

# Digital computer art: A view from art history into the early beginnings

## Christoph Klütsch (International University Bremen)

### Aesthetic values

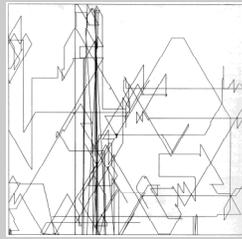
The historical coincidence of Max Bense's (Stuttgart, Germany) and Abraham Moles' (Strasbourg, France) 'information aesthetics', and the academic use of mainframe computers created a surrounding which has enabled: Frieder Nake, Georg Nees, and (independently in the USA) A. Michael Noll to explore new fields of visual research since 1962.

When the first public attempts at computer art were made, this new breed of people considered themselves to bridge C. P. Snow's 'two cultures'.

What started on 2/5/1965 as 'generative aesthetics' at a small exhibition in Stuttgart, found its international culmination in a series of conferences in Zagreb and exhibitions in NY and London in 1968/69. The questions addressed were:

- Is it possible to write a program which would enable a computer to produce aesthetic objects with a significant aesthetic value?
- How could these aesthetic values be scientifically, psychologically, and philosophically defined?
- What kind of implications does computer art have not only on art itself, but also on society, and our self understanding as human beings?

### 1965 digital computer art entered the art world - "The three N's"



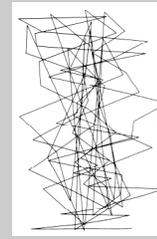
Frieder Nake  
Fliegenganzig 13/8/1965 Nr. 3

"Each painter is a restricted picture generator. So is each picture generating computer program. At all times, artists have applied the same method most computer program employ: they tried to vary a theme as often as possible in order to attain a 'best' (in their judgment) object. This method became particularly important in recent years with Bauhaus, concrete art, New Tendencies, etc." (Nake 1969)



Georg Nees  
Schotter before 1968

Georg Nees wrote his PhD about 'Generative Aesthetic' with Max Bense as doctoral advisor. Nees considers his work as an "aesthetic laboratory" which enables him to do "visual research". Here we see the transition from order to chaos. In other works he investigated 'Nexus': Which connection of elements constitutes structure?



Michael Noll  
Gausian Quadrate: 1962

"In general, completely random two-dimensional pictures are not very interesting. However, the computer is also able to mix together randomness and order in mathematically specified proportions to achieve a desired effect." (Noll 1966)

### Bense's Information Aesthetics

In 1965 Max Bense published his 'Aesthetica'. Referring to David Birkhoff's *Mathematical Aesthetics*, Claude Shannon's *Information Theory*, Noam Chomsky's *Generative Grammar*, and Norbert Wiener's *Cybernetics*, Bense developed a new aesthetic based on strict science.

The goal was to measure the value of art works by determining the ratio between order and chaos respectively, information and redundancy:

- The aesthetic information is part of (human) communication.
- Communication can be understood as a cybernetic process.
- Information theory measures information (Shannon)
  - Artworks contain aesthetic information => Aesthetic information can be measured
- Aesthetic Measure is an interplay between order and complexity (see Birkhoff) and can be described in terms of neg-entropy.
- The process of art is the inverse of entropy: art creates order.
- The aesthetic object is related to a process which can be understood as a sign process.
- Given the rules for generating aesthetic information, a computer can produce aesthetic objects which are perceived as signs.

### Intuition in Art



Pollock in his studio, 1950

### Art and Machines



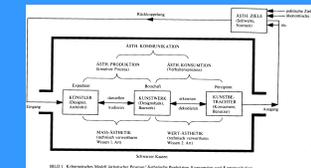
Tigely, Meta-Matic 1958

## Generative aesthetics - ARTificial ART

### Who is the CREATOR in computer art?

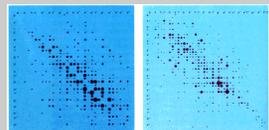
### The artist, the programmer, or the program?

### Art as a communication process:



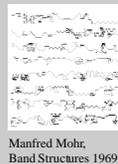
S. Maser: A cybernetic model of aesthetic processes

### We can TALK about the aesthetic values of objects - can we MEASURE them?



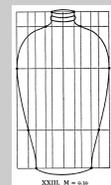
Ullmann: Statistische Analyse der Musik. *Journal für Psychologie*, 1950. *Psychologische Beiträge zur Musikwissenschaft*, 1951. *Journal für Psychologie*, 1952. *Journal für Psychologie*, 1953. *Journal für Psychologie*, 1954. *Journal für Psychologie*, 1955. *Journal für Psychologie*, 1956. *Journal für Psychologie*, 1957. *Journal für Psychologie*, 1958. *Journal für Psychologie*, 1959. *Journal für Psychologie*, 1960. *Journal für Psychologie*, 1961. *Journal für Psychologie*, 1962. *Journal für Psychologie*, 1963. *Journal für Psychologie*, 1964. *Journal für Psychologie*, 1965. *Journal für Psychologie*, 1966. *Journal für Psychologie*, 1967. *Journal für Psychologie*, 1968. *Journal für Psychologie*, 1969. *Journal für Psychologie*, 1970. *Journal für Psychologie*, 1971. *Journal für Psychologie*, 1972. *Journal für Psychologie*, 1973. *Journal für Psychologie*, 1974. *Journal für Psychologie*, 1975. *Journal für Psychologie*, 1976. *Journal für Psychologie*, 1977. *Journal für Psychologie*, 1978. *Journal für Psychologie*, 1979. *Journal für Psychologie*, 1980. *Journal für Psychologie*, 1981. *Journal für Psychologie*, 1982. *Journal für Psychologie*, 1983. *Journal für Psychologie*, 1984. *Journal für Psychologie*, 1985. *Journal für Psychologie*, 1986. *Journal für Psychologie*, 1987. *Journal für Psychologie*, 1988. *Journal für Psychologie*, 1989. *Journal für Psychologie*, 1990. *Journal für Psychologie*, 1991. *Journal für Psychologie*, 1992. *Journal für Psychologie*, 1993. *Journal für Psychologie*, 1994. *Journal für Psychologie*, 1995. *Journal für Psychologie*, 1996. *Journal für Psychologie*, 1997. *Journal für Psychologie*, 1998. *Journal für Psychologie*, 1999. *Journal für Psychologie*, 2000. *Journal für Psychologie*, 2001. *Journal für Psychologie*, 2002. *Journal für Psychologie*, 2003. *Journal für Psychologie*, 2004. *Journal für Psychologie*, 2005. *Journal für Psychologie*, 2006. *Journal für Psychologie*, 2007. *Journal für Psychologie*, 2008. *Journal für Psychologie*, 2009. *Journal für Psychologie*, 2010. *Journal für Psychologie*, 2011. *Journal für Psychologie*, 2012. *Journal für Psychologie*, 2013. *Journal für Psychologie*, 2014. *Journal für Psychologie*, 2015. *Journal für Psychologie*, 2016. *Journal für Psychologie*, 2017. *Journal für Psychologie*, 2018. *Journal für Psychologie*, 2019. *Journal für Psychologie*, 2020. *Journal für Psychologie*, 2021. *Journal für Psychologie*, 2022. *Journal für Psychologie*, 2023. *Journal für Psychologie*, 2024. *Journal für Psychologie*, 2025.

In the 50's, Wilhelm Fucks analyzed the statistic value of outstanding works of art and formalized stylistic criteria.



Manfred Mohr, Band Structures 1969

"The first step in that direction was an extended analysis of my own paintings and drawings from the last ten years. It resulted in a surprisingly large amount of regularities, determined of course by my particular aesthetic sense, through which I was able to establish a number of basic elements that amounted to a rudimentary syntax. After representing these basic constructions through a mathematical formalism, and setting them up in an abstract combinatorial framework, I was in a position to realise all possible representations of my algorithms." (Mohr 1971)



Birkhoff 1932



Sung Dynasty (960-1279)

David G. Birkhoff (1884-1944):  
M = O/C  
M = aesthetic measurement  
O = Order  
C = Complexity

$$M = \frac{O}{C} = \frac{F + E + R + HV - P}{C}$$

### Order and Complexity are fundamental principles in the world.

### Is there an aesthetic relation between them?

### Two Cultures

20.-22. March 1968 at the MIT:  
"The session entitled 'Art, Technology and Communication' began in the afternoon with Jerome Lettvin, M.I.T.'s monumental (six feet, 270 pounds) Professor of Communications Physiology, removing his jacket, rolling up his sleeves, brushing his hair back behind his ears, and stating that we've been handed a 'Snow job' on the division between art and science." (Spruch 1969)

### Computer art as a bridge?

In the 60's a new collaboration of artists and engineers emerged in using a computer:  
- In the tradition of the Bauhaus, industrial production merged with artistic production using the computer as a tool, and exceeded with the generative aesthetic, classical industrial design.  
- Nevertheless, while in Europe engineers had to fight to be seen as creative, in the USA the new scientist-artist was seen as 'superior' to classic artists such as Picasso.

### Early networking

In the January 1966 issue of 'Computers and Automation', Leslie Mezei at the University of Toronto suggested building a network for sharing information about events connected with computer art.

Shortly afterwards, he published a bibliography on computer art and in June 1966 the conference "Design and Computer" was held at the University of Waterloo, Ontario, Canada.

The conference was organized by Martin Krampen, who at that time worked at the Institute of Design at the University of Waterloo and at the Hochschule für Gestaltung in Ulm, Germany.

The participants were: Allen Bernholtz, Edward Bierstone, Steven A. Coons, William A. Fetter, Edwin L. Jacks, Kenneth C. Knowlton, Marvin L. Manheim, A. Michael Noll, Kenneth G. Scheid, and Arthur E. Neuman.



Leslie Mezei 1968