a. Title: motion as material. the kinetic art of gerhard v. graevenitz

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c. Abstract: This document examines the questions both physical and theoretical in the conservation and exhibition of works of art using moving elements. A short historical outline is given to determine if Kinetic Art is the Perpetuum Mobile or the deconstruction of that idea. Asking, as movement results in fatigue, when is this physical consequence detrimental to the work? What intervention and conservation is sympathetic to the nature of the individual piece. How does this relate to the practical problems inherent to documenting and restoring of such works. Beyond the relevant material problems in conservation, how should the kinetic idea be documented and respected within its natural "wear and tear". These questions are examined in relation to a kinetic object of Gerhard v. Graevenitz, who can be seen in a constructivistic tradition.

d. Keywords: Kinetic Art; motion; moving elements; conservation; documentation; Gerhard v. Graevenitz; Constructivism;

e. The main body of the paper:

Introduction
"Art does not show the visible but makes visible". That is true not only since Paul Klee said so, but since the earliest expressions like the cave painting more than 15 000 years ago as well as the crucifixion with multiple portrayals or sculptors and painters. But the motion itself started in the head of the spectator.

One approach of the arts has always been the examination of life, motion and its many manners of transformation. In the painted picture, typically is a still life, transitoriness may become an issue explored within the subject but the very material itself, in most cases, were seen to last forever. In comparison the Eat Art of the 1960's used food whose purpose was to decompose, degenerate and rot. Both may be concerned with transitory qualities of life as a main theme but their different approaches generate more complicated questions around preservation and restoration. Few would deny the conservation of a painting, but what of a piece of art whose purpose is to degenerate and decay? As the subject is to a painting the motion is to kinetic art. In approaching the documentation and conservation of moving elements it is necessary to understand the artists intention and in what manner Kinetic Art is used. Is art with moving elements the Perpetuum Mobile or the deconstruction of that idea? Is it the dissolution of form or the ironically examination of machines? Does it relate to a specific material, a certain time or a technique? Why did artists start to investigate movement and motion at the beginning of the 20th century and particularly in the 1960's? These questions can be ascertained with our Christian-western background and the empirical knowledge of seeing we made. But to investigate and understand this is probably the only way to find out what the original is and how to preserve it.
historical survey

The ancient world and the Middle Ages saw articulated statues and human automata as
magic creatures[1]. Since the Renaissance and especially in the 17th and 18th century they
were the input for philosophical speculations; Romanticism transformed them into erotic
obsessions and today it is just the medium of science[2]. Motion or kinetics in relation to
fine arts starts to develop in the late nineteenth century, when colour theories and
photographic research were applied to painting and sculpture. From 1910 onwards
programmatic use was made of the new technical possibilities and materials available to
the twentieth century artists, particularly by the Italian Futurists, the Russian Constructivists,
and by members of the Bauhaus, notably László Moholy-Nagy and Oskar Schlemmer.
Dadaists and Surrealists, like Marcel Duchamp, Man Ray, and occasionally Max Ernst or
Alberto Giacometti, made more illusive use of movement, exploiting its poetic, continued
by the mobiles and so-called useless machines of Calder and Murano in the 1930's.
Experiments extended over many media to include moving stage sets, mobiles and
animated films. These movements were documented by manifestos. The first one
mentioning specifically the "kinetic rhythms as the basic form of our perception of real
time" is probably also one of the best known, the "Realist Manifesto" by Naum Gabo and
his brother Antoine Pevsner published in 1920 [3].

Conserving motion?!

When thinking about pure kinetics from a conservatorical point of view it might be helpful
to distinguish categories, descending on the one hand from Constructivism like Naum
Gabo's "standing wave" from 1920, which is probably the first kinetic sculpture [see Fig. 1];
and on the other hand from Dadaism and Surrealism.

Gerhard v. Graevenitz obviously comes from the constructivistic tradition, which means
that he is using motion as a material to make the spectator think about time as an abstract
idea. This truly differs from the intention as for example Tinguely who used machines in an
often ironical manner, to express the fascination and - within his lifetime more and more -
also the threat that is coming with it. That culminated in performances like the "Homage to
New York", taking place in the garden of the Museum of Modern Art in New York the
evening of 17 March 1960, were Tinguely built a machine that destroyed itself within less
than half an hour [see Fig. 2].

This paper shall focus on the questions concerning works of kinetic art which comprise of
mechanical moving elements as part of its physical three dimensional form. No matter if
the origin of the impetus comes from the artwork itself (engine, electricity, magnets, etc.),
any environmental influence (sun, wind, water, etc.) or by activation through the visitor.
Thinking about motion as such should be basic knowledge for all the wider technical
scope one find today like video-, projection-, computer-, and even so-called immaterial
(internet-), interactive- or cybernetic art.

The conservator when approaching such art has not only to consider the physical qualities
of the piece but also the dimension of time and the physical mechanics which contain and
produce its time frame. Being confronted with the task of preservation and restoration of
such kinetic artworks and wishing to remain sympathetic to the intention of the work, is
challenged by certain questions: Do artists who employ real motion through moving parts
as an artistic expression realise that there is an inbuilt obsolescence that comes with it?
Fundamentally such works of art offer the viewer an experience encapsulated in "real time".
Integral then is the physical qualities within the duration of its motion and the associated
time needed to experience such work. Can a kinetic artwork work, if it does not work? Is it
therefore legitimate or even a necessity to keep a kinetic artwork going at all costs, or are
there limits set by the properties of the materials used? May I or must I exchange parts of wear and tear? If I do so where does “retouching” end and “replacement” start? How far does the preservation of the mechanical workings of the artwork take precedent over the pictorial form? Is there a difference between the pure impetus (like invisible mechanical parts) and the works portrayal (visible parts)? What parts are fundamental to the works portrayal?

Gerhard v. Graevenitz

“The relation of my objects to reality is not that of copies, but rather of models, for example, I try to make them so simple and logical that they take on the character of models.”[4] Important for Gerhard v. Graevenitz is the fact, that he is really concerned about the movement itself without any environmental influence. In the place of form there are elements, which function within systems according to rules. The apparently simple system adopted by the artist gives way to incalculable visual combinations. The elements are simple and geometric like circles, ellipses, squares or strips. The kinetic objects are not traditional sculptures set into motion. In his sense motion means the changing of the network of relationship which defines the structure in space and time. For Gerhard v. Graevenitz “kinetic art is not a new style but a new art in the sense that it establishes a new object-spectator relationship”[5] A viewer is no longer a receiver of messages, but has become a participant in a game. His work “lies between challenge and game. I am mostly interested in systems in the domain of visual reality. I do not use century-old traditional materials, but new, everyday ones”[6] which brings him close to technical engineering. His artworks explore statistically the interplay of microelements without an aesthetic information. But since the relationship of these movements are at random, their interconnections become extremely complex. Poverty of information, predictability, banal calculation, is transformed into the incalculable. In the beginning he used many elements but reduced them to just necessary minimum to show strictly non-hierarchical homogenous structures. The kinetic objects cause the changes themselves, and here the usual restriction to non-colours like black and white has the function of laying the strongest possible emphasis on the movement. The movement is not linear, it has no beginning and no end. The number of possible situations is so great, that a repetition is almost improbable.

Object 240/677

Gerhard v. Graevenitz applied for a patent on one of his first mechanisms. He never wanted the spectator or even a colleague to see the mechanical parts of his “paintings” – as he called his kinetic objects. He entitled his objects only with technical information to stress that they have nothing to do with emotional feelings but are investigations. The object on which these examination were scrutinised, is out of a series of three from 1975 that have all the identical form (122 x 122 x 20 cm) but differ in their appearance which is also their technique and title:

4 exzentrische Streifen, a-synchron (4 eccentric strokes a-synchrony) [see Fig. 3]
4 exzentrische Streifen, je 2 synchron (4 eccentric strokes, every 2 synchrony) [see Fig. 4]
4 exzentrische Streifen, synchron (4 eccentric strokes, synchrony) [see Fig. 5]

The black strips are glued on one end to axes coming through the white hardboard and turn at random, sometimes clockwise, sometimes counter-clockwise which are moved by one electric motor. This motor is specifically reliable and silent (the company that still produce them was finally found). The motor will drive a wooden disc with spring-loaded tracks mounted on the inside. For v. Graevenitz the motor is the never changing structure for investigating the system. But the mechanism he created to transmit the power can and
even shall cause irregularities. They are caused by the spring-loaded tracks with their PVC-coating being pressed to the handmade Polyethylene (PE) wheels. But even the direction will change from clockwise to counter-clockwise or in case of having no contact, the strips might "fall" to one side. The PE-wheels will than transmit this irregularity to the mechanism that is connected to the strips in the front. But also the transmission with driving belts (made of springs, polyvinyl-belts, rubber-cloth or other material) can slip on the PE-wheels. [see Figs. 6-9]

Documentation
"The first step in preserving these works is to accurately document them. As the vocabulary develops to describe their nuances, so too will the sophistication of our approach to their conservation."[10] When documenting moving elements the human capacity for recalling motion is always subjective, characterised by moods and feelings. At the end of a stressful day one might describe a motion as horrifying nervous, whereas the same person might describe the same motion even in the same environment on a calm Sunday morning as meditative and soothing.

It is not enough to simply document such objects in photographs and writing, which is the common practice. Even if good photographs may allow to reconstruct the system of the movement, it does not tell anything about the speed [see Fig. 10]. Therefore the moving image and sound should be recorded. Most important than are the precise parameter of colour and sound, programme-code and format, etc. and one should be aware of the longevity of hard- and software used. Most important for documenting kinetic artworks beside the aesthetic appearance are technical information's like revolutions per minute of the motor, the number of cogwheels and cogs, the change of the transmission ratio and if possible the revolving time of the moving elements etc. In any case, the entire structure, design the mechanism's mode of operation has to be examined very closely. An analysis is required to determine which parts are secondary and what transmission ratios enable what speed. To draw up a movement-scheme can be very helpful to determine what force causes what effects. It can help localising and monitoring the areas at risk or week points. To get a precise documentation the (double synchrony-) motor, the transmission and the whole mechanism was drawn with all details [see Figs. 11-12]. But the motion of this object has no beginning and no end, because it is not cyclic it will not repeat in the time watched, any documentation, replicas or films can – in the best case – only repeat what already happened.

conservation-restoration
The kinetic objects of Gerhard v. Graevenitz will not work if they do not work. And because real motion necessarily causes friction, wear and tear will be the consequence. If we decide that the artwork should not just stay in storage or being shown as a static object it is necessary to confront the question at what point to intervene. That can range from the so-called passive conservation by reducing the time when the kinetic artwork is actually moving. Ideas like schedules for the visitors, motion detectors or even "monthly happening's" should be discussed. On the other hand intervention can mean the restoration of parts of wear and tear or, as the last possibility, exchanging parts. However faults in the sequence of motion are not necessarily caused by later defects. The object may have left the artists studio in a "faulty" condition right from the beginning. Than a very difficult question rises: how legitimate is to repair – or shall one say restore – such a fault; where does retouching or restoring end and repairing start? The kinetic objects from the 1960s and 1970s are often made of low-quality materials. And in most collections
these objects are still treated more like technical objects considered to need less sympathy and care as paintings. But the organic material often warps with climate changes which may disrupt the entire operation of the mechanism and may lead to destruction of sensitive mechanical parts.[7]

Investigations on the objects of Gerhard v. Graevenitz showed that the artist knew exactly were to use best quality materials to ensure that the motion lasts for a long time. Inbuilt week points should not lead to the conclusion that the mechanism will not work very long. Because it is all artists-made there are sensitive areas (e.g. tracks, glue points, etc.) but for example the main axes that come through the hardboard to hold the black elements sit in the best ball bearings the artist could get at that time. The whole mechanism is held by a welded iron frame, sitting in the double cross frame in the back of the object. To avoid unintentional irritations all parts related to the mechanism must be perfect right-angled and the black strips need to be in perfect balance with their counterweights.

The restoration should not make a difference between the visible and not visible parts because there are only original elements. Reconstructed or replaced parts were indicated as such, even if these are "original spare parts" made of the same materials used by the artist to match the mode of operation. Unlike in paintings conservation, where one try to differ the inpaint-material from the original, it could cause sensitive disruption in the structure of motion that were intended by the artist.

When taking over the object the white street mark paint sprayed on the front was dirty with various accretions, none of the black strips were in position, the iron parts were heavily corroded (lose rust already crumbled off), the organic materials were mouldy and one track was missing, another one broken [see Fig. 8]. After intense investigations and documentation the mechanism was taken apart as little as possible but as much as necessary to reduce the corrosion products mould and dirt. The lubrication had to be redone because corrosion products or dirt could cause abrasions in the moving elements, but those bearings Gerhard v. Graevenitz made of teflon need no extra lubrication. All iron parts were coated with a mixture of the malleable microwax TeCero 30201® and a microcristallin hardwax TeCero 30410®. In a ratio of 2:1 the melting point is high enough and the surface is not sticky but dense. The wax was first melt, diluted in benzine (Shellsol T®), applied with a brush and after one night condensed with a cotton fabric. Certainly problematic is the bonding between the ends of the four main axes and the black strips. The bonding area is just 1,7 cm² at one end of the metal strips that are almost 50 cm long. Technically the forces are too strong for bonding. But to avoid high temperature because of the black lacquer a glue had to be found that is strong enough – even if it will not last for ever. Nevertheless chlorides can corrode the iron epoxy resin (UHU Plus endfest 300®) was used because there is no other glue that has similar physical values.

At the back of the object a data-sheet was placed with informations like: power supply, spin direction of the motor (it can vary), revolution per minute, transformation ratio, number of cogwheels and cogs, recommendations for maintenance, installation, exhibition and packing, "first aid" in case of irregulations, etc.

f. Conclusion:
Stress should be limited on any kinetic object even if it is working properly. However these objects need obviously more qualified maintenance and professional care. Cleaning and maintaining in certain intervals as well as monitoring the parts at risk may require a table in terms of risk assessment. Even in the same object some parts may be extended to a
greater load-bearing capacity than others. But that can only be seen and understood, if the physical system is investigated. On closer examination we have to accept that even if the artists use technical materials and construct technical elements, we should avoid to conclude that they just did not have the right material or better skills. Any restoration, no matter how carefully it will be undertaken is an interpretation of the artwork. But especially artworks like Kinetic Art and Electric or Electronic Media are likely to be seen as technical equipment that will be treated like an old machine or the electrical system in a household. Signs of wear must be found and analysed, because these may point to possible sources of faults in the mechanism that have not yet led to a visible defect and which, in most cases, can be easily eliminated at an early stage. What consequences does that mean for documentation, care, maintenance, exhibition, storing, loans and transport? As Artur Ketnath wrote: "It may be possible to detect such sources from an overview of the way the entire mechanical system functions, but this requires a certain understanding of technical processes."[11]

Gerhard v. Graevenitz manoeuvred between scientific development and artistic expression. The materials and techniques are important components in his artworks. Even though the materials seem common every-day-ones, most of them are no longer available - and these artworks are just 25 years old...

Acknowledgements:
To my great delight Mrs. Antje v. Graevenitz put a piece of the estate from Amsterdam at my disposal for the restoration. That was made possible by Artur Ketnath, who took me into his confidence.

Endnotes and references:
[6] Ibid.
i. Materials:
TeCero® Wax (30201; 30410), Fa. Tromm, Cologne, Germany.
Shellsol T®, boiling limits 165 – 185, free of aromatics, Shell chemicals
UHU PLUS® endfest 300 epoxy-resin, UHU GmbH, Bühl, Germany.

[Fig. 1] Naum Gabo Kinetic Sculpture "Standing Wave", 1920
[Fig. 2] Jean Tinguely "Homage à New York", 17 March 1960
[Fig. 3] Gerhard v. Graevenitz "4 exzentrische Streifen, a-synchron", 1975
[Fig. 4] Gerhard v. Graevenitz "4 exzentrische Streifen, je 2 synchron", 1975 AT (after treatment)
[Fig. 5] Gerhard v. Graevenitz "4 exzentrische Streifen, synchron", 1975
[Fig. 6] G. v. G. "4 exzentrische Streifen, je 2 synchron", 1975. Recto with disc BT (before treatment)
[Fig. 7] G. v. G. "4 exzentrische Streifen, je 2 synchron", 1975. Recto without disc BT
[Fig. 8] G. v. G. "4 exzentrische Streifen, je 2 synchron", 1975. inside of wooden disc, two tracks missing BT
[Fig. 9] U.L. Sketch with section of G. v. G. "4 exzentrische Streifen, je 2 synchron"
[Fig. 10] Gerhard v. Graevenitz "181 weiße streifen auf schwarz", 1966
[Fig. 11] U.L. Sketch of the motor and cogwheels of G. v. G. "4 exzentrische Streifen, je 2 synchron"
[Fig. 12] U.L. Sketch of the mechanics and transmission of G. v. G. "4 exzentrische Streifen, je 2 synchron"
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