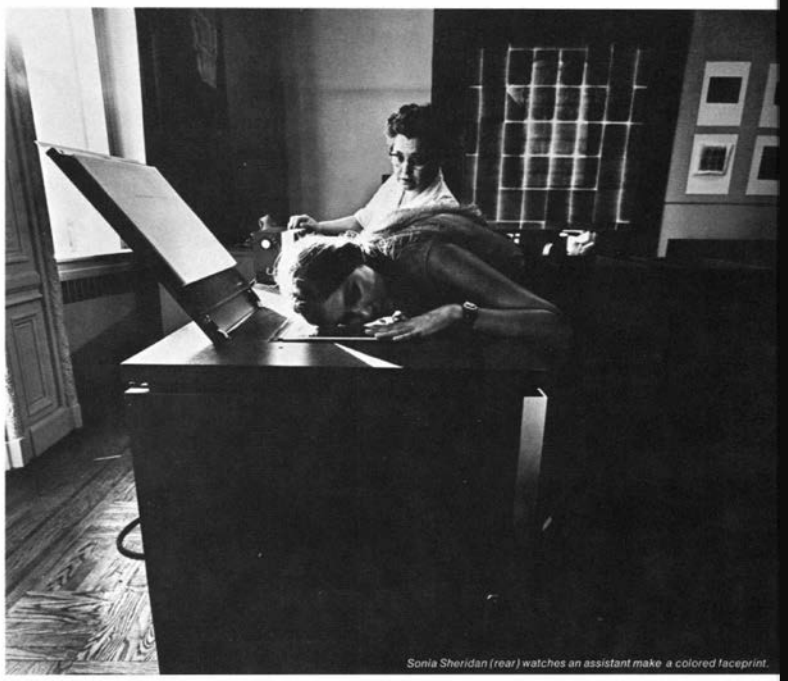
This exhibition encourages artists to use the medium of electronic technology in challenging and unconventional ways. The link between art and science, which the artists in *Software* are examining, is the same link we must explore and strengthen in our automotive styling and engineering.

Because of our continuing interest in people, in technological achievement, and in the advancement of modern art forms, our involvement in *Software* has been both rewarding and stimulating.

Roy D. Chapin, Jr., Chairman
American Motors Corporation

https://monoskop.org/images/3/31/Software_Information_Technology_Its_New_Meaning_for_Art_catalogue.pdf

“Software”, Exhibition at Jewish Museum, NYC curated by Jack Burnham



Sonia Sheridan (rear) watches an assistant make a colored faceprint.

Sonia Sheridan
Interactive Paper Systems 1969-70

Part of the basic equipment for *Interactive Paper Systems*, a 3M Thermofax machine is simply a revolving belt which permits a treated paper to react to carbon as it passes in seconds through the heated machine. Demanding no special training, it can be used to produce a variety of color transparencies, spirit masters, stencils and opaque copy. Through experimentation we have discovered that some of its artistic uses lie in making large projection transparencies, copy for film making, transparencies for photo screening, freak color separations, instant textile design, image distortion and transparency collages.

The Color-in-Color machine, available for a portion of the exhibition time, is a recent 3M invention which translates into full color any two or three dimensional object which can fit in its 8˝x10˝ format. This instrument is a major breakthrough in the graphics field, for it can produce an endless variation of images within a span of minutes. In the hands of a creative person neither the size nor the quality of the image is limited. It can be adapted to produce images on either paper or onto a matrix, which is then transferable to any heat resistant material by means of an ordinary iron or a companion Color Processor. We have considered using this instrument for rapid film animation, instant 2-3D books, rapid textile design, light printing with stencils, colorful and dynamic correspondence and a variety of other possibilities. Michael Schumacher has done some fine photomontage work with this machine. Keith Smith exploded the size limitation by cutting up Kodalith positives and ironing them onto a huge quilt combined with silkscreen and photographs. *Cosmo*, a team of Robert Frontier and William McCabe, rephotographed the Adlai Stevenson family album on the machine, took slides and projected them so that black and white photos were completely altered. We have been able to increase the variety and volume of correspondence and to carry on interactive graphics with artists, inventors and businessmen.

The capacity of the new graphic machines for instant production has the most profound implications for the visual world. The artist, who once spent hours rendering an orange, can photograph the orange whole, cut up into any variety of forms, or squeezed into juice, and can rephotograph it within minutes. In an hour's time he can produce 120 variations; in eight hours he can have almost 1000 different versions of the orange. It is obvious that this work process becomes another kind of time for the artist as the distance from conception to conception is reduced to minutes and objects change as rapidly as thinking allows.

Equipment on loan from the 3M Corporation

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Hans Haacke
Visitors' Profile 1969
with assistance from Scott Bradner (Art & Technology, Inc., Boston)
Digital Equipment Corporation (time share PDP-8 computer)

A teletype terminal with a picture scope is connected with a digital computer on a time-sharing basis and serves both as input and output device.

Using the keyboard the visitors can answer questions which are posed to them on the scope. Due to branches in the polling program a number of these questions are personalized and vary from visitor to visitor.

Essentially the questions are of two types. One set asks the visitors for *factual* information about themselves, e.g., age, sex, educational background, income bracket, etc. The other set of questions inquires about their *opinions* on a variety of subjects.

The computer compiles the answers, compares them with information received from other visitors and correlates data relevant for a statistical breakdown.

A terminal prints out the processed information in the form of statistics giving percentages and cross-tabulations between answers, opinions and the visitors' demographic background. The processing speed of the computer makes it possible that at any given time the statistical evaluation of all answers is up to date and available. The constantly changing data is projected onto a large screen, so that it is accessible to a great number of people.

Based on their own information a statistical profile of the exhibition's visitors emerges.

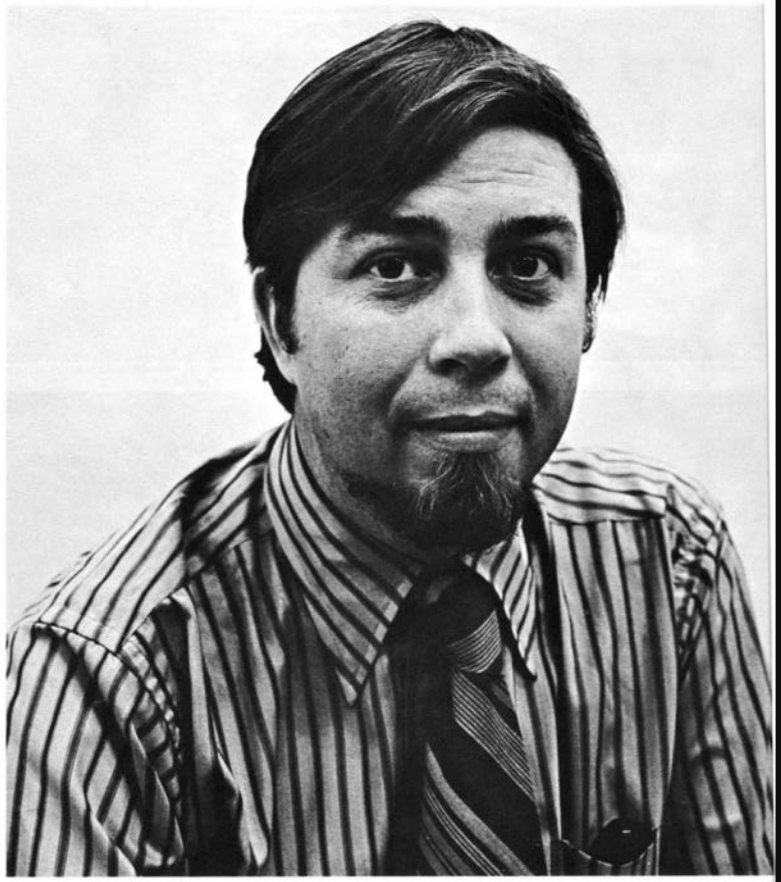
Hans Haacke
News 1969

Local, national and international news is being received fr U.S. as well as from foreign news services. It arrives in the exhibition via teletype print-out at the same time as it is being received by the other clients of the various news services. The print-out accumulates and piles up behind the teletype machines.

Visitors peruse N

https://monoskop.org/images/3/31/Software_Information_Technology_Its_New_Meaning_for_Art_catalogue.pdf

“Software”, Exhibition at Jewish Museum, NYC curated by Jack Burnham



Notes on art and information processing

Jack Burnham

Software is not specifically a demonstration of engineering know-how, nor for that matter an art exhibition. Rather in a limited sense it demonstrates the effects of contemporary control and communication techniques in the hands of artists. Most importantly it provides the means by which the public can personally respond to programmatic situations structured by artists. *Software* makes no distinctions between art and non-art; the need to make such decisions is left to each visitor. Hence the goal of *Software* is to focus c sensibilities on the fastest growing area in this culture: information processing systems and their devices.

In just the past few years, the movement away from art objects has been precipitated by concerns with natural and man-made systems, processes, ecological relationships, a the philosophical-linguistic involvement of Conceptual Art. All of these interests deal with art which is transactional;

Triangulate your thoughts

Agnes Denes
Dialectic Triangulation: A Visual Philosophy 1970

Dialectic Triangulation is a simplification and systematic re-building of complexes of any subject or matter, through various methods, such as re-evaluation, re-grouping or division, at times starting with a single proposition, at others searching for the mean between two extremes. But each time it is the triangulation which institutes the interaction of a particular static state, being the activating force.

To use an example, if a person feels that within his knowledge he does not understand himself and his universe, and decides to attain greater knowledge, he has instituted a triangulation. His initiative, ‘the desire to know more’, being here the activating force between ignorance and wisdom.

Dialectic Triangulation is a building of progressive trichotomies, failing and succeeding in a dialectic method, each time arriving at a better thesis on a higher level—like changing scientific theories, which always advance and develop in complexity. By appraising the milestones in human knowledge and scientific achievement, we take inventory of it and of ourselves. A new curiosity and insight is born, a new awareness. And since this is an artistic probing, concrete facts are sometimes thrown into abstract corners, and abstract terms are concretized; each getting a sort of bath or soaking in the other’s fluids. It is an explorative evolutionary process, the way of nature and man.

Types of triangulations:

inanimate tri-groups representing all of a genus, class or category

re-grouping or classification

accepted facts, perceptual or ideational errors re-evaluated, their importance re-established or denied—new ones created whenever possible

arriving at a conclusion derived from two propositions

arriving at a mean between two extremes

the building of one proposition through dimensional complication into trichotomies

the building of one proposition through divisional trisection into trichotomies

pure idea groups activated by controversy

interdependent or progressive ideas becoming effective through successive stages of advancement

threefold theories interchangeable—threefold theories not interchangeable, and those forming argumentative conclusions

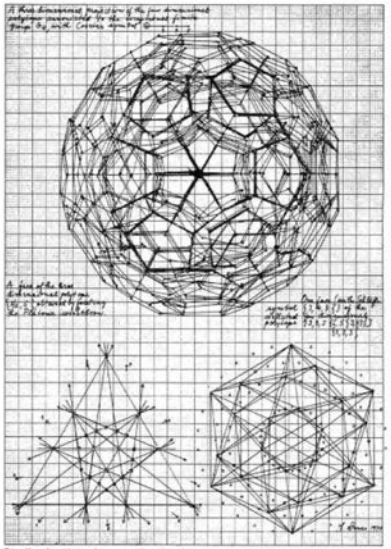
Agnes Denes (right) programmed her computer display with the assistance of Theodor H. Nelson and The R.E.S.I.S.T.O.R.S. (from left) Peter Eichenberger, Lauren Sarno, John Levine (not present: Nat Kuhn).

Agnes Denes
Matrix of Knowledge & Trigonal Ballet 1970
(Work for computer display) with assistance from Members of The R.E.S.I.S.T.O.R.S., Pennington, N. J.: John Levine, Nat Kuhn, Peter Eichenberger and from Theodor H. Nelson

Restoration of the triangulation concepts on the screen can be at best only partial, mentally confronting the participant with the challenge of comparing ideas and the visual consequences of a new structuring. The artist’s own structural conjectures are here shared with the viewer.

NOTE: Matrix of Knowledge schedules events in a triangular mesh. List structure is kept comparatively simple by rewriting the display file for each new incarnation of the picture.
Trigonal Ballet animates through a succession of frames to obtain its “infinite effect.”

The IDIIOM, a dynamic display with its own built-in computer, is on loan from Information Displays, Inc. of Mount Kisco, New York.



Studies for thought-complication (completed 1970)

https://monoskop.org/images/3/31/Software_Information_Technology_Its_New_Meaning_for_Art_catalogue.pdf

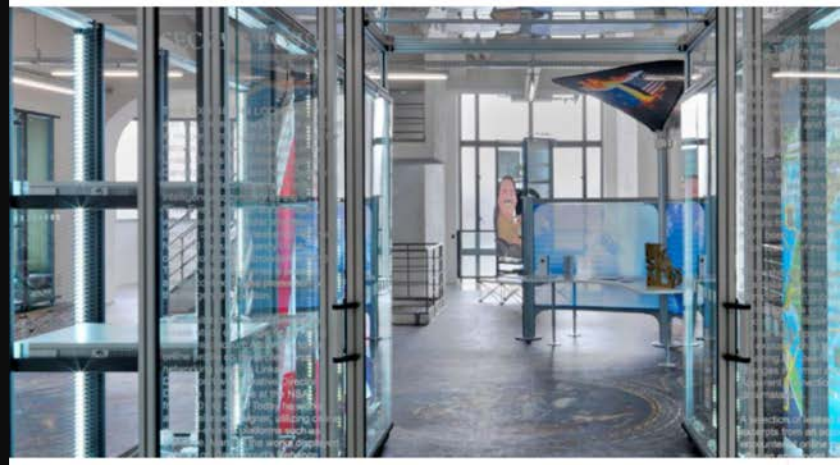
Dan Flavin, view of installation, Pink and Gold, 8' fluorescent lamps, 1967 (Museum of Contemporary Art, Chicago)

SYSTEMS ESTHETICS

Art Versus Silicon Valley: Are Artists Losing the Conceptual Advantage?

As startups looks towards increasingly abstract schemes, where is the art that answers to today's deeply networked structures?

BY GARY ZHEXI ZHANG IN **OPINION** | 24 SEP 18

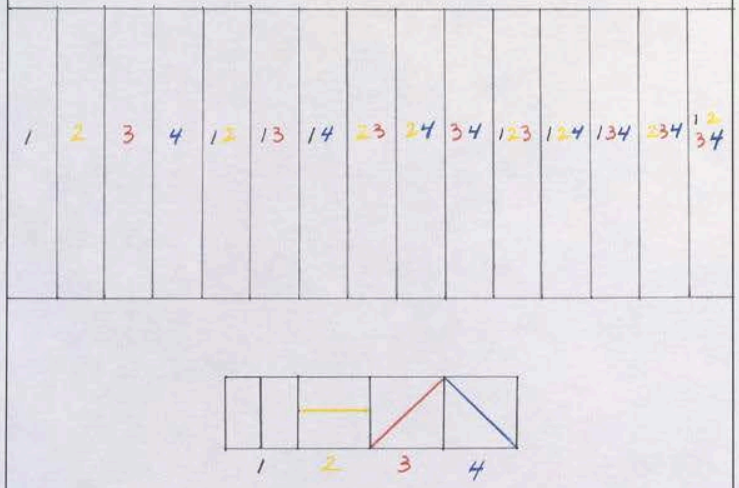


In 1968, the conceptual artist and critic Jack Burnham published an essay entitled 'Systems Esthetics'. Burnham began with an acidic critique of the modernist formalism of the day, championed by the likes of Clement Greenberg and Michael Fried, comparing the artistic contributions of 'formalist invention' to the '"new" car of the automobile stylist'. For Burnham, the progression of the modernist art object, like the release of a new iPhone, was all icing and no cake, promising transcendence but always circling back to the same. Instead, he felt that the artistic practice should concern itself with the deep structures forming the cultures around it. Writing at the dawn of the digital age, Burnham argued that information, not objects, would form the structuring paradigm of the emerging socio-cultural environment. He wrote: 'We are now in transition from an object-oriented culture to a systems-oriented culture. Here change emanates, not from *things*, but from *processes*.'

https://www.frieze.com/article/art-versus-silicon-valley-are-artists-losing-conceptual-advantage

“A Wall divided into 16 Equal Parts”, Sol Lewitt (1970)

DIAGRAM



This is a diagram for the Sol LeWitt wall drawing number 49. It should accompany the certificate if the wall drawing is sold or otherwise transferred but is not a certificate or a drawing.

CERTIFICATE

This is to certify that the Sol LeWitt wall drawing number 49 evidenced by this certificate is authentic.

A wall divided vertically into fifteen equal parts, each with a different line direction and color, and all combinations.

Red, yellow, blue, black pencil
First Drawn by: Chris Hansen, Nina Kayem, Al Williams
First Installation: Jewish Museum, New York, NY. June, 1970

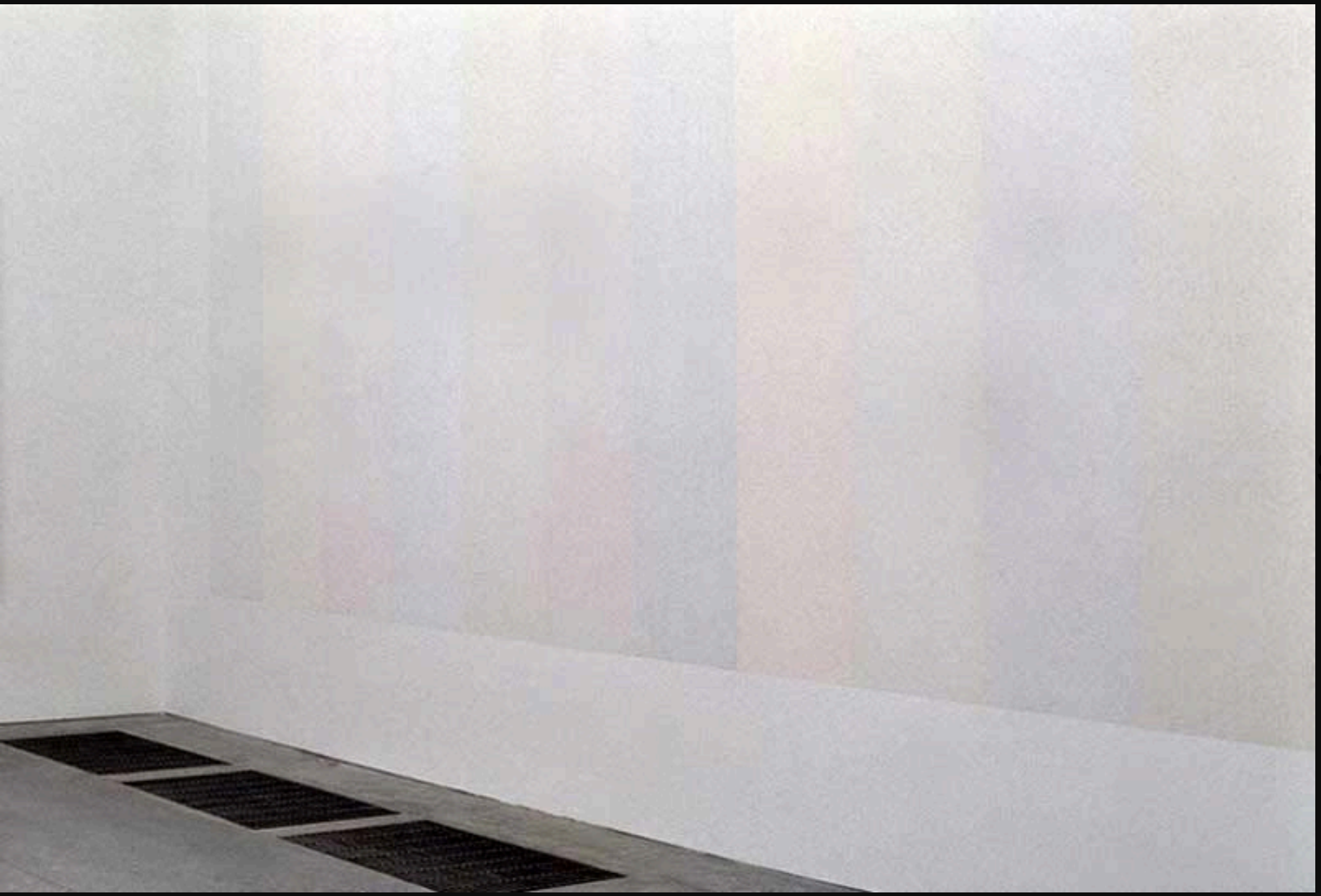
This certification is the signature for the wall drawing and must accompany the wall drawing if it is sold or otherwise transferred.

Certified by Sol LeWitt
Sol LeWitt

 Date

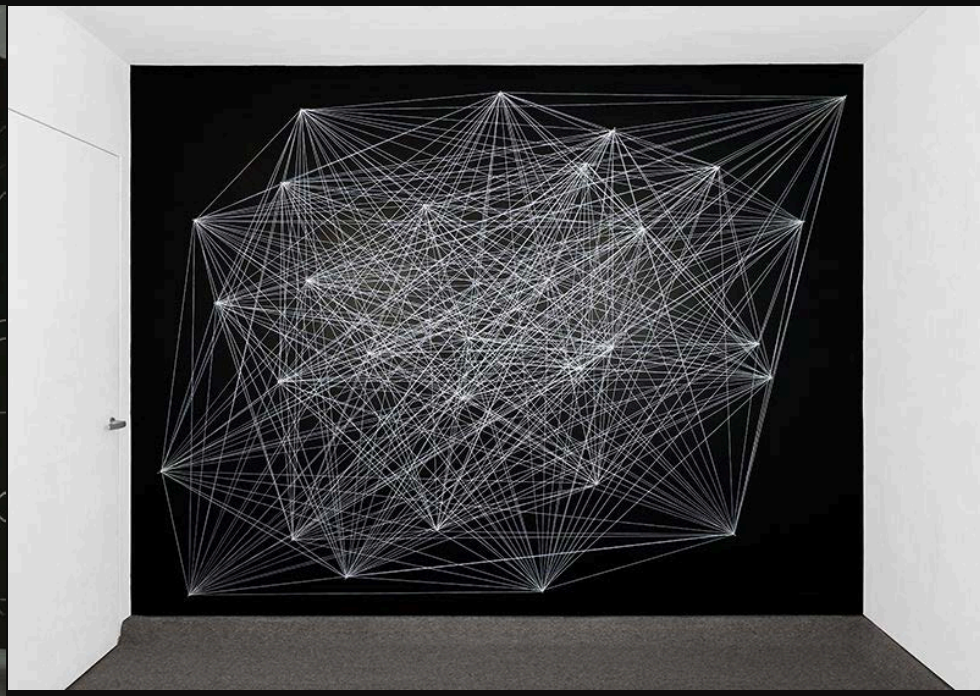
https://www.tate.org.uk/art/artworks/lewitt-a-wall-divided-vertically-into-fifteen-equal-parts-each-with-a-different-line-t01766

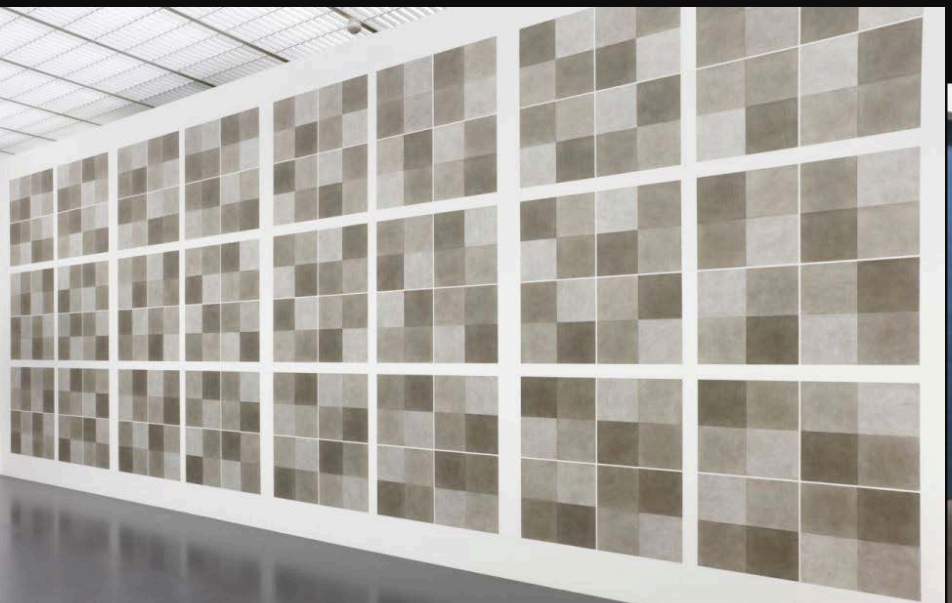
“A Wall divided into 16 Equal Parts”, Sol Lewitt (1970)



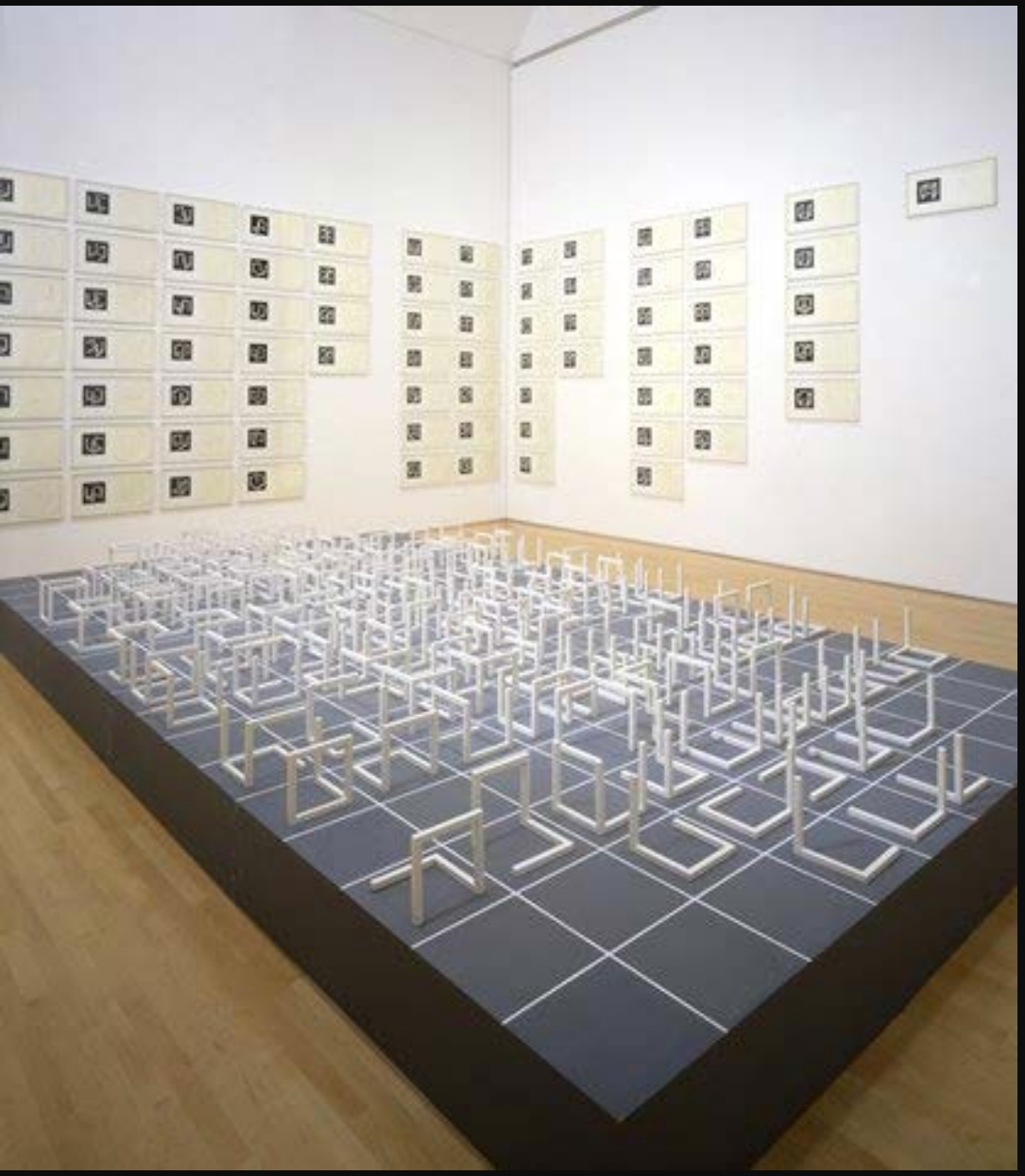
https://www.tate.org.uk/research/publications/tate-papers/14/ideas-in-transmission-lewitt-wall-drawings-and-the-question-of-medium

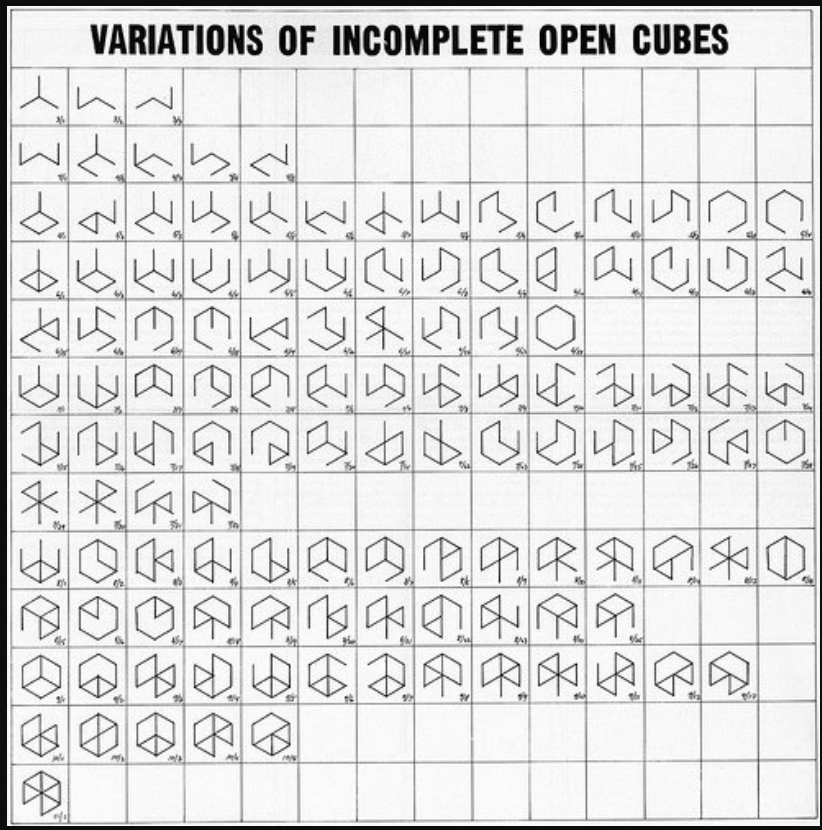
“Wall Drawing”, Sol Lewitt (1976)





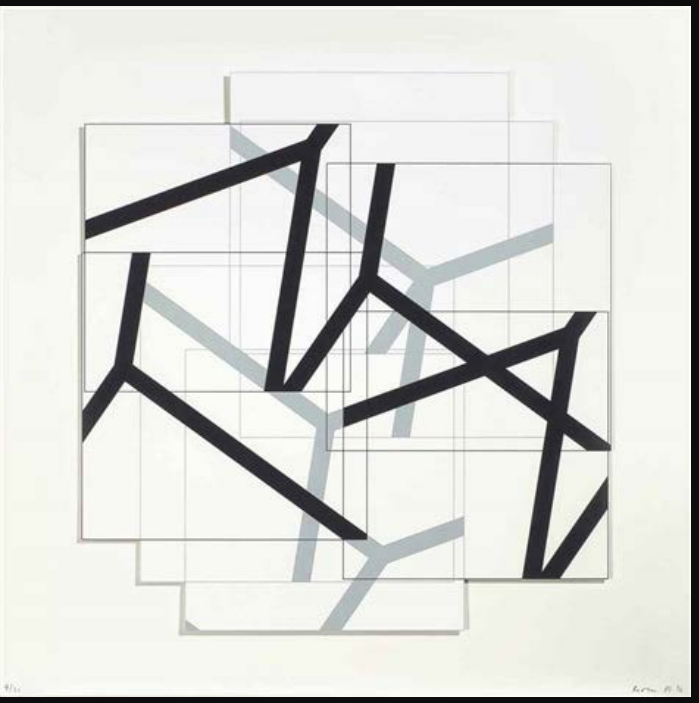
“Variations of Incomplete Open Cubes”, Sol Lewitt (1974)

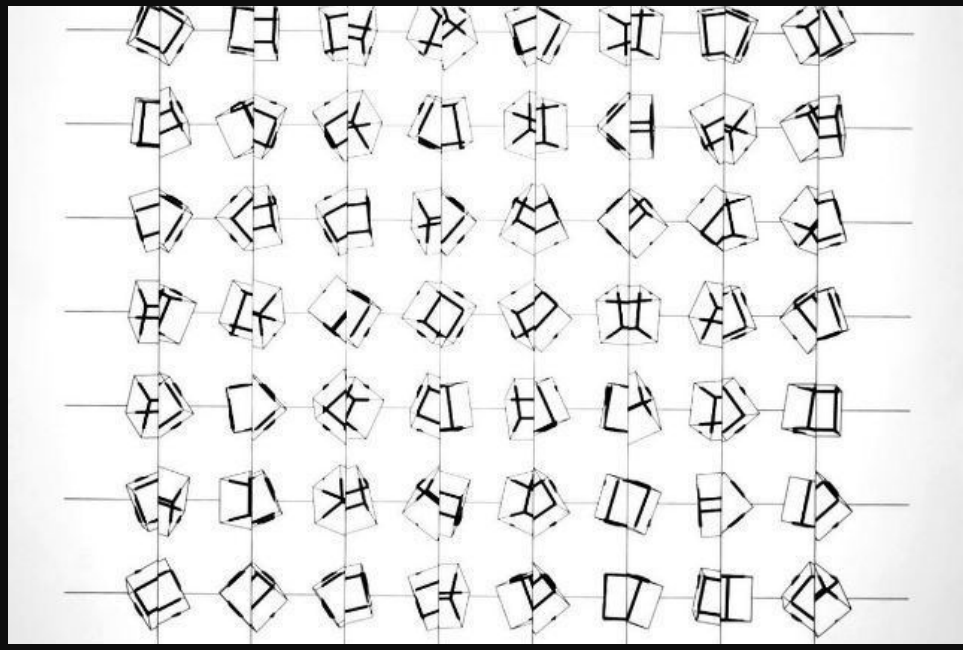


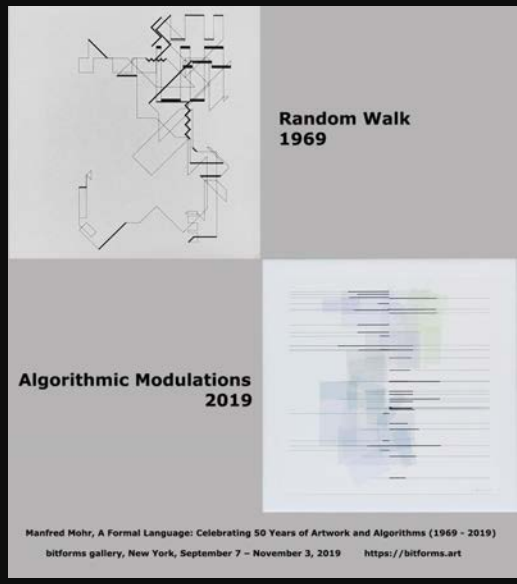


http://fiftytwopieces.blogspot.com/2009/03/sol-lewitt-incomplete-open-cubes-all.html

Manfred Mohr (1938, computer-based art since 1969)

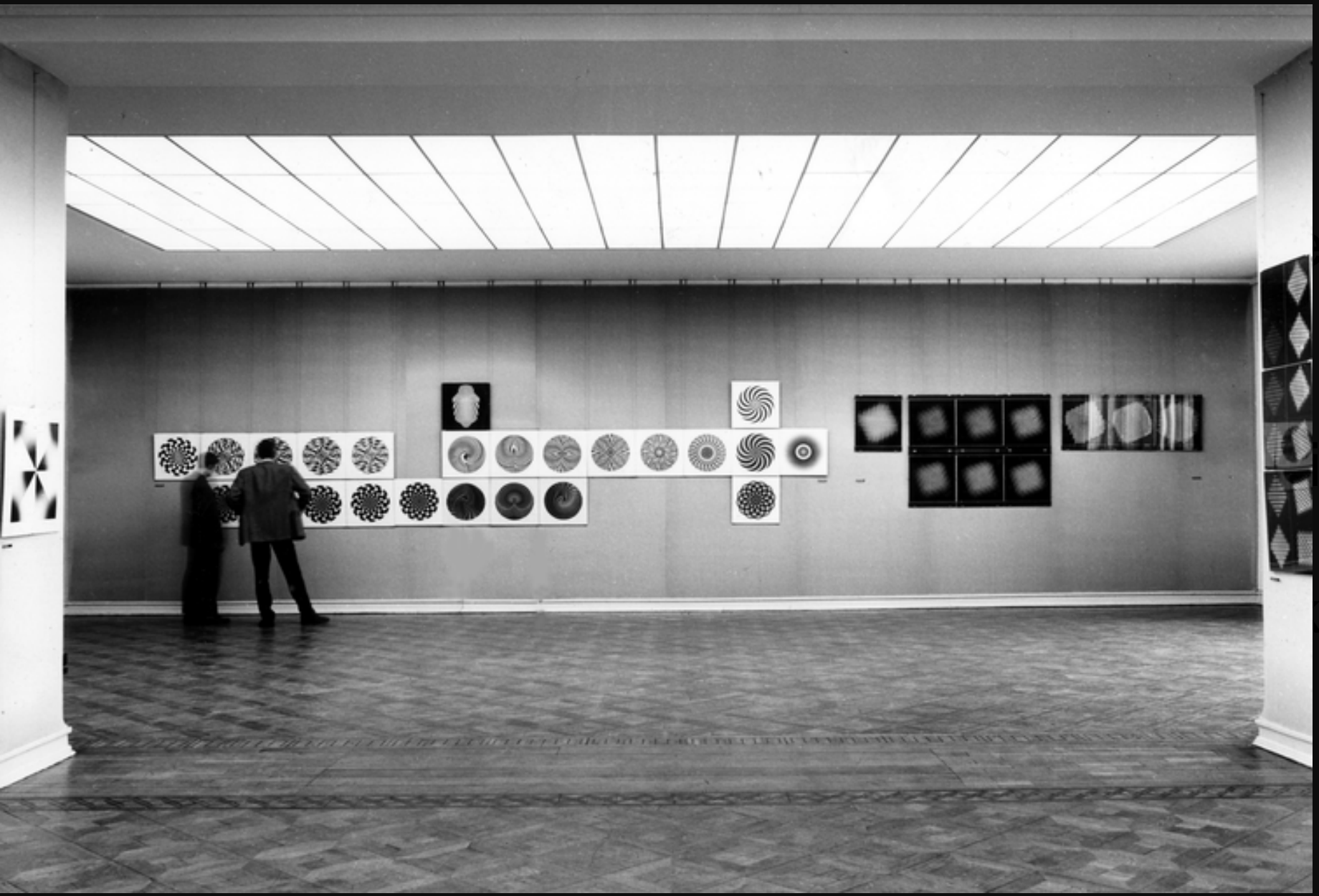






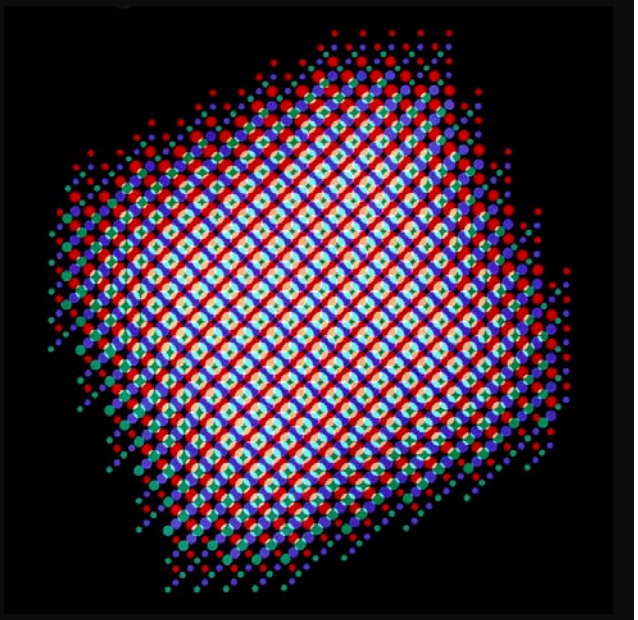
https://www.theguardian.com/artanddesign/2016/feb/12/manfred-mohr-the-man-who-taught-computers-to-make-art

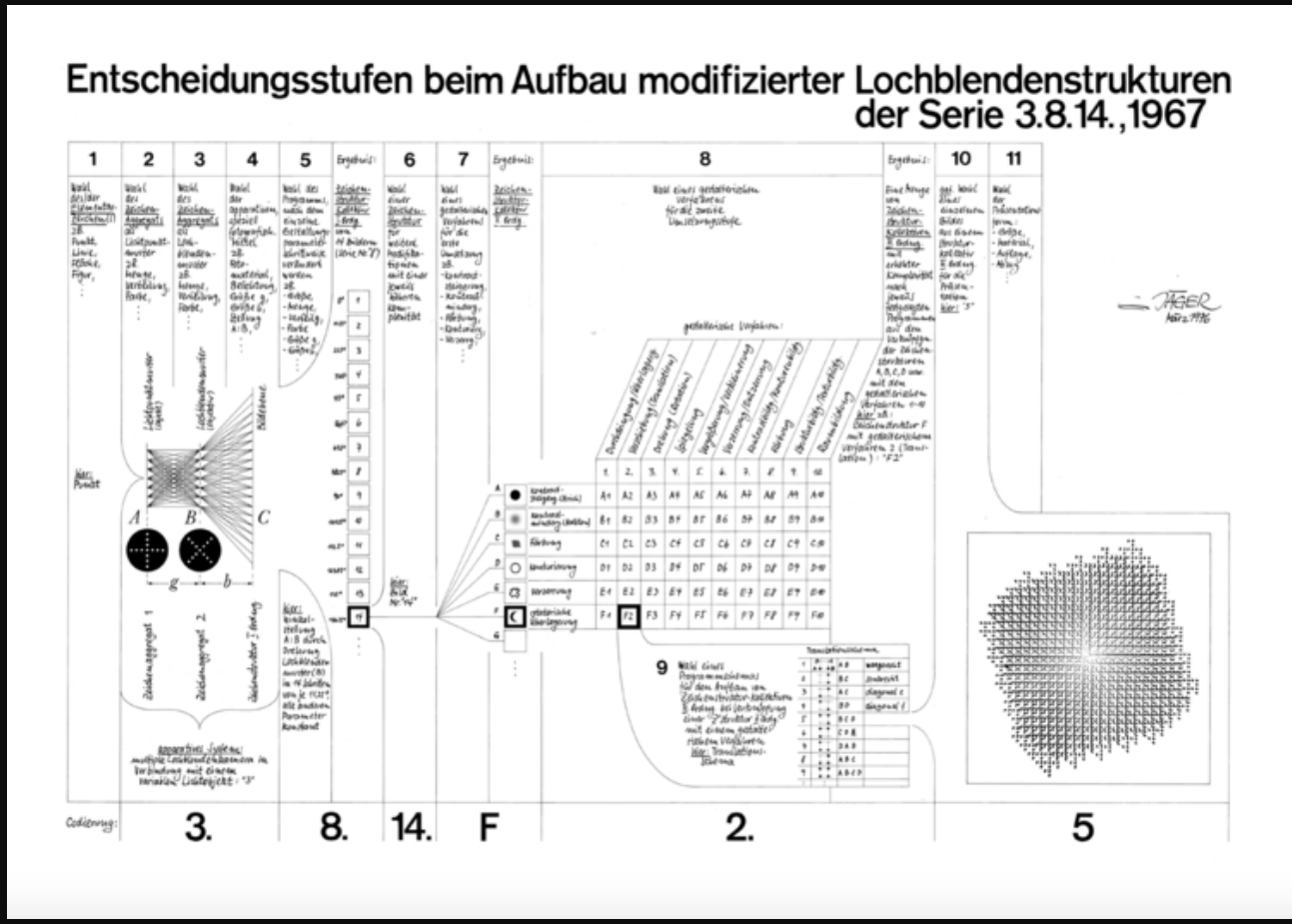
Generative Photography: Pinhole Structures – Gottfried Jäger (1968)



https://www.artnome.com/news/2019/8/18/generative-photography-an-interview-with-gottfried-jager

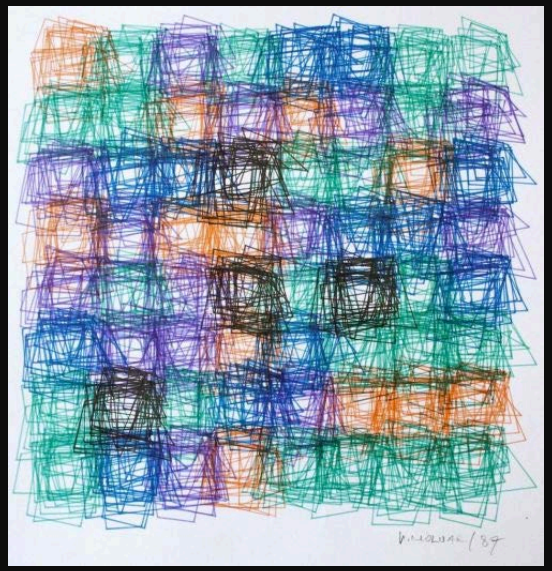
Generative Photography: Pinhole Structures – Gottfried Jäger (1968)

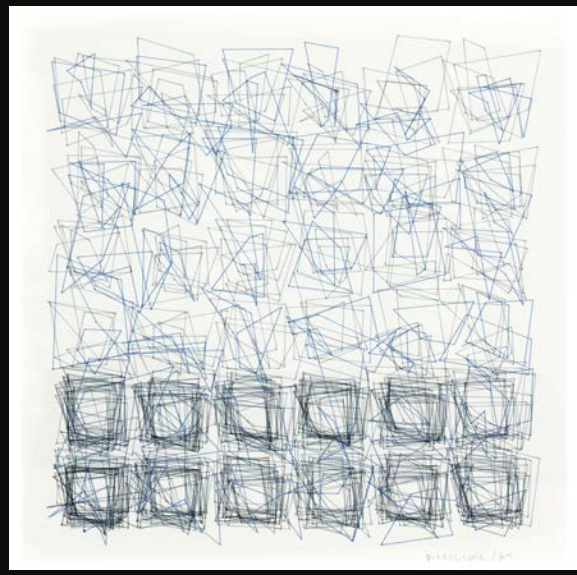


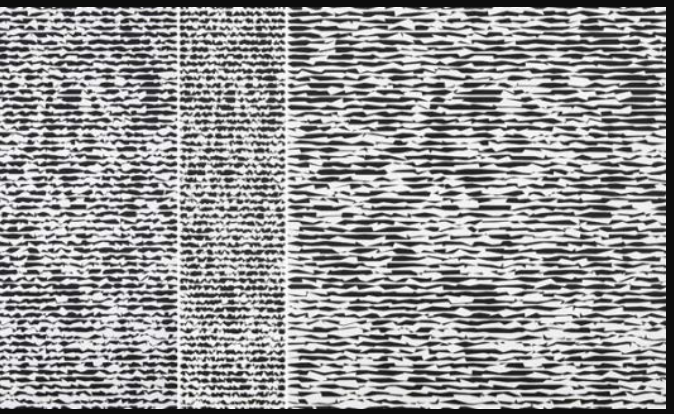


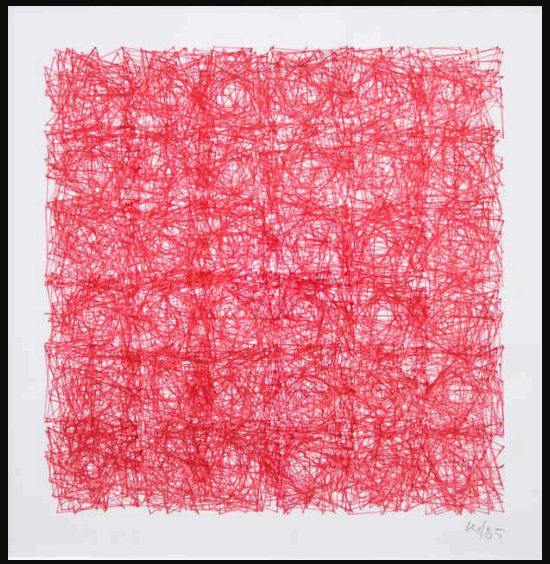
Decision-making stages in the construction of modified pinhole structures of the serie 3.8.14

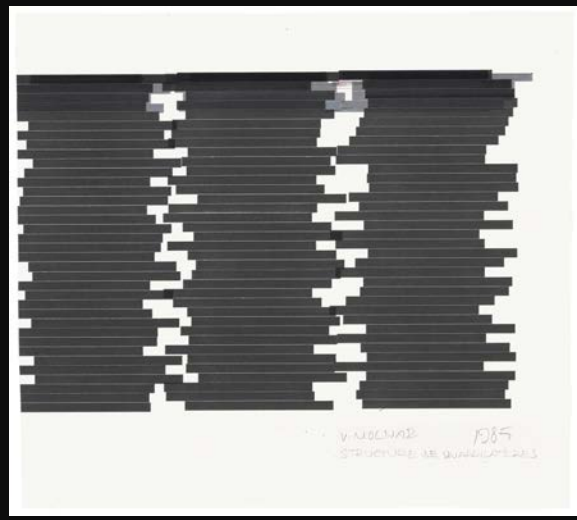
Vera Molnar(1924-present)





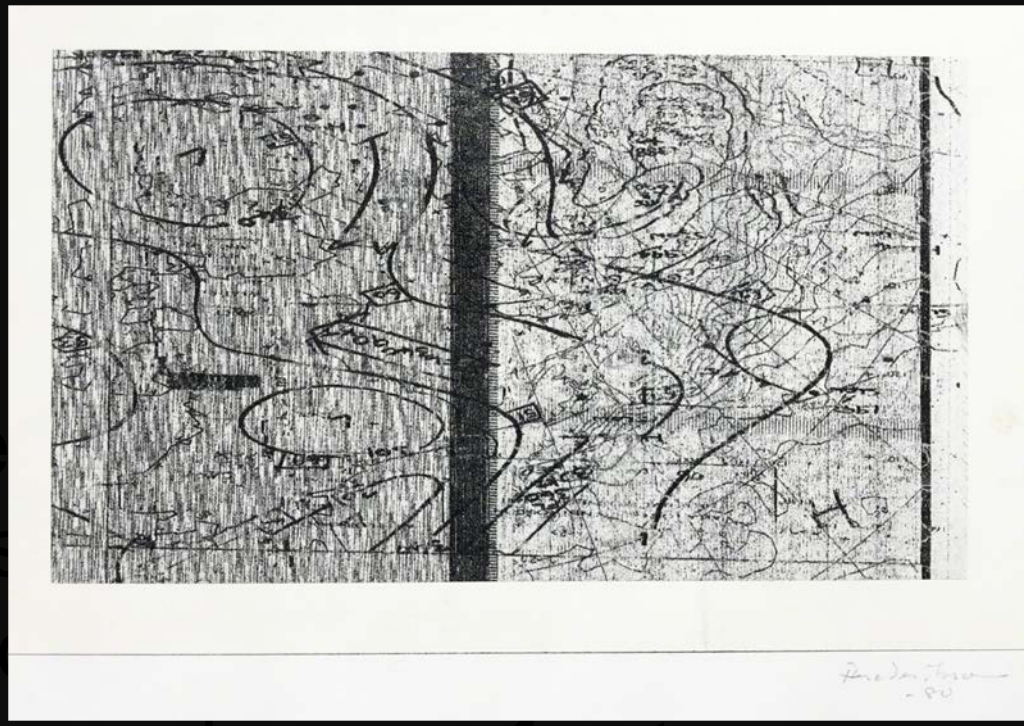


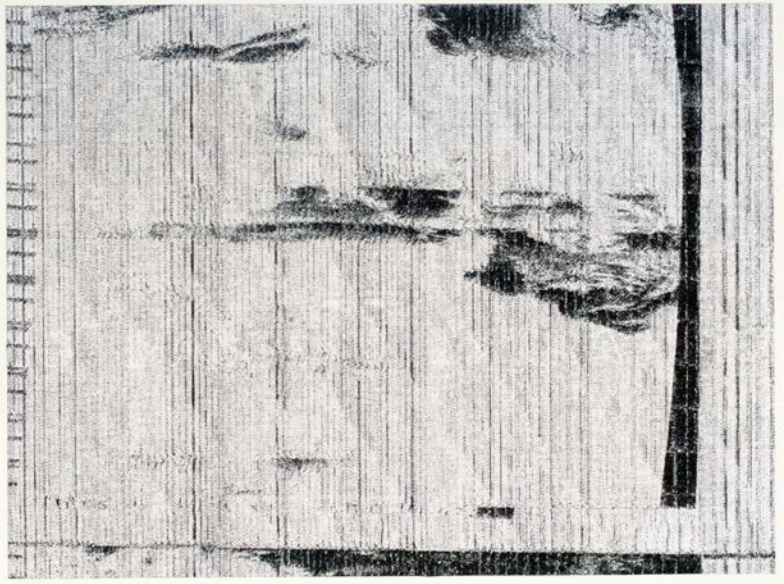




http://agenda.germainpire.info/view_entry.php?id=102846&date=20190307

ElectroStatic Works, Lars Fredrikson(1968)





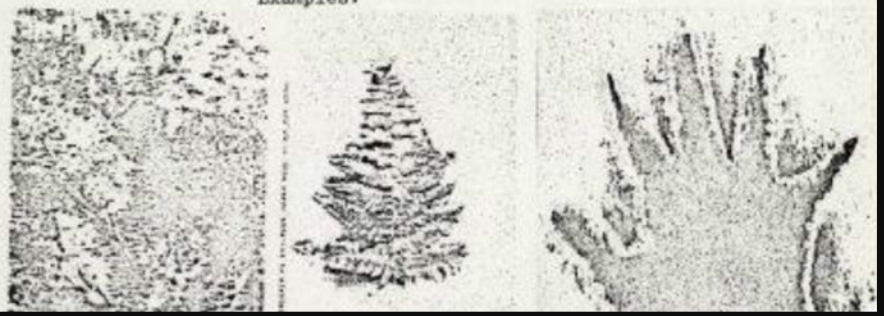
http://www.insituparis.fr/fr/artistes/presentation/8650/fredrikson-estate-lars

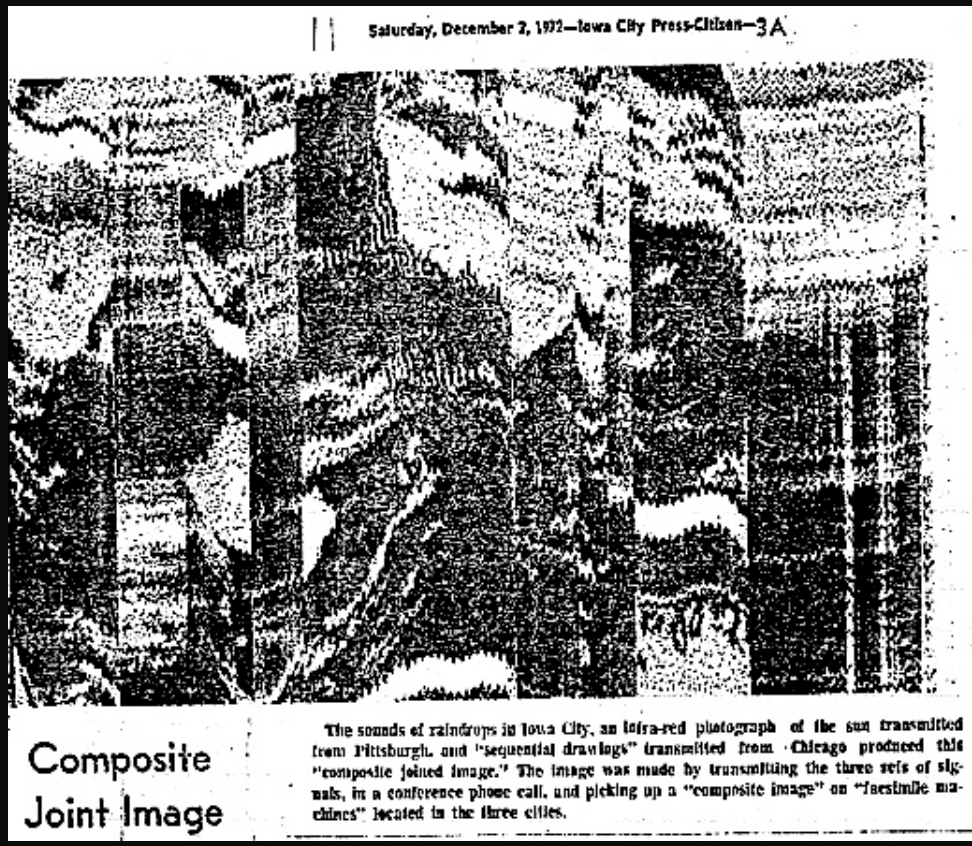
Generative Systems & Electrostatic works, Sonia Sheridan(1968)

Page 2 - IMAGE GENERATION SURVEY

d. Dip a leaf or similar flat object into the magnetic powder. Shake off the excess. Place on a sheet of paper below the plexiglass and rub the plexiglas with the fur until the leaf begins to move and the powder spreads about. Once you have observed and imaged this process try taping the leaf to the sheet of paper so that only the powder shifts. A clear image of the leaf should appear on the paper.

Examples:





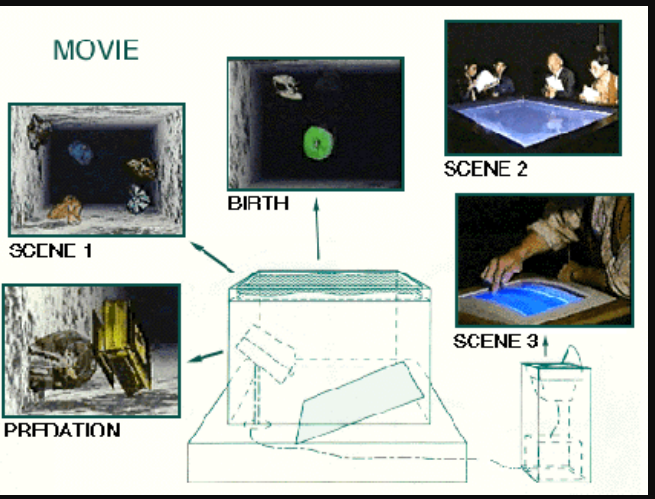
Saturday, December 2, 1972—Iowa City Press-Citizen—3A

Composite Joint Image

The sounds of raindrops in Iowa City, an infra-red photograph of the sun transmitted from Pittsburgh, and "sequential drawings" transmitted from Chicago produced this "composite joined image." The image was made by transmitting the three sets of signals, in a conference phone call, and picking up a "composite image" on "facsimile machines" located in the three cities.

https://www.fondation-langlois.org/html/e/page.php?NumPage=2048

“A-Volve”, Christa Sommerer, Laurent Mignonneau (1992)



http://www.interface.ufg.ac.at/christa-laurent/WORKS/FRAMES/TOPFRAMES/A-VolveTop.html

generative art

a practical guide using processing

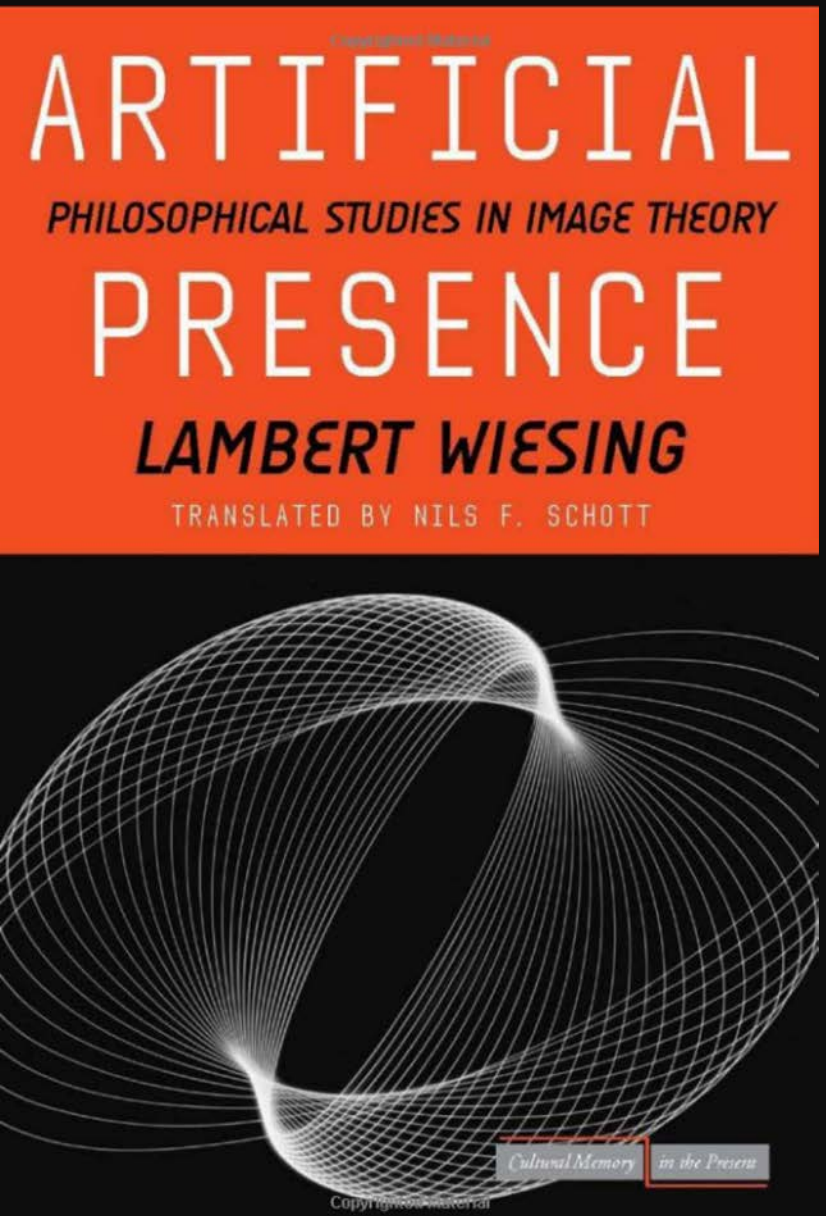
matt pearson

foreword by marius watz

MANNING

https://www.mat.ucsb.edu/~g.legrady/academic/courses/20f594/txt/generativeArt2.pdf

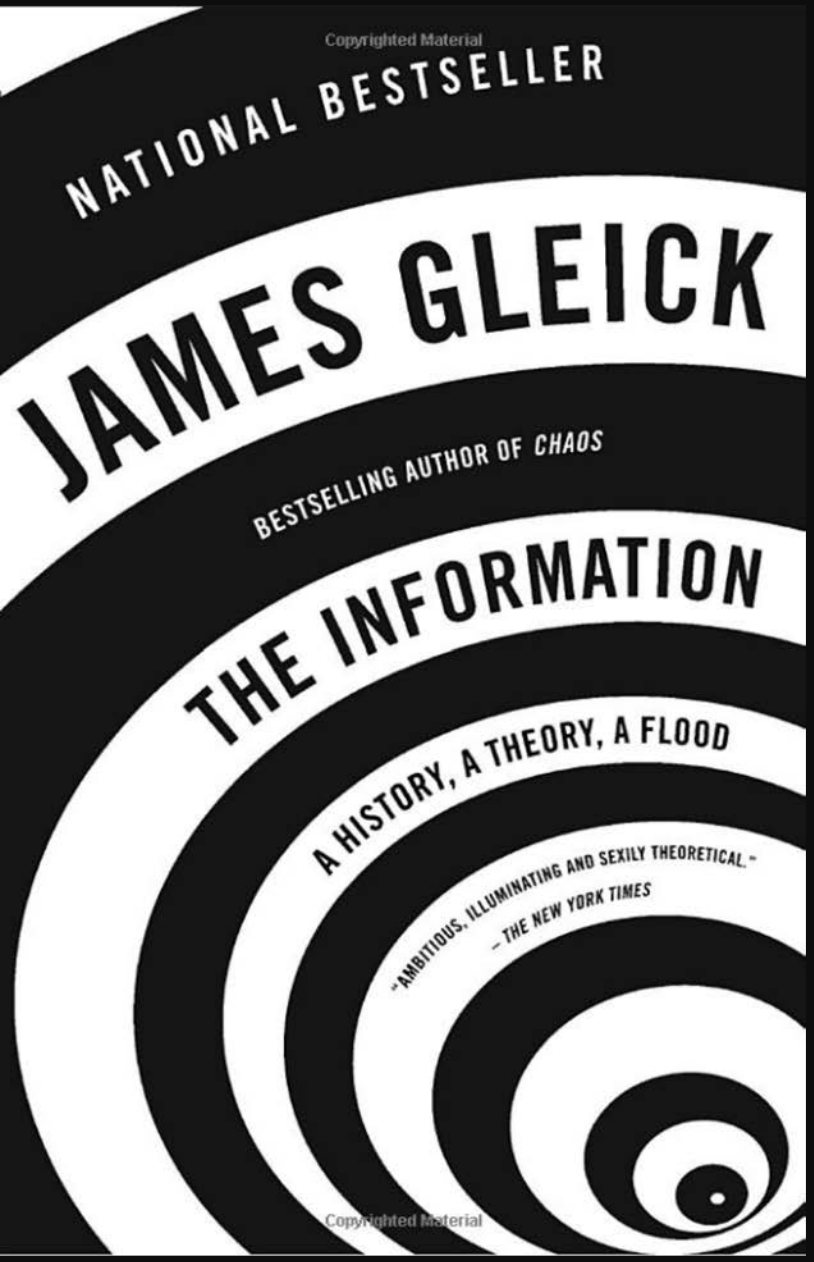
“Artificial Presence: Philosophical Studies in Image Theory”,

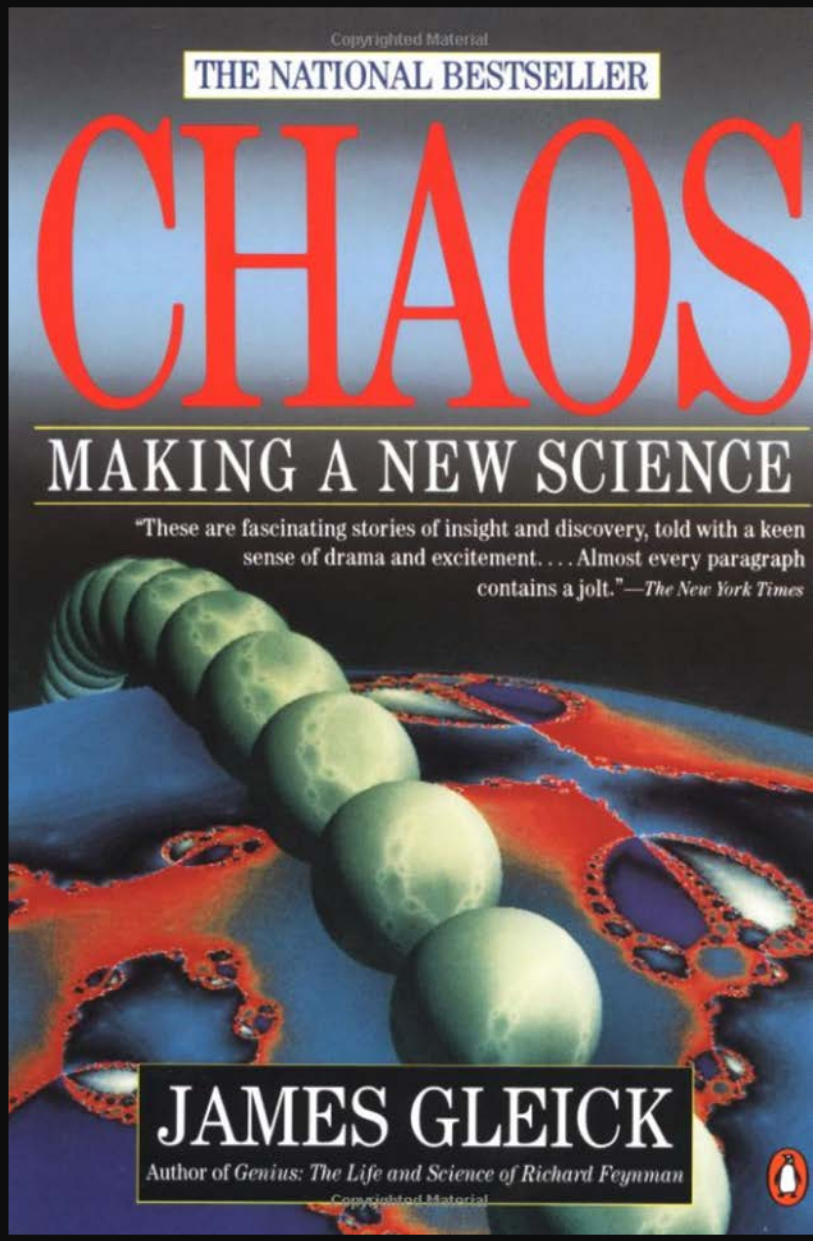


Contents

https://www.amazon.com/Artificial-Presence-Philosophical-Studies-Cultural/dp/0804759413?asin=0804759413&revisionId=&format=4&depth=1

“Information”, “Chaos Theory”, James Gleick





https://en.wikipedia.org/wiki/James_Gleick

Related Articles

- Jack Burnham (1968), "Systems Esthetics", in: *Artforum* (September, 1968
- Edward A. Shanken, "Art in the Information Age: Technology and Conceptual Art," in SIGGRAPH 2001 Electronic Art and Animation Catalog, (New York: ACM SIGGRAPH, 2001): 8-15; expanded and reprinted in Art Inquiry 3: 12 (2001): 7-33 and Leonardo 35:3 (August, 2002): 433-38

Art in the Information Age: Technology and Conceptual Art

Edward A. Shanken

ABSTRACT

Art historians have generally drawn sharp distinctions between conceptual art and art-and-technology. This essay reexamines the interrelationship of these tendencies as they developed in the 1960s, focusing on the art criticism of Jack Burnham and the artists included in the *Software* exhibition that he curated. The historicization of these practices as distinct artistic categories is examined. By interpreting conceptual art and art-and-technology as reflections and constituents of broad cultural transformations during the information age, the author concludes that the two tendencies share important similarities, and that this common ground offers useful insights into late–20th-century art.

In the mid-1960s, Marshall McLuhan prophesied that electronic media were creating an increasingly interconnected global village. Such pronouncements popularized the idea that the era of machine-age technology was drawing to a close, ushering in a new era of information technology. Sensing this shift, Pontus Hultén organized a simultaneously nostalgic and futuristic exhibition on art and mechanical technology at the Museum of Modern Art in New York (MOMA) in 1968. *The Machine: As Seen at the End of the Mechanical Age* included work ranging from Leonardo da Vinci's 16th-century drawings of flying machines to contemporary artist-engineer collaborations selected through a competition organized by Experiments in Art and Technology, Inc. (E.A.T.).

E.A.T. had emerged out of the enthusiasm generated by *nine evenings: theatre and engineering,* a festival of technologically enhanced performances that artist Robert Rauschenberg and engineer Billy Klüver organized in New York in October 1966. E.A.T. also lent its expertise to engineering a multimedia extravaganza designed for the Pepsi Pavilion at the Osaka World's Fair in 1970. Simultaneously, the American Pavilion at Osaka included an exhibition of collaborative projects between artists and industry that were produced under the aegis of the Art and Technology (A&T) Program at the Los Angeles County Museum of Art.

Ambitious as they were, few of the celebrated artist-engineer collaborations of this period focused on the artistic use of information technologies, such as computers and telecommunications. Taking an important step in that direction, *Cybernetic Serendipity,* at the Institute of Contemporary Art in London in

protocols of computer software and the increasingly "dematerialized" forms of experimental art, which the critic interpreted, metaphorically, as functioning like information processing systems. *Software* included works by conceptual artists such as Les Levine, Hans Haacke and Joseph Kosuth, whose art was presented beside displays of technology including the first public exhibition of hypertext (*Labyrinth,* an electronic exhibition catalog designed by Ned Woodman and Ted Nelson) and a model of intelligent architecture (*SEEK,* a reconfigurable environment for gerbils designed by Nicholas Negroponte and the Architecture Machine Group at the Massachusetts Institute of Technology) [1].

Regardless of these points of intersection and the fact that conceptual art emerged during a moment of intensive artistic experimentation with technology, few scholars have explored the relationship between technology and conceptual art. Indeed, art-historical literature traditionally has drawn rigid categorical distinctions between conceptual art and art-and-technology. The following reexamination, however, challenges the disciplinary boundaries that obscure significant parallels between these practices. The first part describes Burnham's curatorial premises for the *Software* exhibition and in-

Generative Art

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