

KINETIC ART, ITS DEVELOPMENT AND DIRECTION

THESIS

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INTRODUCTION

For many centuries different societies have incorporated real motion in artifacts designed to give aesthetic satisfaction. However, it was only in this century that the term 'Kinetic Art' was coined and that Kinetic Art objects became recognised as visual fine art.

The number of artists who devoted their talents to this kind of art has greatly increased since the beginning of the century. Inspired by the impact of new visual experiences, of modern conceptions of aspects of nature and of man, and of novel techniques provided by science and technology, the scope of Kinetic Art itself has expanded.

Although Kinetic Art is now taken seriously by the art world, in many advanced technological societies, it will probably take several more decades before large numbers of art lovers turn to it for emotional satisfaction. At present, only a few museums have permanent displays of Kinetic Art works and a staff capable of conserving them.

Having worked for six months designing and manufacturing a kinetic construction for an exhibition in Dublin, I became aware of the fact that 'kinetics' has been applied to advertising, discotheques, pop concerts, and of course, exhibitions. This would lead many people to conclude that Kinetic Art is suitable only for decorative purposes. They forget that there has long been an interplay between the fine and applied arts.

In this thesis, I shall endeavour to trace the origins and highlight some of the achievements of the machine in Kinetic Art. It is hoped that all of the important aspects and the thinking behind them will be explored, revealing the dynamic and intriguing nature of these works, which most spectators find awe-inspiring and sometimes hypnotic in their effect.

1. MACHINES, ANCESTORS OF REAL MOVEMENT

In a study of the first kinetic machines, mention should be made of the earthenware articulated statuettes of ancient Egypt, which were used as cult objects. Mention should also be made of the numerous physical demonstrations of Hero of Alexandria, who lived around 100 A.D. Hero made use of processes and techniques like displacement of water, compressed air, turntables and flames, which were alternately alight and extinguished. At a later stage, the Byzantines and, in particular, the Arabs, used types of automata to distract the attention of guests at a feast. The Arabs also invented a kind of water clock, which it seems, was the origin of the armed figure used to sound the hour in medieval clocks, and led eventually, towards the end of the fourteenth century, to the construction of whole scenes illustrating religious or profane subjects. One of the most famous of these is the legendary bronze head of Albertus Magnus, placed in the Cathedral of Strasbourg around 1350. The same building contained a celebrated wooden cock which flapped its wings and produced sounds.

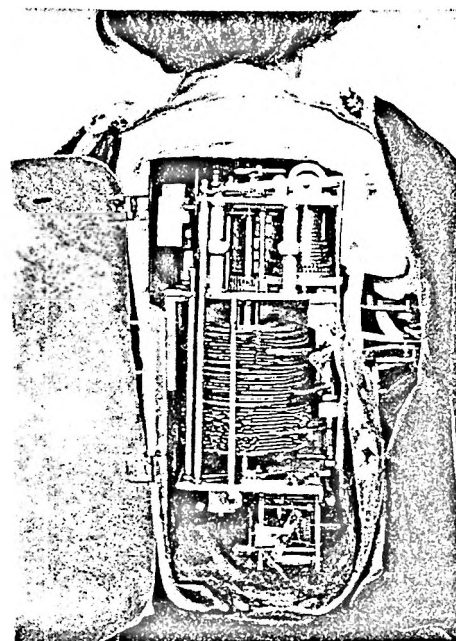
The story continues up to our own day. Writers of the seventeenth century sometimes made allusion to the existence of mechanical fountains. The examples given by Salomon de Caus are particularly interesting in this connection. Mechanical toys and marionettes have a long history, particularly in the Far East. And sixteenth century Europe pioneered the transformable painting, with a composition on a movable disc which could be pivoted according to the spectator's wish. This was followed in the reign of Louis XIV by the appearance of the first animated pictures which consisted of painted backgrounds against which the cut-out figures moved in procession. Musical instruments involving mechanical elements, such as the organ, can be found as early as the fourteenth or fifteenth centuries and reach a very flourishing stage in the sixteenth and seventeenth centuries.

The seventeenth century saw the development of a new phenomenon, the human or animal automation which imitates life-like appearances. The celebrated duck of Jacques de Vaucanson (1709 - 1786) is now thought to be inauthentic. But the same inventor has left some

remarkable android-like figures, such as the flute and tambourine players. In 1760, Friedrich von Knaus (1724 - 1789) constructed 'The Writer' which can be seen today in the Gewerbemuseum, Vienna. Other extremely well known androids, depending on extremely complex mechanisms, are to be found in the museum at Neuchâtel. Entitled, The Writer, The Draughtsman and The Musician, these androids were constructed in 1774 by Leschot and the Jacquet-Droz family. They are still in good working order. The Timpani Player of 1785, now exhibited in the Conservatoire des Arts et Métiers in Paris, was built by Kinzing, while the Writer-Draughtsman in the Franklin Institute, was begun by the Jacquet-Droz family and finished by H. Maillardet in London.

During the eighteenth century, the taste for mechanical toys, marionettes and automata which had already existed in classical times was cultivated in princely and noble circles. At the same time, there was an interesting development at the popular level. Travelling fairs offered the optical marvels of the 'phantasmagoria' - a kind of animated tableau depending on the use of illuminated figures in total darkness. There were also the 'transparent' paintings, such as the proverbs of Carmontelle, which depend on the operation of a light source from behind.

Mechanical pictures with musical accompaniment succeeded animated paintings in the nineteenth century. At the same time, mechanical toys, based on the power of a spring, grew more and more popular. There were the so-called 'Articles de Paris', jewel boxes with singing birds, cylindrical organs, and clocks of all varieties. All these techniques were available for the transmission of a language which hovered between the areas of the artist and the craftsman.



1. Jacquez-Droz. Mechanisms of a Draughtsman (1774)

2. THE MACHINE AESTHETIC AND REAL MOVEMENT

Archipenko, Duchamp, Man Ray, Tatlin

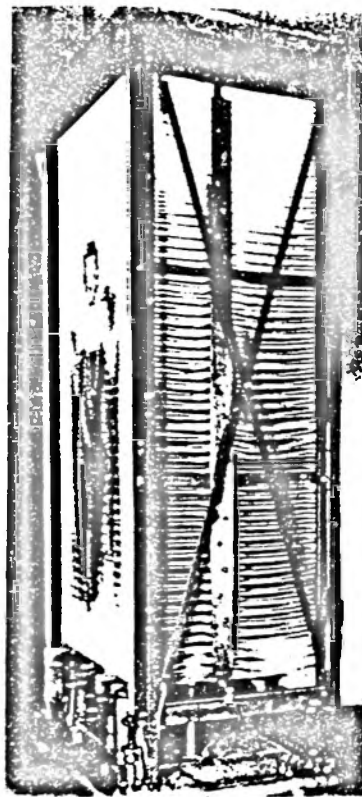
Artists reacted in various ways to the coming of modern machinery, and development around 1910 of what has been called 'the machine aesthetic'. Foremost in this 'modernolarria', or worship of modernity, were the Italian Futurists and, in particular, Boccioni, Balla, and Severini. Since the machine aesthetic was to be closely linked with the origin of three-dimensional works in real movement, it is important to see which other artists contributed to the significance of the term.

Mention must be made in the first place of the number of artists who actually experimented with the incorporation of real movement into their works. Around the year 1912, Larinov, Balla, Archipenko and Duchamp all made experiments of this kind, introducing movement by the use of an electric motor or leaving it to manual control. There was in fact, a considerable interest among young Russian artists of the time for the introduction of objects or natural phenomena in their pictures. For this reason the fact that Larinov and David Burlinsk included movable elements in their pictures need not be held to signify a new departure in the plastic arts. With Balla, however, the interest in movement goes deeper. From examining it purely as a pictorial problem, he proceeded in 1915 to an attempt at integrating real movement within the work. This can be seen in his portrait of the Marchesa Casati, and especially in his theatrical presentation, a story of two amorous fishes, which date from 1915 and 1918 respectively.

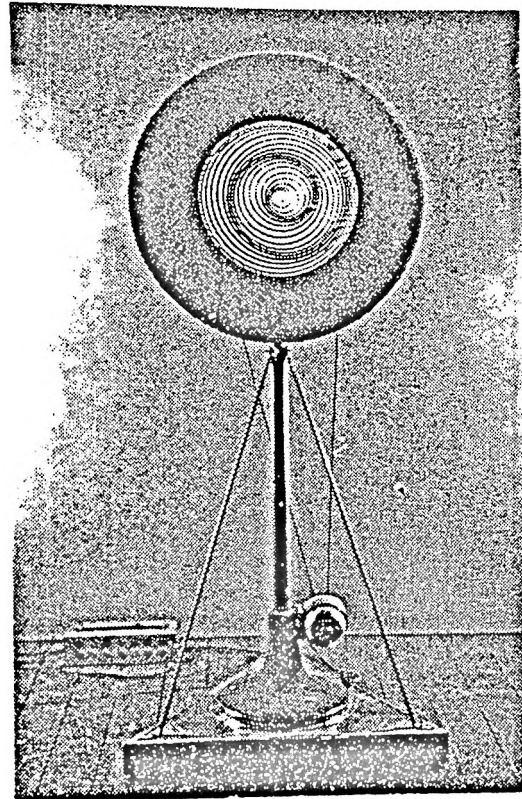
Archipenko's research into the possibilities of real movement began in 1912 in Paris, when he constructed The Juggler of wood, glass and wire, which was to be called 'Medrano I' and which was exhibited a year later in Budapest. In the artist's view, this was the first three-dimensional construction in the history of Modern Art. For our purposes it stands between the categories of virtual and real movement, since The Juggler's arm is mobile but the three discs and balloons indicate the movement in a symbolic way.

Archipenko went on from this point to create Medrano II, a sculpture of similar structure, which was made of wood, metal and glass. He completed this in 1914, but his solution to the problem still left him dissatisfied. He was to take the idea up once again at Berlin in 1922. Finally, in New York in 1924, he crowned a period of intensive technical research with the invention of his 'Archipenkura', an actual machine which was intended to create an illusion of movement in a pictorial subject through methods analogous to those in the cinema. This invention, which he finally designed, patented and constructed in the United States in 1928, consisted of a box roughly 7 x 3ft. in dimensions. On each side were a number of narrow metal bands superimposed as in the case of Venetian blinds. An electric motor drove these around. As successive strips of painted cloth made their appearance, an effect of genuine movement was obtained. Archipenko made it clear that the essence of his invention lay not in the importance of the subject which was chosen, but in the actual manifestation of change. He did not abandon this point view, as can be seen from his commentary on the four views of his Revolving Figure (1956).

Marcel Duchamp approached his kinetic experiments in three dimensions from a very different point of view. The first readymade, which dates from 1913, was the bicycle wheel mounted on a stool. From this use of movement pure and simple, an attempt to de-mystify art and to strip it of its material qualities, Duchamp began around 1920 to investigate the possibility of producing spatial illusions with the use of actual spatial constructions. These were stationary, dynamic objects. An air of paradox therefore dominates the work which he completed shortly after this date, such as the 'plaques de verre rotatives' and, ultimately, the Rotative Demi-spheres of 1925 and the Disques Visuel of 1935. The Rotative Glass Plaques and the Appareil Rotatif de Précision both depend upon an electric motor, which causes them to rotate and thereby gives the visual effect of circles changing into spirals. The Rotative Demi-sphere is similar in construction, with a hemispherical spiral turning at the centre. The Disques Visuels or Rotorereliefs are abstract compositions which appear to be three-dimensional when placed upon



2. Alexander Archipenko. Archipentura (1924)



3. Marcel Duchamp. Rotative Demi-sphère (1925)

a gramophone turntable. They were exhibited at the Concours Lépine in 1936.

Duchamp's work with movement, which went hand in hand with his interest in the cinema, holds an important place, along with that of Man Ray, Gabo and Moholy-Nagy, in the history of the integration of real movement into the arts on a conscious basis. This must be admitted in spite of the negative and somewhat intermittent character of his achievement. Perhaps he should be seen in relation to a number of other artists whose contribution has been of a similar character, Fran Giacometti, who in 1919 created 'a mobile work which was like a square cloud with a pendulum made of blue smoke', to Calder in 1932, and finally to Tinguely, Kraemer and Bury.

Man Ray began his Dada experiments with a series of mobiles incorporating real movement. These will be examined at a later stage. In 1923, he began to use mechanical movement, mounting a cut-out photograph of an eye on the rod of a metronome and calling it 'objet de destruction'.

Tartin also began his kinetic work with a number of mobiles, but his project for a 'Monument of the Third International', which was realised in wood and metal in 1919-1920, involved different types of movement. This monument was intended to be dynamic in its external form as well as to allow activity in the spaces within.

Least of all, must you stand or sit in this building, wrote a contemporary, you must be mechanically transported up, down, carried along willy-nilly; in front of you will flash the firm, laconic phrases of an announcing agitator, further on the latest news, decrees, decisions, the latest inventions will be announced creation, only creation.

In this connection should be mentioned the comparable case of El Lissitzky's remarkable 'Electrical-Mechanical spectacle, developed in Moscow, 1920 - 1921.

3. GABO AND PEWSNER - THE REALIST MANIFESTO:
The Manifesto of Moholy-Nagy and Kemeny

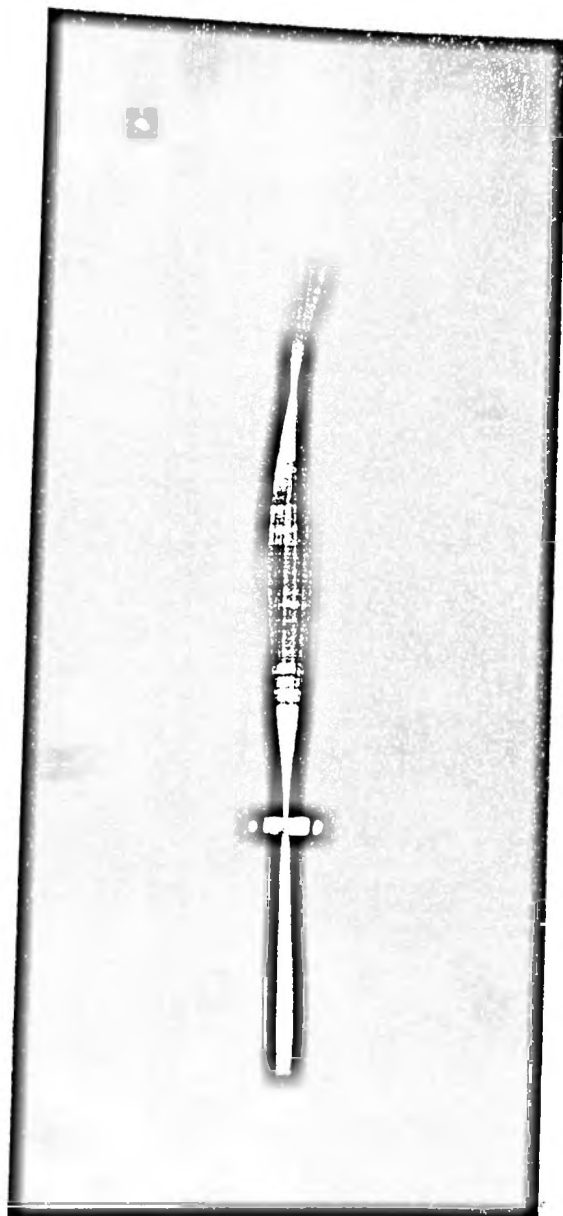
The first work which answers all the criteria of the Realist Manifesto, both in plastic and in theoretical terms, is Gabo's 'Virtual Kinetic Volume' of 1920. It was the fruit of profound reflection on the problems of movement in Art, which Gabo and his brother Pewsner summed up in the same year in their 'Realist Manifesto': (See Appendix).

We know that every object has its own essential image; chairs, tables, lamps, telephones, books, houses, men..... every one of them is a world in itself, with its own rhythm and its own planetary path..... In place of static rhythms in the plastic arts we announce the existence of a new element, Kinetic Rhythm, which is to be the basis of a new perception of real time.

Through Constructivist techniques we are today capable of bringing to light the hidden forces of nature and realising physic events.

Gabo's Virtual Kinetic Volume has also been referred to as Kinetic sculpture or Kinetic model. It consisted of a strip of steel attached at the base to an electric motor and so set into rhythmical vibration. The theme was to be the 'Interval of Vibration', by means of which Gabo was to produce the spatial effect of 'virtual volume'. In other words, the rotation of the steel strip according to a certain periodicity produced the illusion of a rounded volume where the strip was forced away from the vertical by the speed of rotation. Unfortunately Gabo made no attempt to follow up this interesting experiment. He considered that the motor was an encumbrance and thought that,

future development in the study of heat and radio, and the powers released in the process, would make possible kinetic solutions of a type hitherto unanticipated.



4. Nuam Gabo. Standing Wave (1920)

It was purely for technical reasons he insisted: that he made no further investigations into real movement. It must be remembered that, the pioneering work of 1920 was followed by a drawing for a kinetic sculpture in 1922. This schema represented a much more complex interaction of moving elements than its predecessors. Gabo was in fact to return to projects in which the idea of movement occupied an important place on several subsequent occasions, such as in 1925, when he made a model in glass and bronze for the monument destined for the Institute of Physics and Mathematics.

Gabo's theories on kinetic sculpture were taken up and developed in another direction by Lazlo Moholy-Nagy, who wrote in his manifesto on the system of dynamico-constructive forms with Alfred Kemeny in 1922. For Moholy-Nagy and Kemeny, constructivism meant the activation of space by means of a 'dynamico-constructive' system of forces - that is to say, a construction of forces, some of which represent the tension of the structure itself in physical space and others the tension within the system. They proclaimed in their manifesto, in a passage reminiscent of the Realist Manifesto:

We should therefore replace the static principle of classical art with the dynamic principle of universal art.

Their practical plan was to substitute a dynamic construction for the traditional static type involving relationships between material and form. They envisaged material simply as a carrier of forces.

Moholy-Nagy and Kemeny were also interested in allowing the spectator a much more active role by the application of their system. Their plan of procedure was to begin by setting up experimental apparatus which would test the relationship between man, materials, forces and space. The results of these experiments would then be utilized in the creation of works of art which would move freely and lack the constraints of mechanical and technical movement.

It was at the same date that Moholy-Nagy began his practical research into light, space and movement. His light machine, or Lichtrequisit, was not to be completed until 1929-30, and was finally exhibited at the Exposition Internationale du Batiment at Paris in 1930. However, it was to undergo some further modifications at a later stage. Essentially this machine was a moving sculpture, placed on a circular base, with three distinct spatial cells to allow greater complexity of movement. It was made of polished metal which reflected the light. The three cells were divided up as follows: the first consisted of rectangular pieces of metal moving in an irregular undulatory fashion; the second of perforated metal discs moving vertically up and down and releasing a small black ball; and the third of a glass spiral turning and producing a virtual conical volume. The construction was provided with around 130 electric light bulbs of different colours which were linked together and controlled by a single coil. These gave a complex spectacle of moving light.

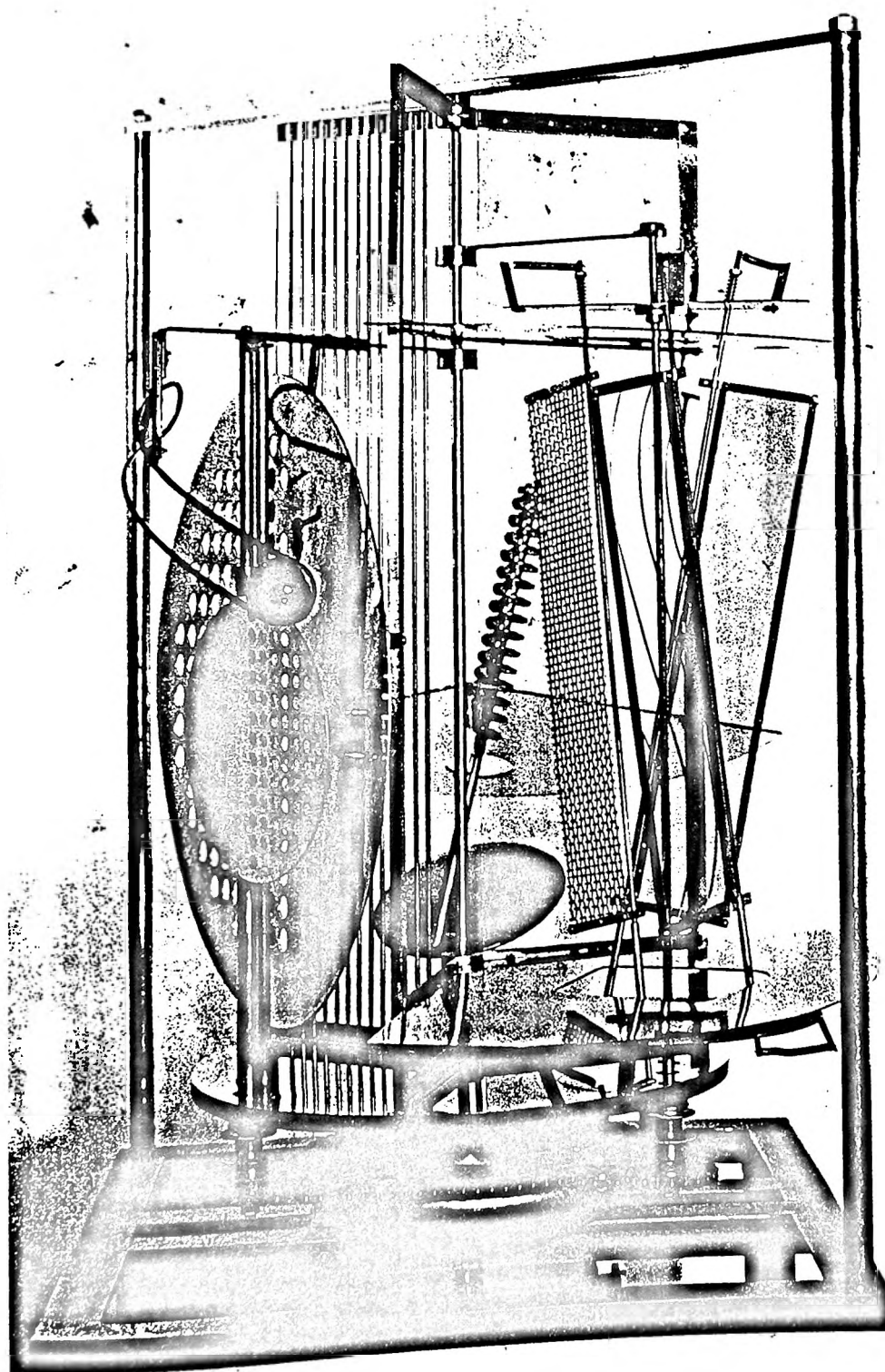
Sibyl Moholy-Nagy has left us a lively description of the Lichtrequisit, which she considered to be a construction half-way between a machine and a sculpture when she first became acquainted with it. This work which was to occupy her attention for a large part of her life, consisted of an amalgam of chromium, glass, wire and metal rods. The very centre of the construction was originally of wood, then of glass and finally, of perspex. What struck her immediately was the movement of light and shade projected upon the walls and ceiling, and also the varying reflections upon the metal elements of the construction itself. In effect, the power of the work depended more on the reflection than on the original.

Experiments of the kind described above have multiplied in number since the end of the Second World War. They all belong more or less to the tradition of Dada and Constructivism. But the most useful way of classifying them is not in terms of their historical antecedents, but according to the dominant forces which give each series of works their particular character.

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5. Moholy-Nagy. Lichtrequisit (1930)

4. WORKS DRIVEN BY HAND OR POWERED BY ELECTRICITY:
Munari, Bury

The class of works which depends on continuous human force, particularly that of the hand in the case of marionettes, can be traced back before 1920 in the context of the Modern Movement. Sophie Täuber-Arp's marionettes date from 1917. It would nonetheless be true to say that the most significant pioneer was Alexander Calder, who constructed a miniature circus of animated toys around 1925, before proceeding to his mobiles. This circus was exhibited at the Salon des Humoristes, Paris, in the Spring of 1927.

A contemporary artist who was also inclined to use small electric motors in his 'Automobile Structures' is the German, Harry Kramer, who worked as a dancer in various towns throughout Germany before entering the kinetic field. His first work was a series of figures for a mechanical theatre. These were used for the first time in a show of thirteen scenes which took place in the Springer Gallery, Berlin, in 1955.

Mention has already been made of the part played by Duchamp, Gabo and Moholy-Nagy in introducing electrical forces into the plastic arts. The fact that this link throws together artists of widely differing aesthetic aims suggests that there is an element of ambiguity in the majority of works which utilise this particular technique. It might be said that there is a Dada or Surrealist element even in the works which are constructivist or geometrical in conception, just as there are frequently geometrical shapes to be found in the work of numerous artists. In fact, admiration and caricature of the machine often go hand in hand in the same programme of exploration. A good example of this would be the first mobiles of Calder, which were powered by electric motors.

The Italian artist, Bruno Munari, has pursued several parallel lines of research in connection with the use of real movement. In 1938, he wrote a manifesto of machine art in which he claimed that 'the machine must become a work of Art'. Munari's work

developed in complexity and in 1945 he constructed a number of kinetic objects whose structure was variable. These were powered by small watch movements. At a later stage he evolved the concept of a 'programmed art' that is to say, a form of research in the strict sense whose theoretical postulates preceded the choice of materials and forms, and even anticipated the mathematical combinations involved in the movement. Another feature of his work has been his distinctive interpretation of the Gestalt theory, especially of the concepts of formal purity and good design. And it is worth recalling that he was the first kinetic artist to produce works in editions.

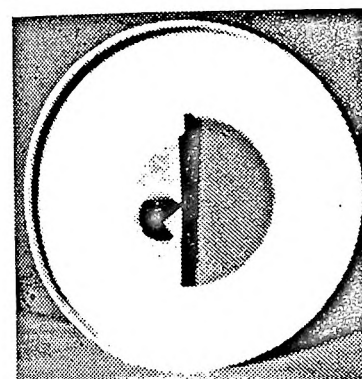
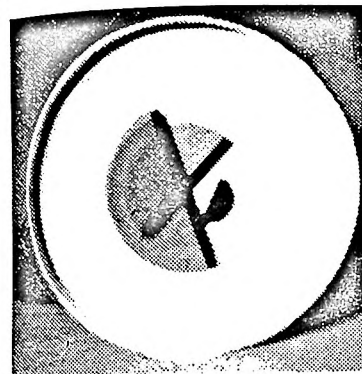
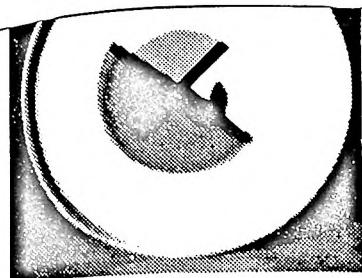
Those of Munari's works which fall within the category of three-dimensional objects in movement most often take the form of small screens on which unstable images of form and colour flicker past.

One of the first artists to undertake a series of works which depended upon the use of electric motors was Belgian, Pol Bury. Impressed by an exhibition of Calder's work, Bury began his research with the construction of what he called 'mobile planes' in masonite. These were sometimes black and white and sometimes coloured. They relied on the spectator for their movement. Bury's aim in making them was to replace the traditional picture frame by an axis, or several axes, and to modify the composition by means of movement while inviting the spectator to participate in the elaboration of the work. He exhibited these 'mobile planes' at the Gallery Apollo, Brussels, in December 1953, explaining in the preface of the catalogue:

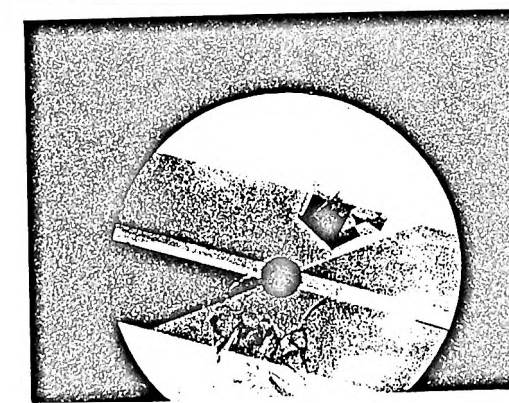
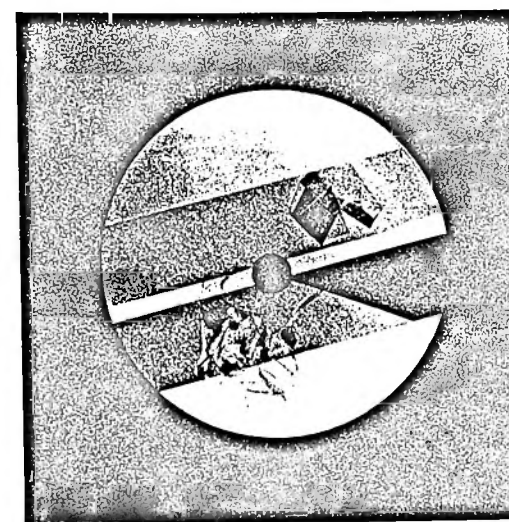
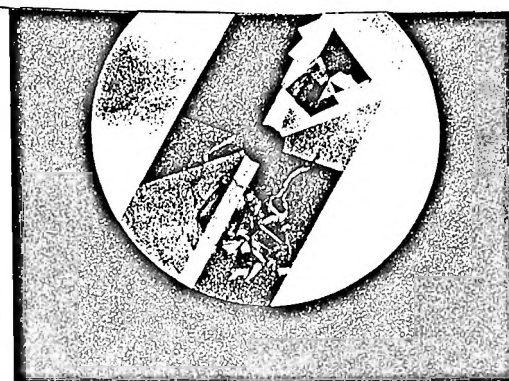
By distributing these forms in three successive planes, I managed to give each of them an axis. That of the first plane was fixed on to the second plane, that of the second fixed on to the third, while the third was fixed to the wall. It was possible to turn the first plane while the other two remained motionless. This permitted in theory an infinite number of pictorial combinations.

BRUNO MUNARI





Ora X



Polariscop

6. Bruno Munari. Ora X
7. Bruno Munari. Polariscop.

The next stage in Bury's work was marked by his invention of the multi-planes in 1957-8. These were constructions similar to the mobile planes, on square slats, but in this case they were set in motion with the help of small motors (which in fact Bury had tried out once or twice in the previous series).

Returning to the rectangular surface of the picture, Bury explained, I made it up out of wooden slats of square section placed parallel to one another in a vertical order. On each of the four faces of these slats, I painted forms which carried on from one face to another and from one slat to another - there were about ten in all. There were therefore four large compositions painted on the various facets of these slats..... As each of the slats was supplied with a cog wheel of differing diameter, each had a different speed of rotation. But since there was continuity in the four dominant compositions, there were no blank spots created by these differences of speed. These works increased my knowledge of real movement. The slats turned very slowly and transformed the composition of the picture almost without the spectator's knowledge.

The result was a kind of mixture of forms. But beyond this satisfaction of seeing the painting change continually, there was a new element of importance. By shifting position in a manner which bordered upon the imperceptible, the moving slats created a feeling or sensation over and above what could be expected.

Bury developed this discovery to some extent in the *Ponctuations Pnéumatiques*, where he made use of an elastic surface. The slats, turning at different speeds, were in this case hidden behind a surface of white cloth, which still sufficiently loose to be

sensitive to the slightest touch. Each of them was fitted with small stalks of rubber, at one rigid and supple. When the work was set in motion, these rubber stalks came into contact with the underside of the cloth and imprinted on its visible side a kind of relief which appeared and disappeared according to the rhythm of the slats.

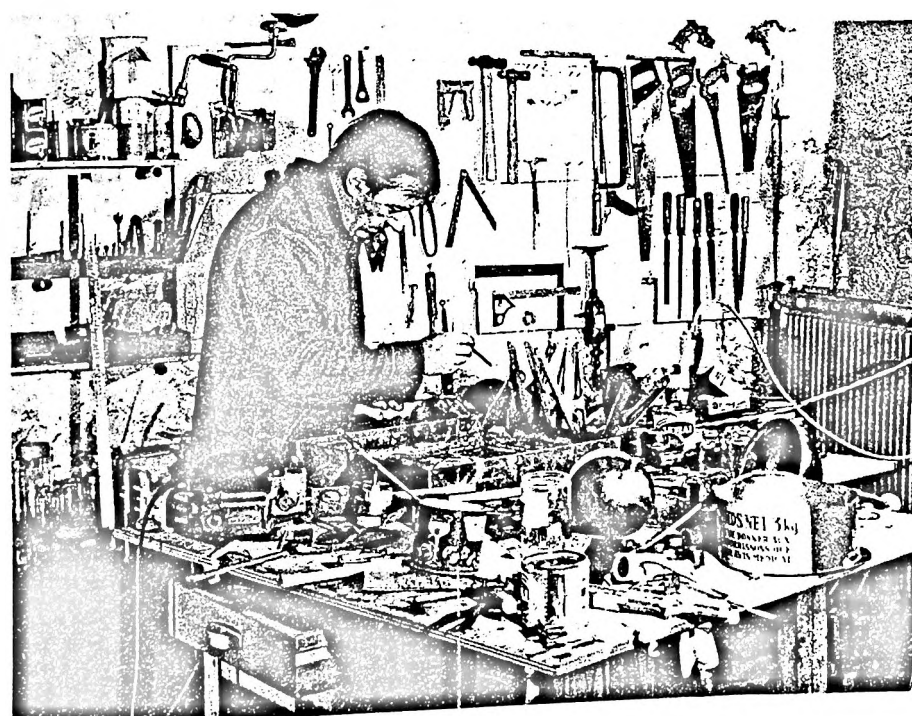
After a short interval in which he studied the movement of points of light, Bury turned after 1959 to more complicated constructions in various materials, mainly wood, metal and nylon. These carried to a further stage his exhaustive research into slow movements of an almost imperceptible, and often very suggestive, kind. However worthwhile it may be to see the origin of these works in the teeming movements of micro-organisms, or indeed, in models of an erotic or surrealist type, it is quite clear that this exceptionally slow process suggests a range of kinetic relationships that were almost unexplored before. These strange interactions of cubes, balls, rectangles, small sticks and large ones are particularly effective when they suggest that the work is free from gravitational forces.

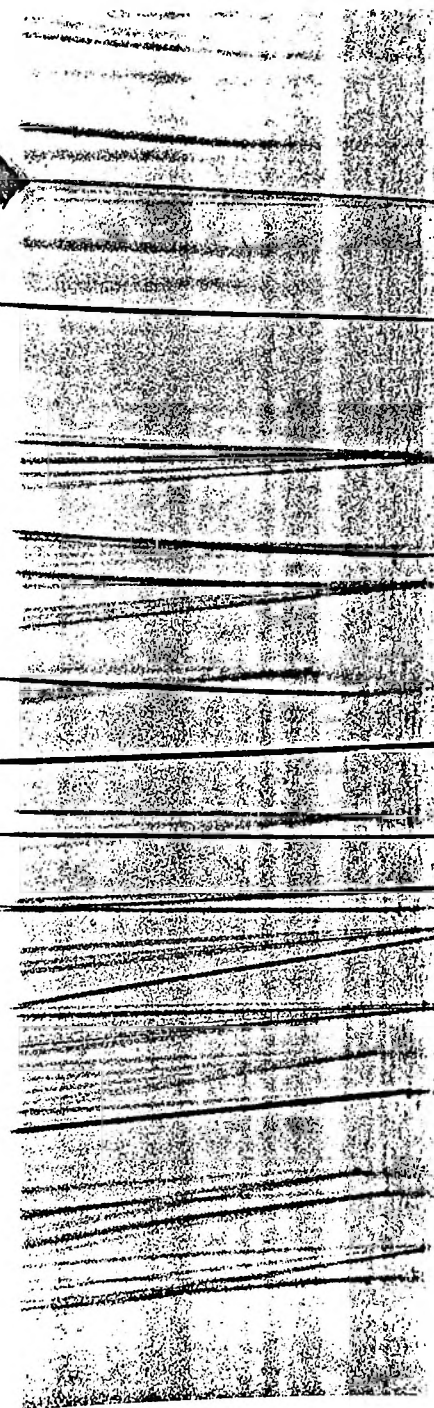
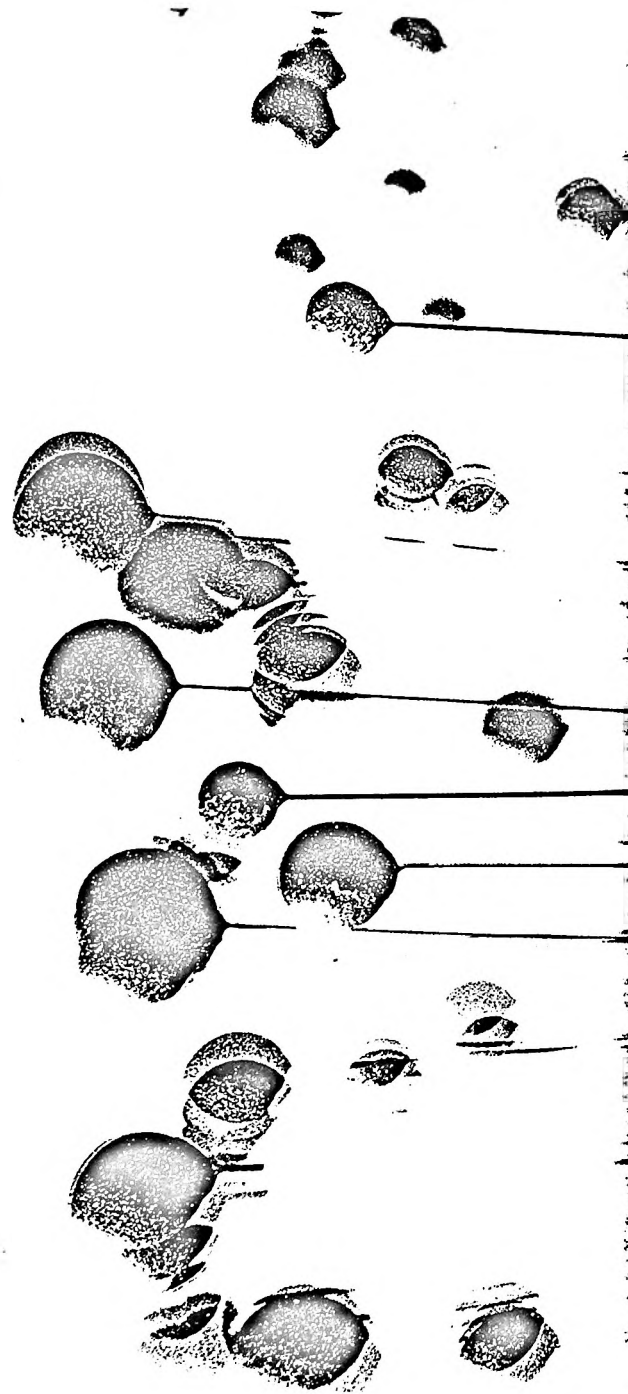
Bury's own view is that the source of mechanical movement - the motor - should remain invisible. The artist's task ends with the creation of the work: after that he should conceal himself behind it. He is anxious that the visible arrangement of forms should involve as large an element of chance as possible, and that the movement should become

anonymous, silent and supernatural.

As far as the problem of interpretation goes, he puts little value upon the purely subjective reactions and associations which his works stimulates. The spectator may be reminded of sea urchins or sea anemones in watching the metal or nylon stalks of some of the works. In others, he may see elements of nature, the City of Interstellar space in the appearance and disappearance of white spots. But Bury is aware of the random character of these impressions and considers them to be extrinsic to the work.

POL BURY





8. Pol Bury. Untitled.

His true aim is to present an image of pure movement. This might be called movement for movement's sake, so subtle that it can be indicated simply by relationships of material or texture, as in the case of smooth balls on a rough surface or vice versa. By this insistence on the slowness and irregularity of movement, he aims to achieve a new region of existence - a universe which leaves behind the world of forms and concentrates our attention upon relative tempi as they are made manifest in plastic organisms composed of very small or even contradictory elements which carry on their own life according to their own rules. Like many kinetic artists, he considers that the traditional divisions within the plastic arts have been superceded now that movement has come into use. He explains:

Just as the painter benefits from knowing some of the elementary theories of the law of colour, I have felt myself obliged to take certain mechanical principles into account. Since the micromotors which I have used have a limited power, I have to be able to exploit the principle of the inclined plane, for instance, to animate elements whose weight exceeded the capacities of the motor. This is a long way from painting and sculpture.

5. THE DADAIST TRADITION:
Tinguely, Kramer

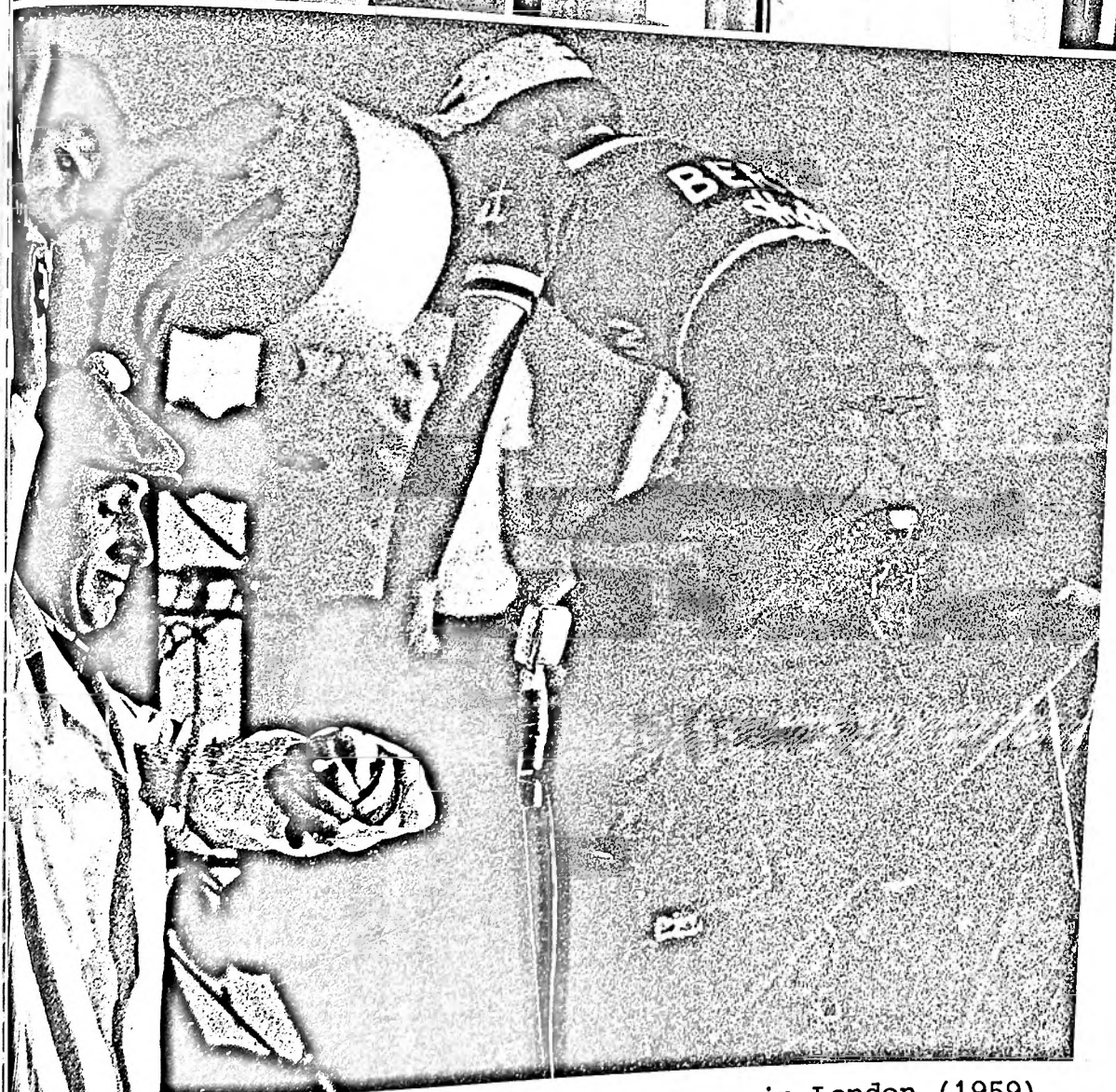
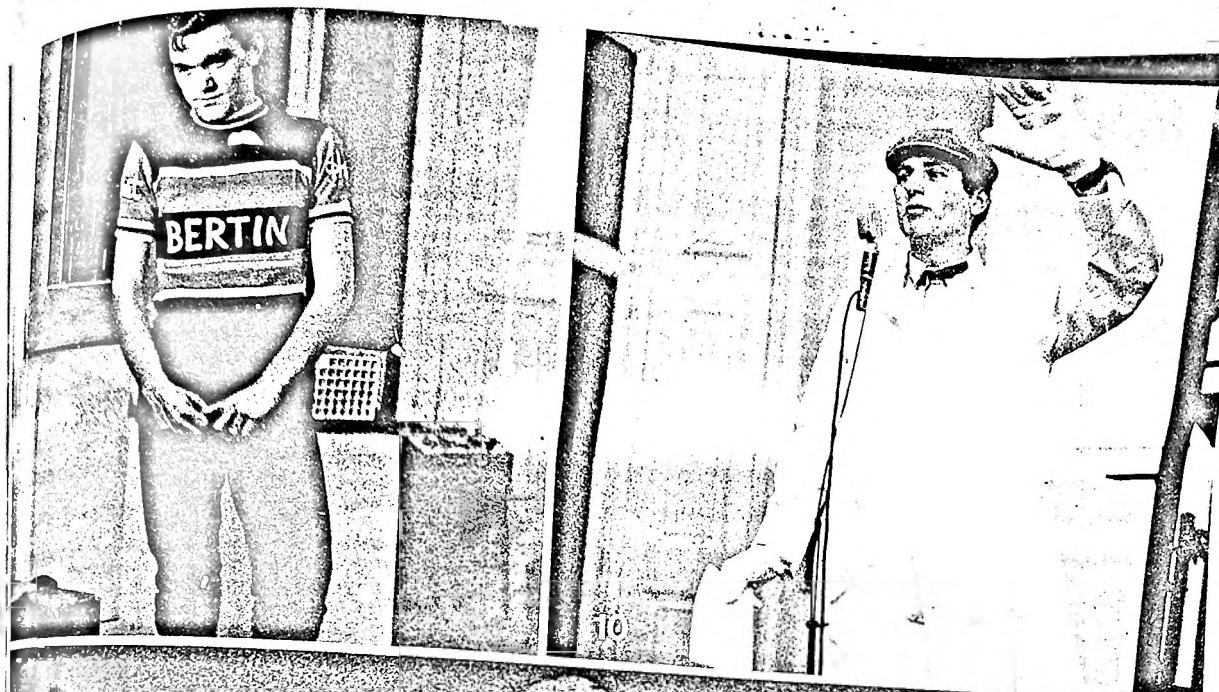
The previous remarks apply equally well to an artist like Jean Tinguely. Although a superficial study of his work would merely bring out the elements of anarchism, Tinguely's attitude to the machine is a much more complex one, depending on a critical stance which itself can hardly be distinguished from a kind of fascination. He used movement at once to stress the properties of the machine and to transcend them. He was struck by the paradox that the machine is by its very essence utilitarian, and yet reverts to complete uselessness when it is no longer in service. He accepted the implications of paradoxes such as this, and in fact makes use of them in order to bring into the open the latent irony, and even monstrosity, of the machine.

One of the paradoxes which is particularly dear to Tinguely has a direct bearing on the question of movement. He was anxious to show that movement itself can demonstrate a kind of stability. A lecture which he gave at the Institute of Contemporary Arts, London, in November 1959, was concerned with this theme. Tinguely sat motionless and silent on the podium while two tape recorders were played simultaneously. The first involved Tinguely himself attempting to explain his theory of stability in modern machine movements. He did so in atrocious English, and the second tape was of an English woman making continual interruptions and corrections in an aggressive voice.

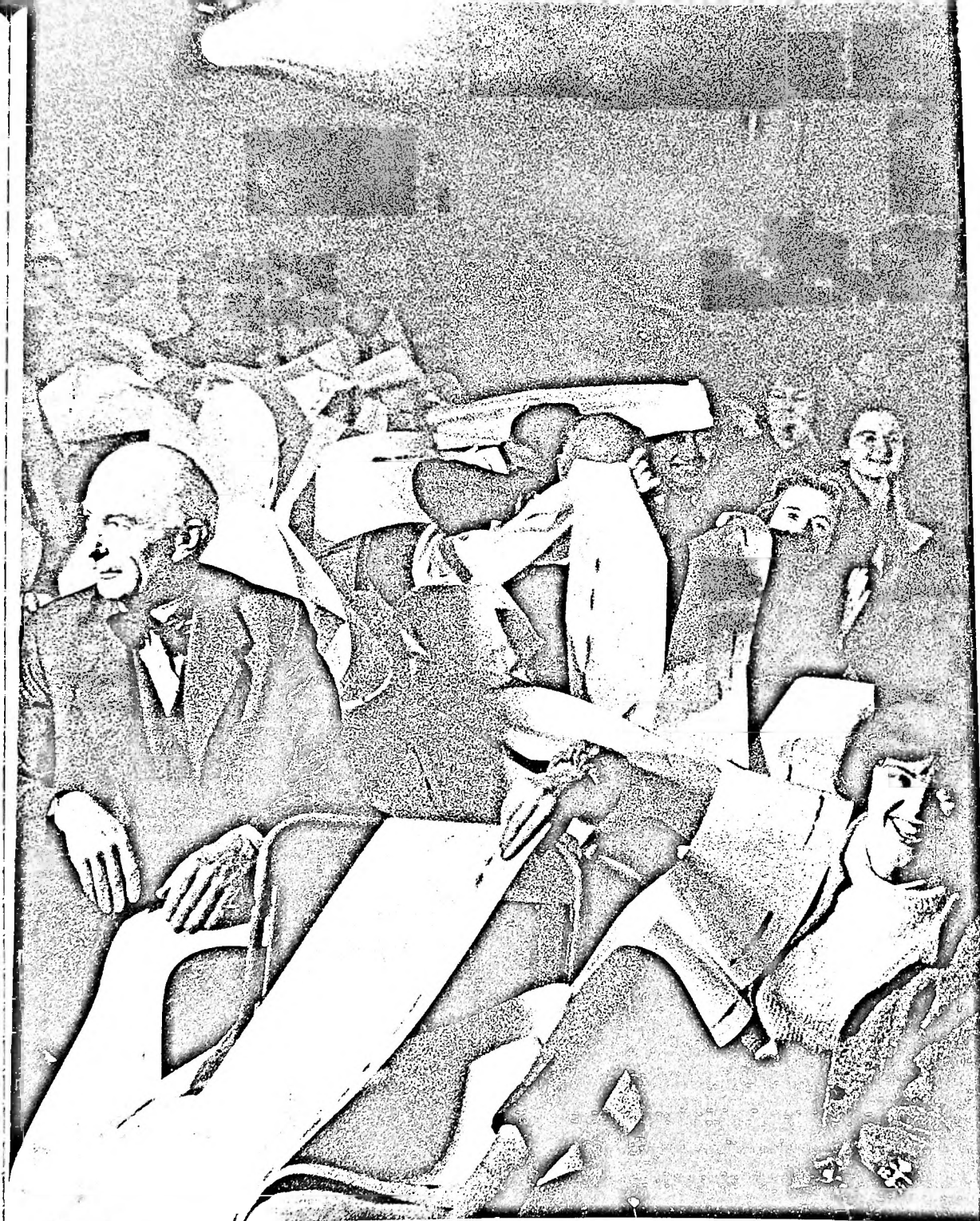
As early as 1948 Tinguely had begun to make experiments in the use of mechanical movement. In that year he constructed a work which was driven by a motor fixed to the ceiling. The motor itself was designed to revolve in an unpredictable way, and so create a virtual volume, as in the work of Gabo or Tatlin. After this Tinguely continued his research with a parallel development of motorized movement and movement induced by the spectator. His Cyclograeur challenged the spectator to mount a bicycle seat and produce paintings or engravings through the

JEAN TINGUELY



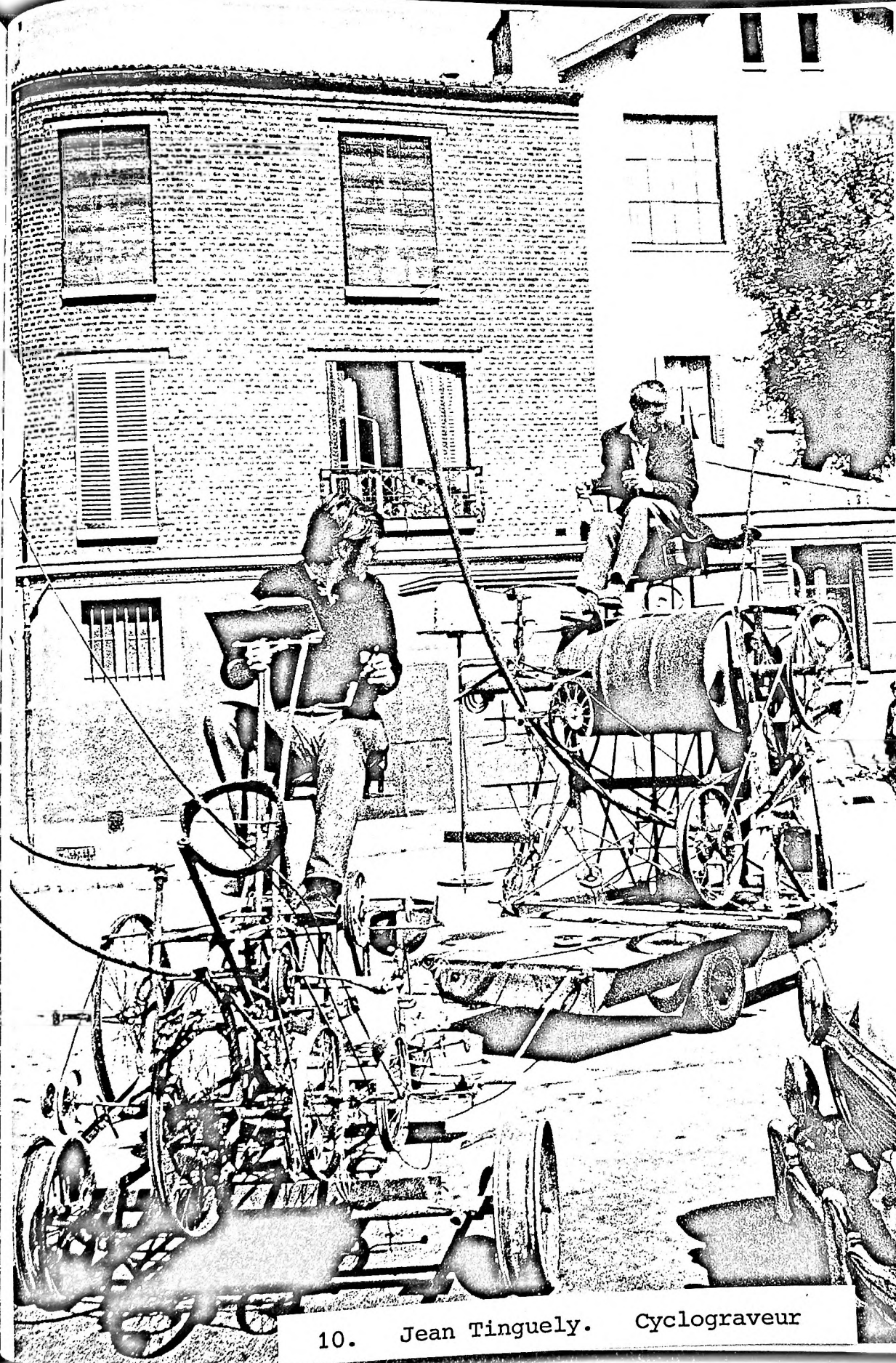


9. Jean Tinguely. Lecture in London (1959)



Tinguely's appearance at the ICA in London on 12 November 1959 still stands out as a genuine Underground event. Tinguely was so far ahead of his time that very few of the people there actually grasped what they were seeing. But one of the spectators,

Terry Hamilton, wife of the artist Richard Hamilton, wrote the perceptive account printed here, and took nearly all the photographs on the preceding and following pages



10. Jean Tinguely. Cyclograveur

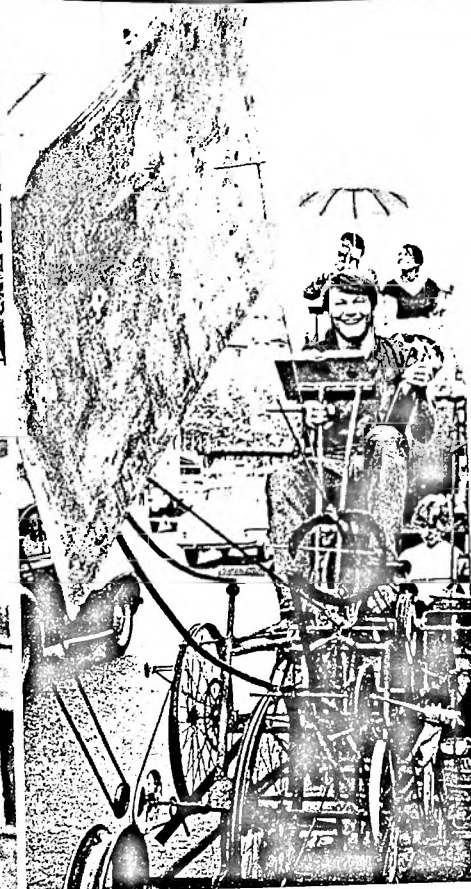
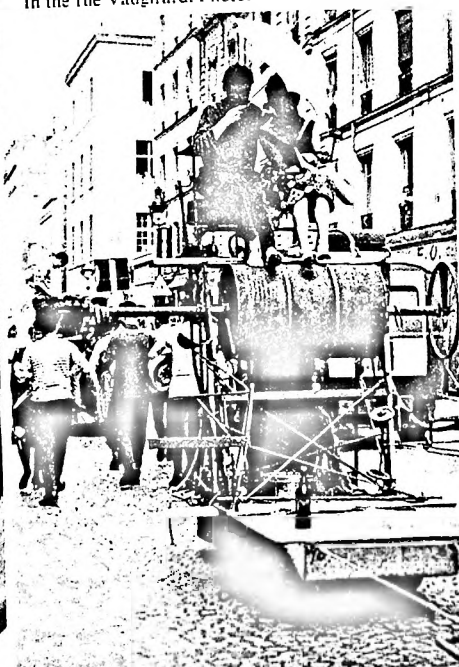


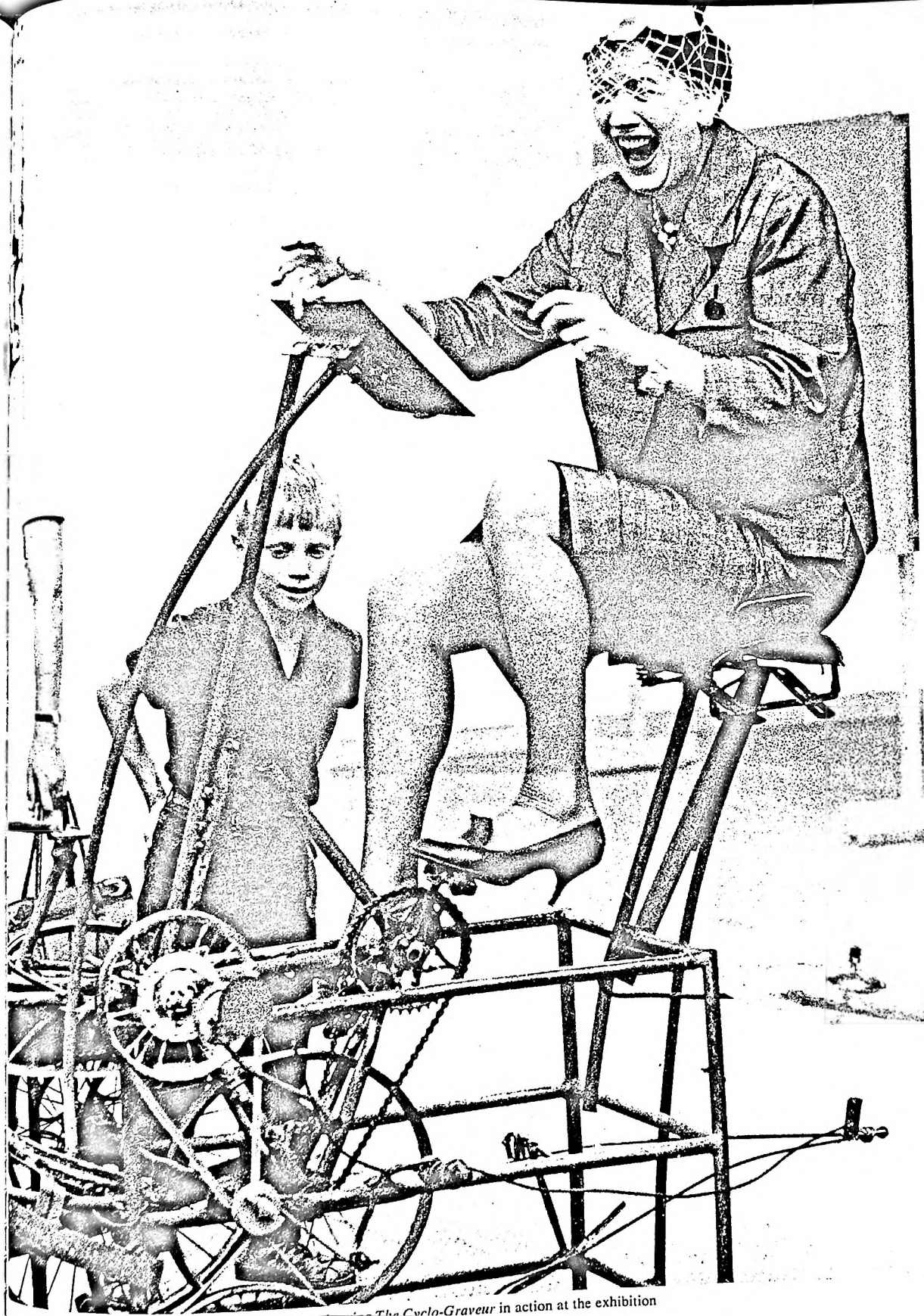
Photo: Christer Christian

Hansli Hunziker and Pamela. All photos on the left: Michel Martin

In the rue Vaugirard. Photo: Michel Martin



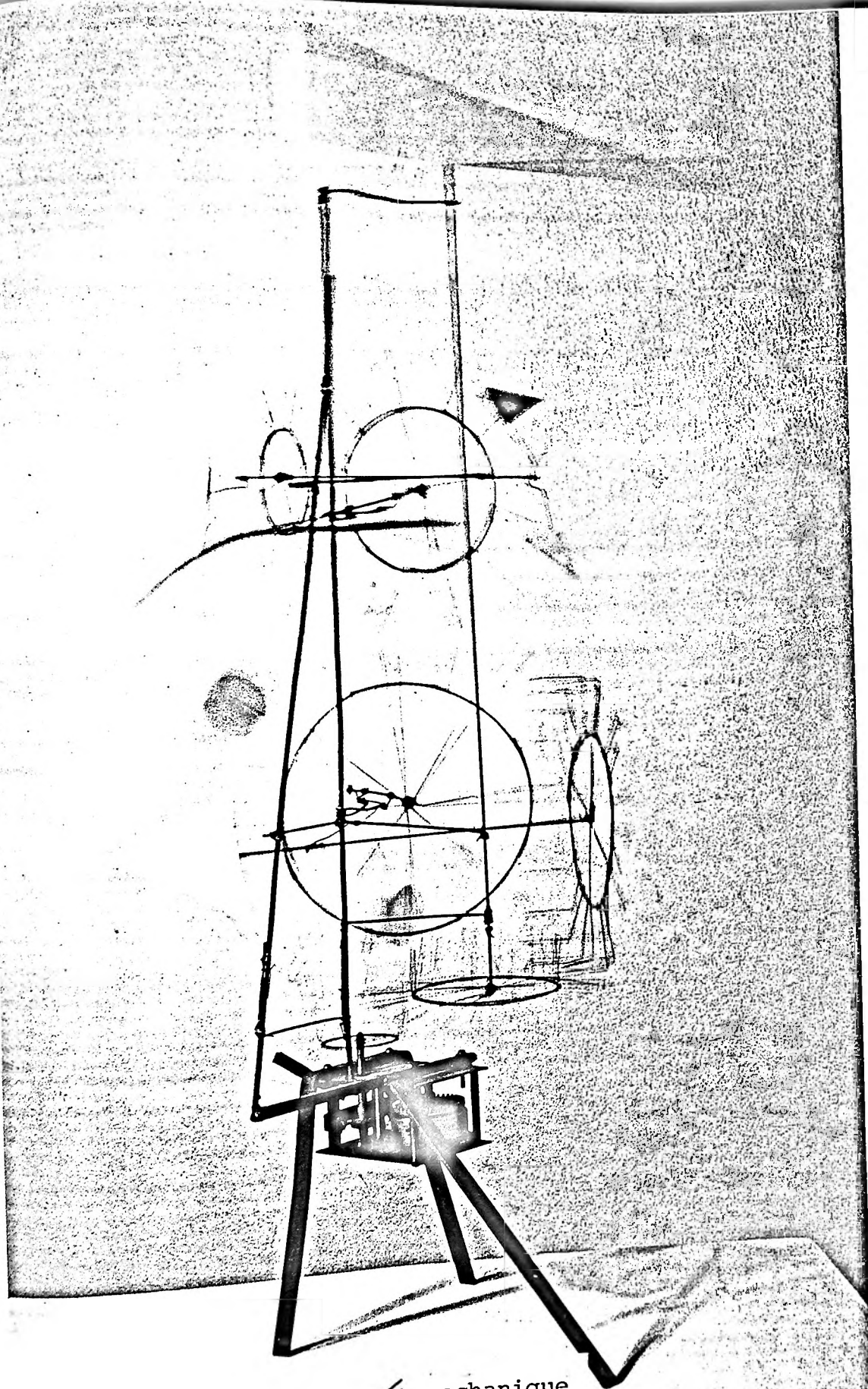
10. Jean Tinguely. Cyclograveur



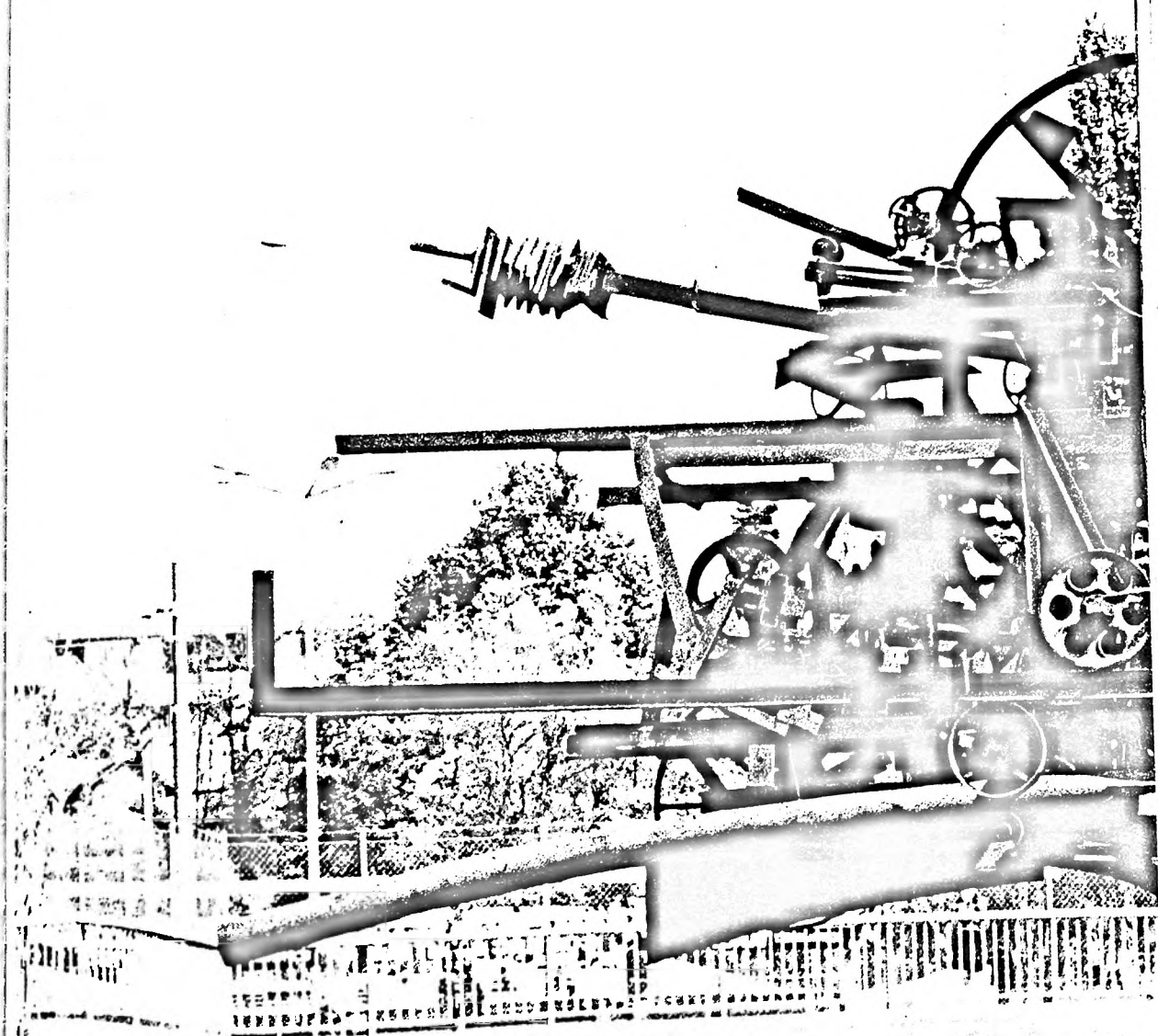
Lennart Olsson's photographic masterpiece, showing *The Cyclo-Graveur* in action at the exhibition

10. Jean Tinguely. Cyclograveur

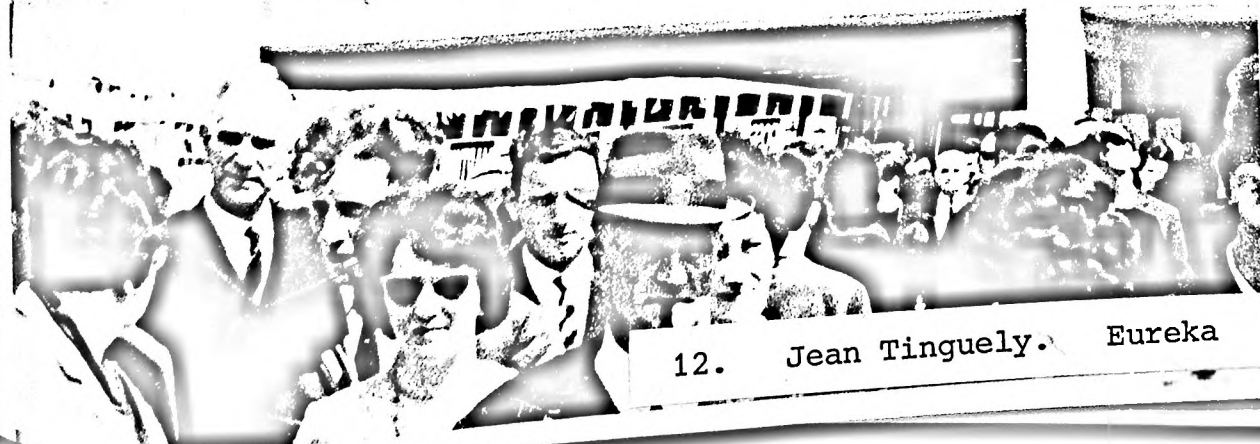
'The Ballet of the Poor'. Photo: Lennart Olsson



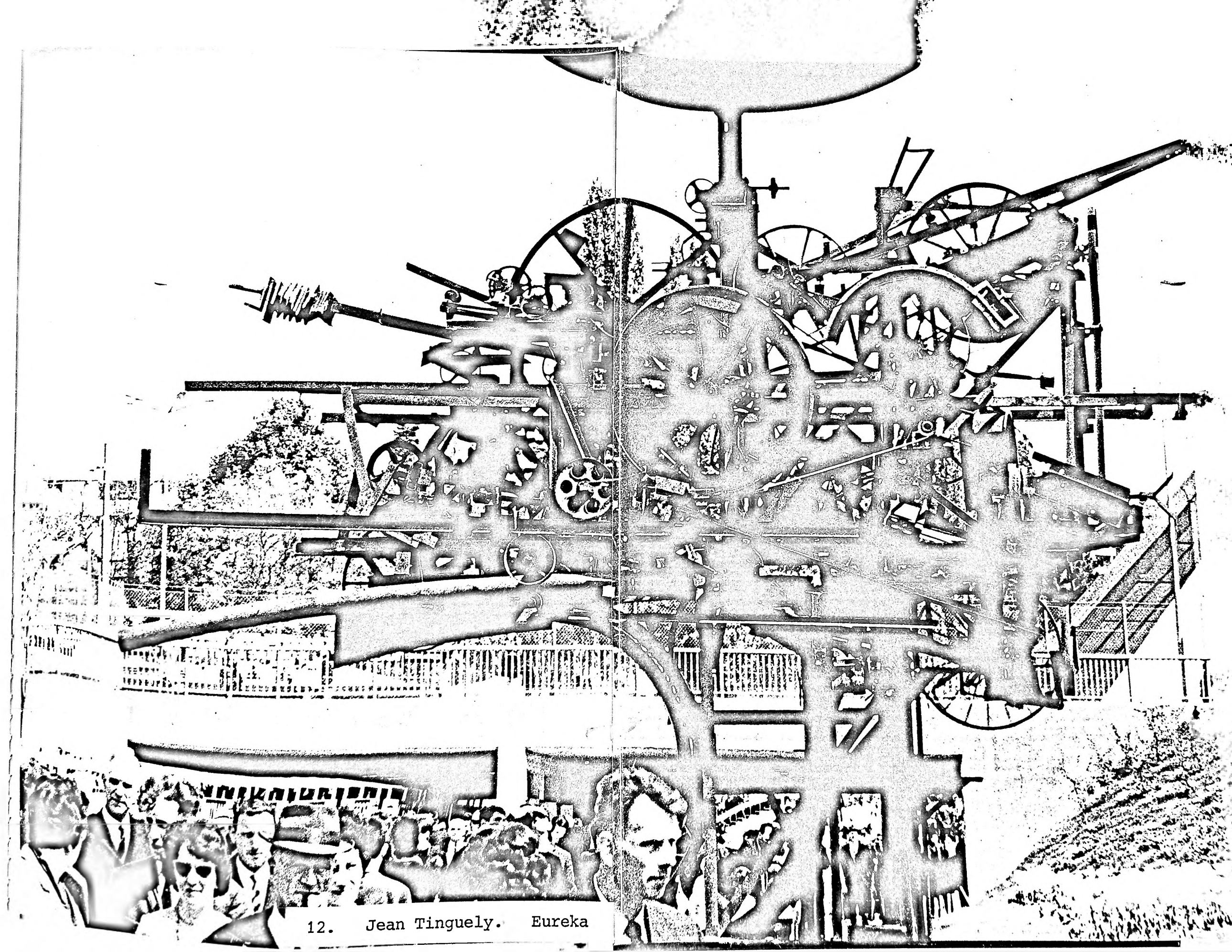
11. Jean Tinguely. Métamechanique

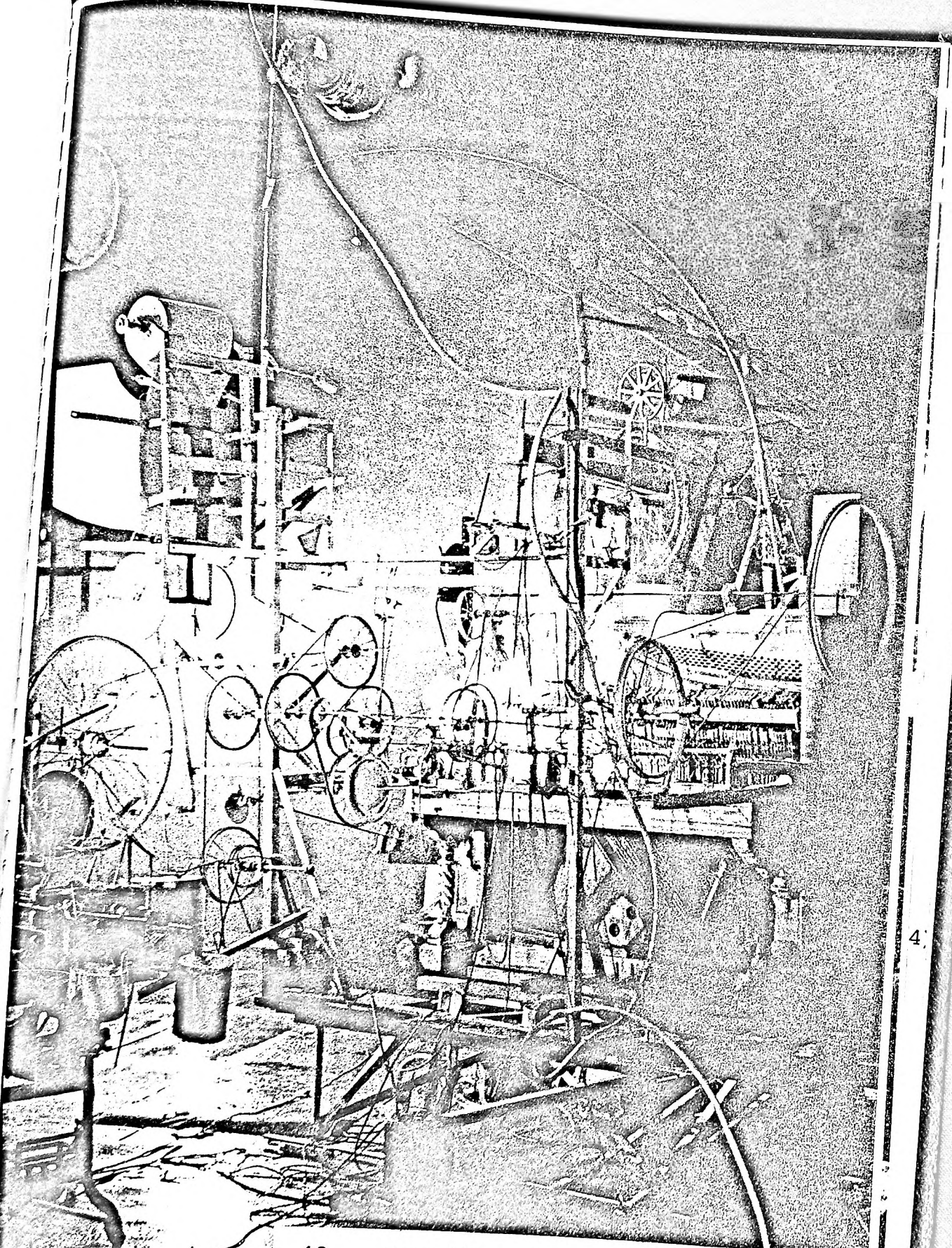


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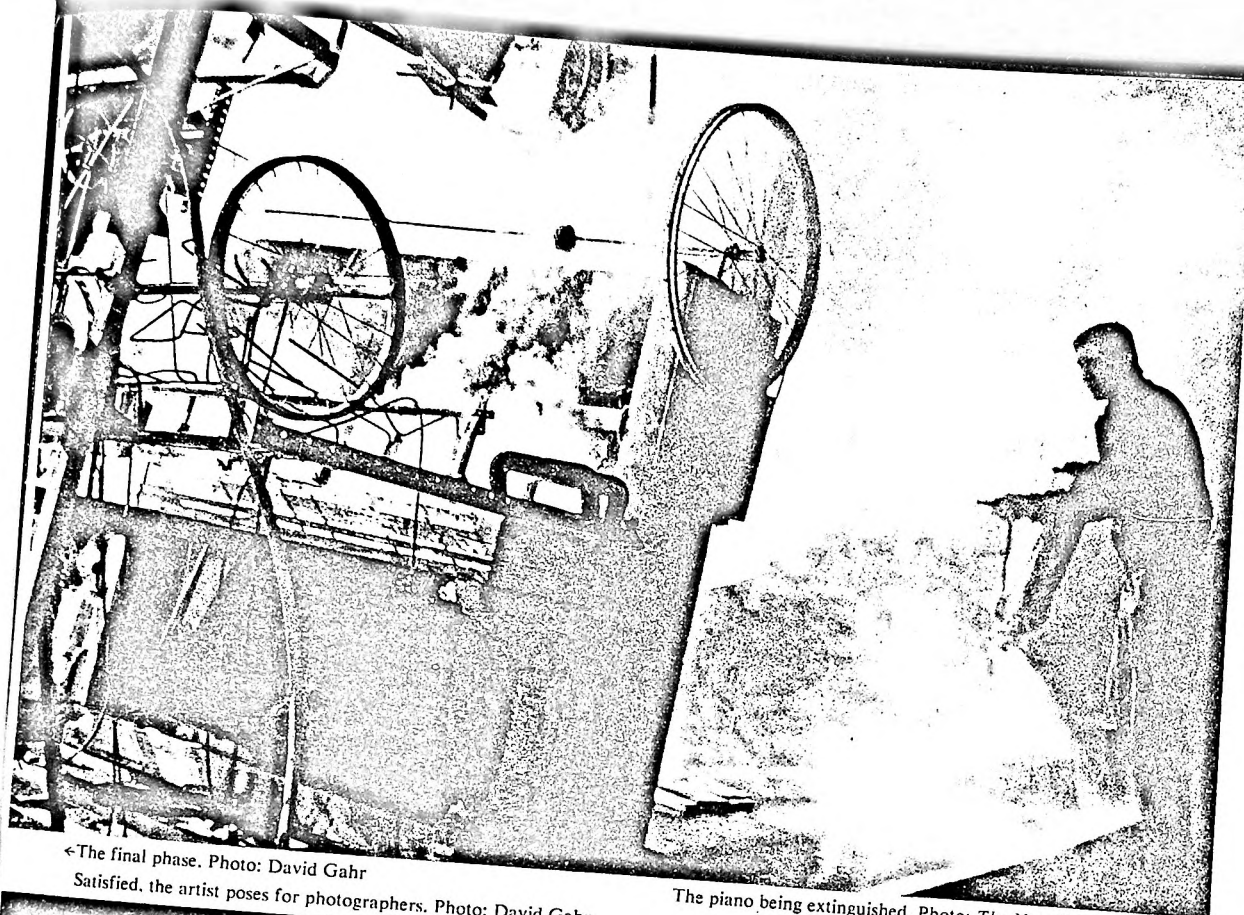


12. Jean Tinguely. Eureka





13. Jean Tinguely. Homage to New York



← The final phase. Photo: David Gahr

Satisfied, the artist poses for photographers. Photo: David Gahr

The piano being extinguished. Photo: *The New York Times*



13. Jean Tinguely. Homage to New York

action of the pedals. The lecture in London which has already been mentioned also comprised a second section in which two racing cyclists on the platform unrolled toilet paper in front of the English public, while a seductive scantily dressed French-woman moved around in the audience.

From Tinguely's point of view, the machines which he devised are living creatures which inspire him at one stage with fear, and at another with astonishment or admiration. He expects this to be so for the spectator as well. One of the dominant qualities associated with his work is humour. This quality is particularly apparent in the series of reliefs, *Metamechaniques*, with which the most important phase of his career began. These reliefs, which are remarkably delicate in their workmanship, take as their starting point the idea of a wheel in rotation. At a later stage, their range is extended to include an element of sound - since for Tinguely there is a most significant correspondence between the movements of a machine and the sounds which it makes. After this series of works, which carried the names '*Métamécanique*', '*Métamatique*' and '*Métamécanique Sonore*', he proceeded to much larger projects. Making use of the debris of machines, he transposed on to a different level the spirit of irony and surprise which had always been his distinctive mark.

One of the most important works in the series was the giant machine, *Eureka*, which dates from 1963 and was presented to the public at the Exposition Nationale Suisse in Lausanne. With this enlargement of scale, Tinguely's machines grew increasingly complex in their movements. But they were never without that small element of surprise which the artist himself referred to as the 'functional use of chance'.

Another aspect of Tinguely's work has been is exploitation of rapid deterioration in machines. In March 1960, a number of mechanical elements were assembled in the garden of the Museum of Modern Art, New York, for a machine 'happening' which Tinguely called '*Homage to New York*'. Here the element of surprise was

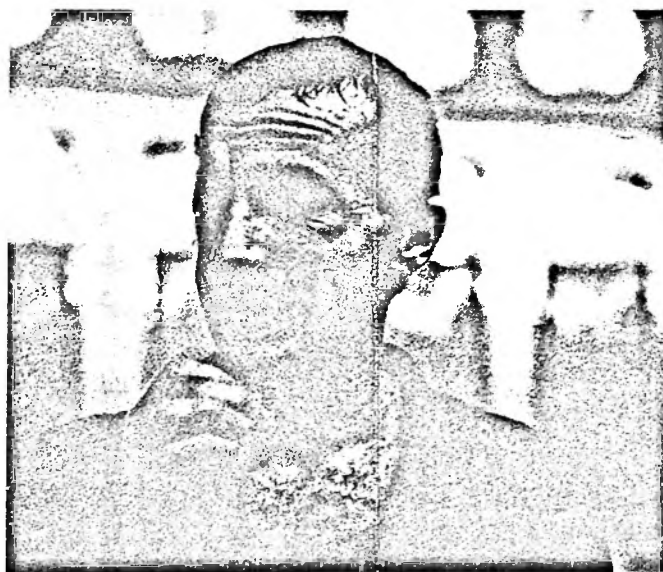
well to the fore, as a fire extinguisher which had been hidden in a piano threatened to explode and the fire brigade was required to hasten the process of auto destruction.

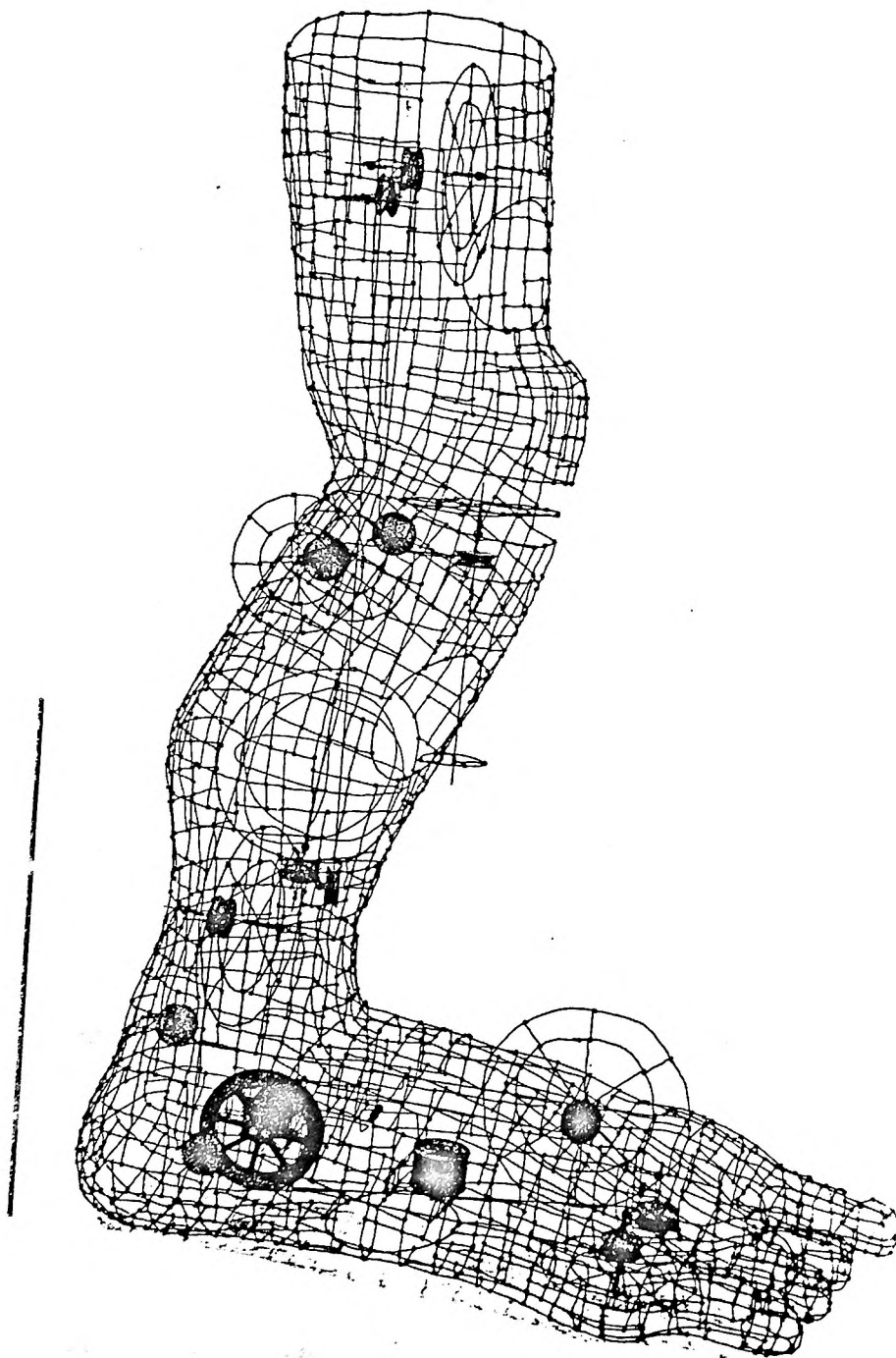
Tinguely introduced a humour into his machines which had been sadly lacking in them in their previous formats. It was a combination of this and the element of surprise which gave his work its unique blend of fascination and ultimately great enjoyment then, now so sadly lacking in the man-machine era in which we exist.

The German artist, Harry Kramer, whose work has already received a passing mention, was influenced by Tinguely's early reliefs. He has continued to explore the subtle possibilities offered by finely judged constructions with a wide variety of movements. His tiny pulleys, which have a choreographic as well as a purely mechanical function, help to make up a meticulous mise en scene. Since 1961, he has been making kinetic wire sculptures which combine exactitude with poetic feeling, suppleness with rigidity. His favourite overall forms are the ball, the column, the tower and the pyramid. Within their bellies, wheels and pairs of wheels move like constellations, fixed at different levels and in different directions. Sometimes Kramer installs a small bell, slows down the rhythm or concentrates his wheels in the upper part of the work, which then appears to float, suggesting distance or isolation. The overall design, in filigree, of these transparent sculptures is extremely beautiful, especially when the naked light throws projections of its delicate moving shadows upon the wall.

Some of Kramer's sculptures, such as his Crying Child - a statuette on wheels - or his Signal and Chronoskop belong to the category of the bizarre. They are in the same family as the monsters of the Swiss artist, Robert Müller, who began to experiment with kinetic sculpture in 1953. Many of these works are not far from the spirit of Dada, even though it must be said that the use of the readymade or the incorporation of industrial waste products is never more than an incidental factor in their aims.

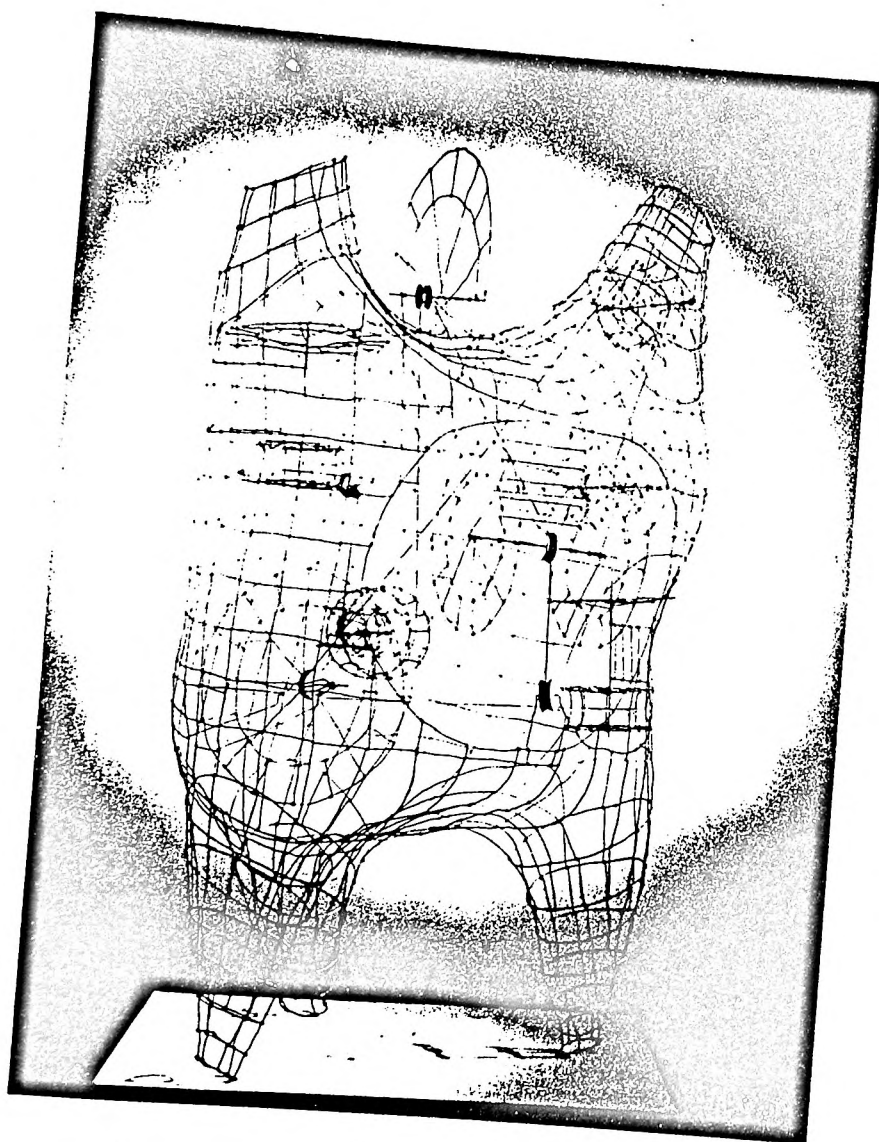
HARRY KRAMER



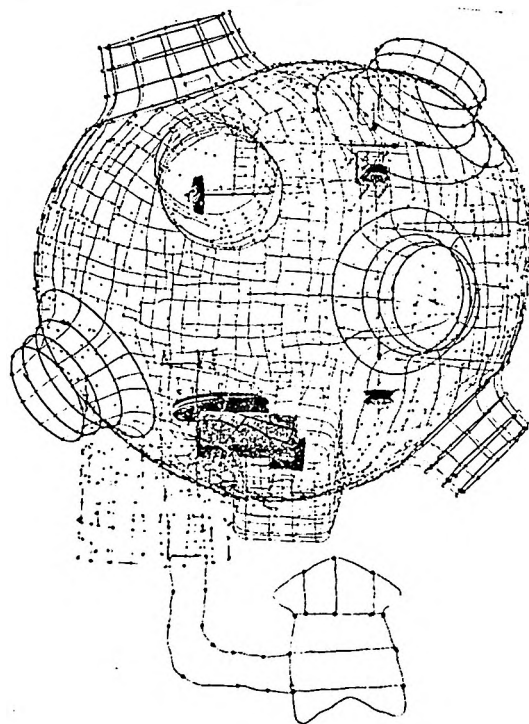


14. Harry Kramer. Foot

Foot

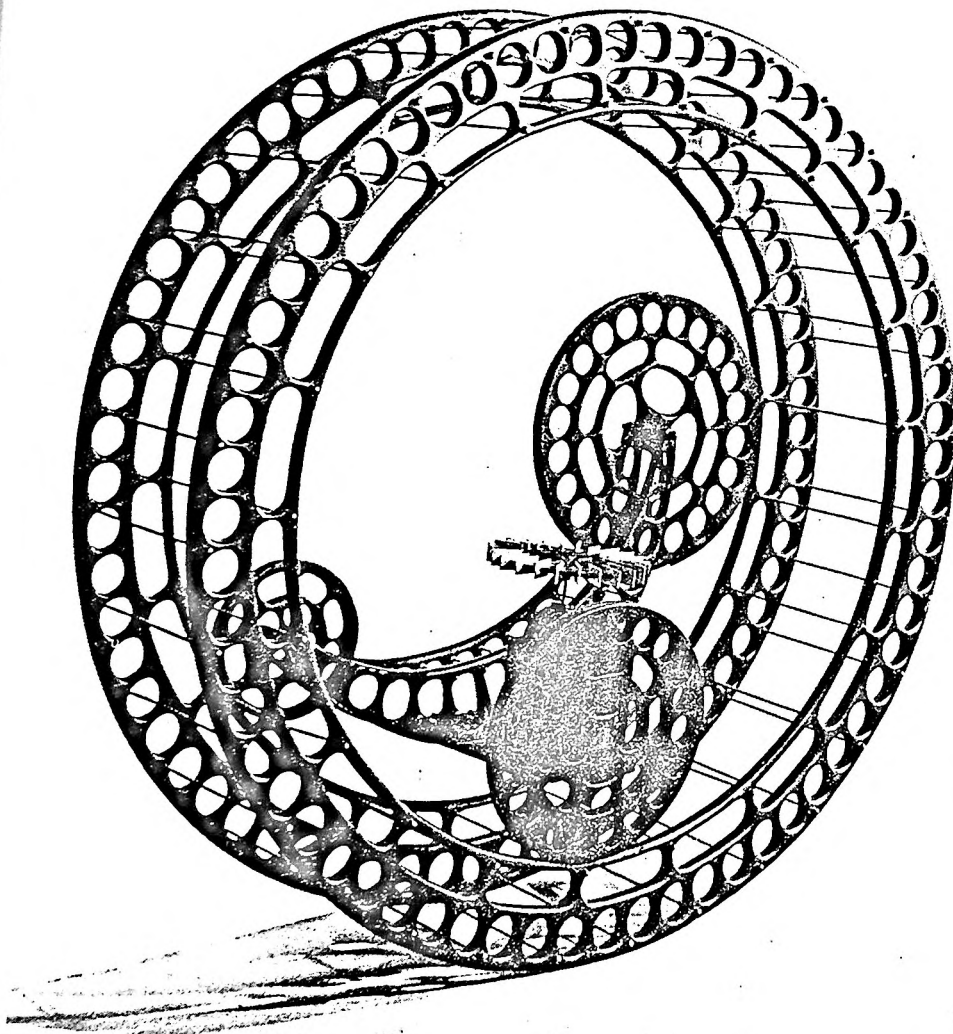


15. Harry Kramer. Torso (1962)



16. Harry Kramer. Ball with opening (1964)

Endless Rail



17. Harry Kramer. Endless Rail.

5. THE CONSTRUCTIVIST TRADITION:
Schöffer, Von Graevenitz, Kosice

This line of research is in clear opposition, on the aesthetic, if not on the technical plane, to the tradition set up by Gabo and Peusner and maintained throughout the inter-war years by Moholy-Nagy. The most important contemporary representative of this tradition is Nicolas Schöffer.

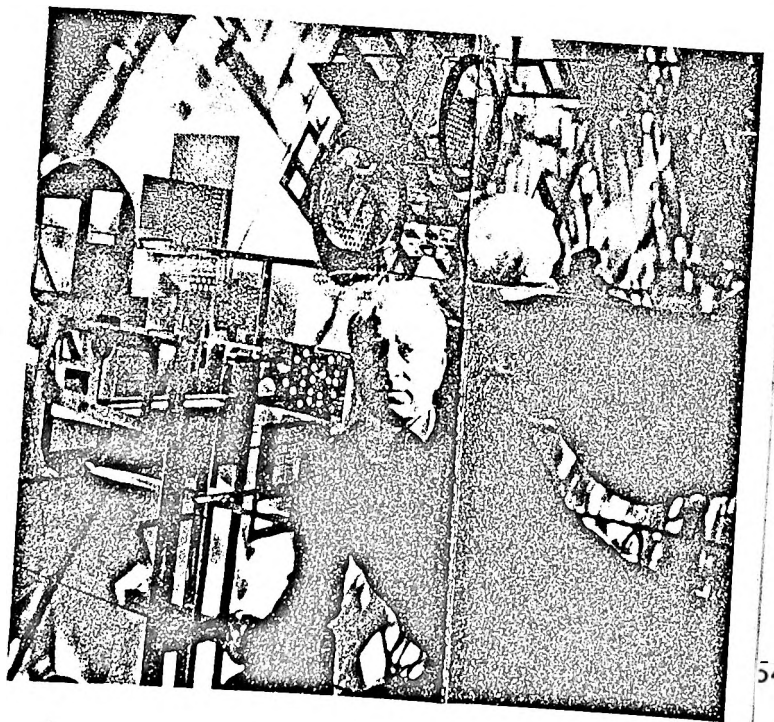
Schöffer's procedure has been to develop the theoretical and practical implications of the 'active void' in Gabo and Peusner: from this he has evolved his own type of '*aerated, transparent and penetrable*' construction, supplementing the rectilinear metal framework with planes of iron, steel, polished copper and other materials. It is important to bear in mind, however, that even at the earliest stages of this research he was closely concerned with the problems of real movement. This can be demonstrated first of all by reference to the various theoretical pronouncements which correspond to the stages of his work. He has always made extensive use of the concepts of movement and of dynamism in these writings. They form part of a descriptive vocabulary which also includes the concepts of space, time, light, mirror reflection, shadow and many features of information theory.

An example of this close parallelism between theory and practice can be found in his association of the notions of space and dynamism in a series of 'Spatiodynamic' works, which began in 1948. At this stage the element of movement could be manual or mechanical. An example of the latter would be his two Horloges Spatio-dynamiques, functional sculptures which were provided with electric motors. The next stage was to come in 1951 when he began to use polychrome mobile elements made of aluminium and plastic. This increasingly wide use of materials was to continue until 1954, when he completed the large scale project of a spatio-dynamic, cybernetic and sonic tower as the centre-piece of the Exposition Internationale des Travaux Publics at the Parc de Saint-Cloud.

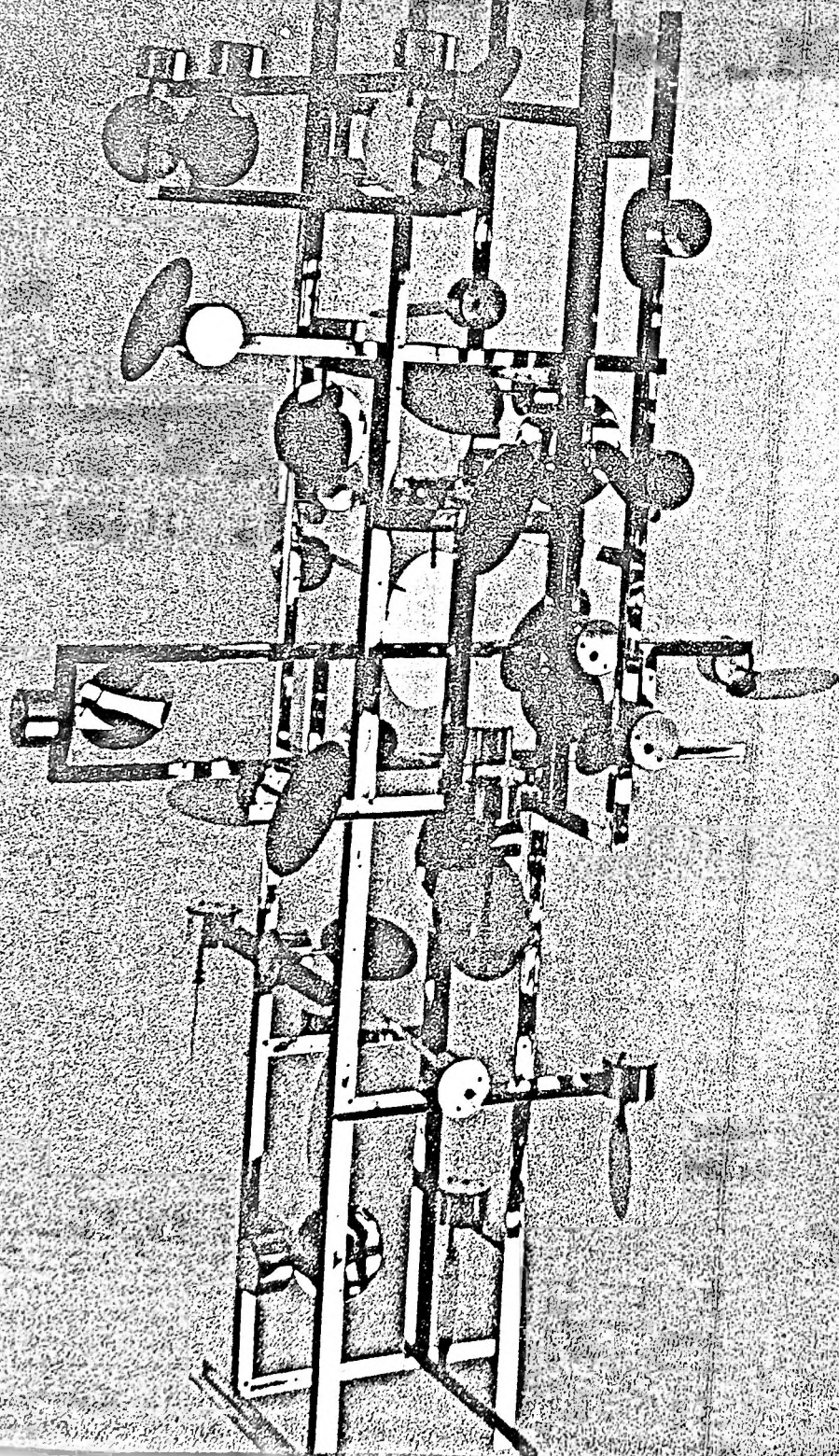
Schöffer's use of movement was already quite original. The great innovation was to make use of the power of electronics and the possibilities of cybernetics not only as a means of integrating the music with the rest of the work but also as a way of subjecting the mobile elements to the influence of external events. This was in fact the central motif of a subsequent work entitled Cysp I, which displayed a remarkable range of movements. In accordance with the title, which stood for 'Cybernetic + spatio-dynamisme', this sculpture was a right-angled construction that moved in response to the instructions of an electronic brain hidden in the base. Handsomely composed of black steel and polychrome aluminium, it engaged in the 'Nuit de la Poésie' at the Théâtre Sarah Bernhardt in May 1956, and shortly afterwards displayed remarkable affinities with choreography when it was included in Maurice Béjart's ballet company at the Festival of the Avant-Garde in the Cité Radieuse of Marseilles.

A further study of the kinetic forces of light in 1957 led Schöffer to advance the theory of 'lumino-dynamism', which was to have important repercussions on his use of mechanical, electro-mechanical and electronic forms of movement in three-dimensional works. This new approach was to be the basis of his procedure from 1960 onwards, since it was in that year that he constructed Chronos I, the first of his works to deal with the dynamic possibilities of time. Chronos I, was made of nickel steel and plastic, incorporating mirror surfaces and 'multiple peripheral projections'. Schöffer described his work as being *electric and autonomous*. As such it anticipated the most considerable achievement in applied Kinetic Art to date: his Cybernetic Tower at Liège. This spatio-dynamic and cybernetic tower, which is 52 metres high and incorporates sound, consists of thirty seven elements turning on their axes at different speeds of rotation. The individual elements are made up of sixty four sheets and blades of polished aluminium cut to different shapes. These reflect rays of light and, thanks to their incessant movement, diffuse them in all directions in an incredible variety of combinations. At night, projectors of multi-coloured light reinforce this impression of

NICHOLAS SCHOFFER



18. Nicholas Schöffer. Chronos I



animation, which a long range vertical beam carries the tower further into the sky.

The various movements connected with this tower are an adjunct to the spectacle, *Formes et Lumières*, which appeared on the facade of the neighbouring Palais de Congrès. The tower was regulated by an electronic brain, sensitive to such features of the environment as sound, temperature and humidity, and it produces an appropriate kind of music, based on such material as street sounds and recorded birdsong. The public could follow the workings of this control unit from outside.

One of Schöffer's main preoccupations has been the problem of integrating mobile sculpture into town planning and architectural schemes. While sculpture remains the centre of his concern, he is anxious to put the question on a more general level by representing the problem as one of incorporating an element of plastic indeterminism into the urban landscape. That is to say, he would like to draw a close connection between town life and the ideas of cybernetics.

The bewildering variety of Schöffer's activities should not lead one to forget that there is a very close connection between the original introduction of movement and his other guiding notions. From 1960, he was increasingly concerned with the psycho-therapeutic, physical and metaphysical aspects of the new temporal concept which he calls 'microtime'. This can be understood better if it is remembered that for Schöffer time represents both a pulsation, which is distinct from the directional phenomenon of movement, and a material, which he first attempted to capture and utilize in the multiple images of 'anamorphosed' movement which he obtained from the complex distortions of reflecting metal mirrors. In effect, he composed a series of small sculptures which he referred to as Anamorphoses, which generally involved two different speeds and derived a further complexity from the spectator's own movements. It was with the experience gained from these works that he was able to glimpse the significance of infinitesimal units of time.

He had brought his research close to the preoccupations of certain branches of science. Now, he was to devote his energies to capturing and controlling 'microtime' with an aesthetic end in view.

In a translation from *La Retroaction et le Micro-temps*, Schöffer has explained that,

simple retroaction is the type of action which takes place when we are responding to the direct emission of signals between the moment they are emitted and the moment of perception.

After this he proceeds to an analysis of microtime, and what he refers to as 'enriched microtime'. His attitude presumes that there is great value in aesthetic research. At the same time, he makes it clear that he by no means rules out the possibility of attaining the realm of transcendental truth through his research, and in particular, through the use of kinetic phenomena. For it is this type of phenomenon - and this alone - that offers the art, through man's intermediary, a substance which transcends man. Towards the end of this essay, Schöffer draws the threads together in a veritable profession of 'scientific' faith. He describes the God, who would permit man to

leave behind the mystical confusion of the religions. This God is intemporal and permanent, available, acting and retroactive, receivable and emissable, omnidirectional and aleatory.

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Schöffer has also laid great weight on what he calls,

the psycho-therapeutic value of the arts that are structured temporally.

In his view,

aesthetic mutations in time comprise an

element of pure energy. This is likely to induce within the psycho-phenomenological field of the individual certain unstructured temporal pulsations which go beyond or stay short of the automatic rhythms oscillating between agony and pleasure and have no sort of imitative character.

Art and works of art are immutable, but techniques are evolving and materials are changing. Both the evolution and the processes of change are functions of an evolution whose rhythm is dictated by our need for temporal divisions.

The fact that this relationship between aesthetic movement and biological 'rhythm' can be used in the service of medicine has been attested by Dr. Ménétrier, who wrote,

In raising the threshold of a visual and auditory perception to the level of total and indissociable sensation, in introducing a dynamic time into the presentation of static forms with the aim of instilling evolution and movement, in providing sculptured, coloured and musical work with an infinite range of variations, technique is helping to resolve any problem of saturation and any partial cause of increasing conditioning.

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With the help of large industrial firms, Schöffer has already been able to construct works that will serve for medical purposes.

Schöffer's contribution to the new art of movement may be summed up under three principal headings. With his uninterrupted programme of research, he has lent new fullness and richness of expression to a class of works in real movement which involve

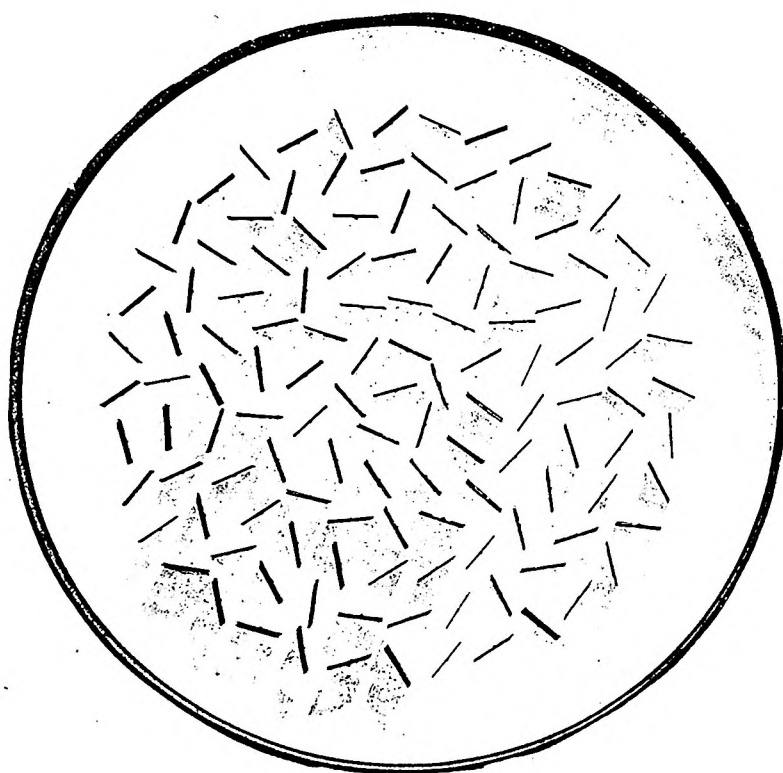
an obvious display of mechanical elements. In the second place, he was the first artist to apply electronics, cybernetics and industrial techniques in his investigations into the use of real movement. Thirdly, he has given considerable momentum to the development of a class of works which combine two and three-dimensional movement, in this way contributing to the breakdown of traditional artistic classifications and presaging the establishment of Kinetic Art as a new and distinct category. Finally, it must be added that Schöffer has explored - both on the theoretical and the practical plane - new possibilities of relationship between time and movement is very pronounced.

The path along which Von Graevenitz' work has developed allows us to pick out a number of obvious influences. Gabo, Moholy-Nagy and Schöffer are behind his continuous exploration of spatial values, light mutations and, of course, movement itself. He has provided an interesting account of his own development, explaining why he found it necessary to go beyond the formulae of Constructivism. He began with various experiments in the use of materials, and progressed at a later stage to simple progressions. Eventually, after he had managed to incorporate statistical and aleatory principles into the operation of the work, he arrived at a type of homogeneous form which could be distinguished quite clearly from the Constructivist model. In the latter, it was simply a case of controlling the plastic shape or 'macrostructure'. For Von Graevenitz and the Nouvelle Tendance there was to be control of the 'microstructure' of the work through statistical methods. In this way, the problem of subject matter could be avoided, if not resolved completely. The Nouvelle Tendance shared the Constructivist ambition to make the public more intensely aware of visual phenomena. But they did so through a type of programming that allowed for an inbuilt indeterminism, an element of personal choice.

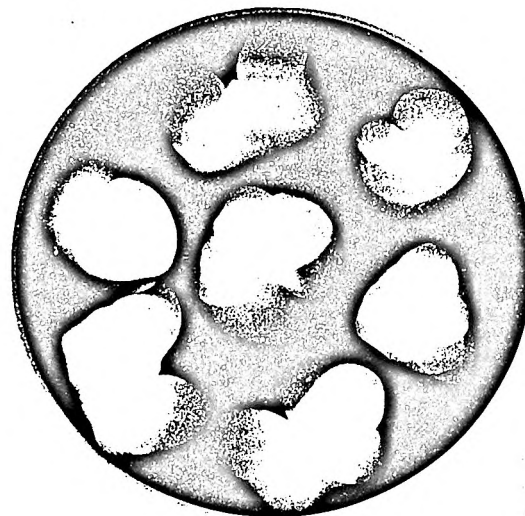
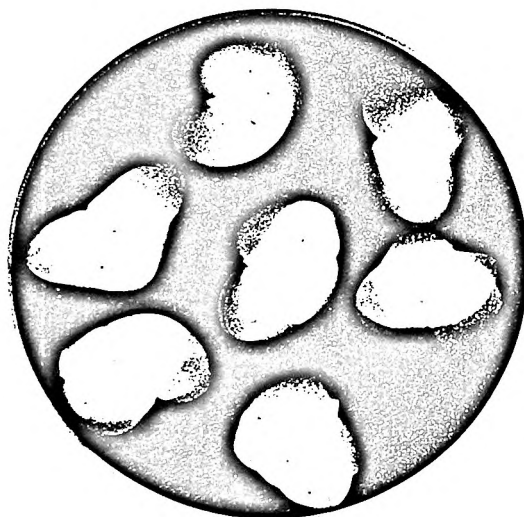
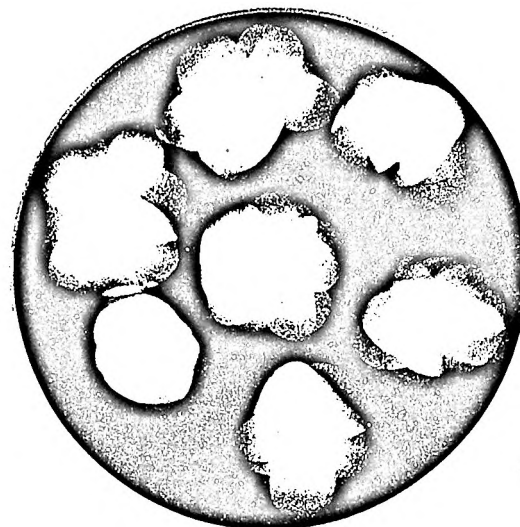
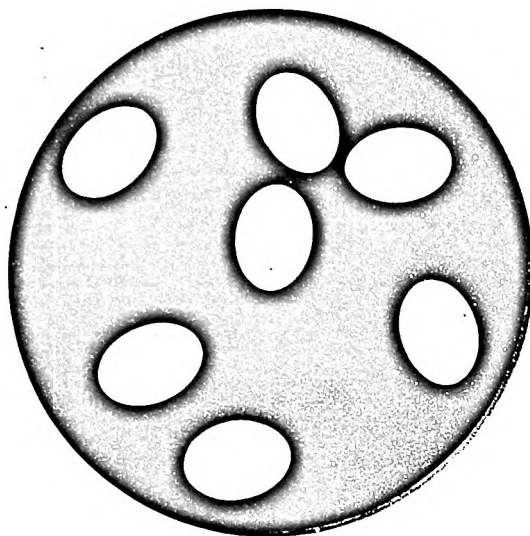
While the aesthetic of the Nouvelle Tendance can in most cases be reduced to that of the game, in Von Graevenitz' case it is the functional value of the work in movement that receives most

GERHARD VON GRAEVENITZ





19. Von Graevenitz. Structures of Black Blades in Motion (1964)



20. Von Graevenitz. Untitled.

attention. He has spoken of his motor driven works as
propositions for a new architecture. However, he holds in
common with the rest of the group a desire to break out from the
confines of the strictly determined form and the closed system,

have done.
the spectator
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Dan McNamara, SS ~~CS~~

Kinetic Art.

Size of the subject makes objective
criticism difficult if it is to
be sustained throughout.

The tenor of the work
changes half way through
to criticism of individual
artists.

(50)

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attention. He has spoken of his motor driven works as *propositions for a new architecture*. However, he holds in common with the rest of the group a desire to break out from the confines of the strictly determined form and the closed system, in much the same way as the American Action painters have done. He aims to realize his objectives through involving the spectator in the space of the work: It is the relationship between the movements of the work and those of the spectator that represents for him the ultimate aesthetic value.

Research of a similar 'Constructivist' tendency has led to the sculptur, Kosice, who is of Hungarian birth and holds Argentinian nationality, to progress from electro-mechanical to 'hydraulic' movement. His most original and interesting works are designed to bring out the aesthetic effects of moving water. It is perhaps relevant to add that he ascribes this fascination with water to a childhood experience, when he narrowly escaped drowning. He retained from this episode a vivid impression of water permeating his whole being.

Kosice began to take an interest in the sculptural possibilities of real movement in 1944. Several of the works which he exhibited in Buenos Aires in the following year incorporated mobile of gyratory elements in the metal or wood construction. His next step was to produce works which relied on an interchange between movement and transparency. For these he selected as his material, perspex, which has always been a favourite material of South American kinetic artists. At a later stage, he made several attempts to introduce neon lighting into his work. Finally, in 1957, he took the decisive step of introducing the element of water. His first 'hydraulic' sculptures were exhibited at Paris in 1958.

By his use of water, Kosice was aiming to isolate the very essence of movement. In works like his 'Vibration du Spectre de l'eau' (1962-3) and 'Langage Chiffre de l'eau' (1963) which involved the refraction of light through moving water, the spectator could

discover a rainbow of colours by moving past the construction. In other works, such as 'Persistance de la goutte de l'eau' (1963), the movement of water bubbles was used. Kosice had successfully liberated water from its obvious associations by animating it in this way.

Since he is both artist and poet, constructive and imaginative, Kosice views the genesis of the kinetic work of art in two ways. First of all, there is the birth of a virtual form - as is particularly evident in the case of his 'Demi-sphères d'eau'. Then there is internal movement of, for example, the drops of water, which give rise to a kind of organic movement with no sense of repetition. Kosice has, in fact, devised some small experimental works which he calls 'Une goutte d'eau bercée à toute vitesse'. These are directly poetic in conception, and he considers that they are untransplantable except in verbal terms, despite the fact that they have already been transposed into a plastic vocabulary.

Since he regards water (and sometimes, air) as the most important vehicle of plastic movement, Kosice tends to use the terms 'hydro-poetry', 'hydro-space' and 'alternacy of hydro-space'. He holds that water is always in the process of transformation, and that it is water which creates the forms in his works. But once the form is realized, water must cede to the forces of inertia and no longer relies on the aid of mechanical force. This transition from a type of movement which is created or circumscribed by men to the natural movement of the elements, is in fact at the centre of Kosice's concern as an artist. He is preoccupied with precisely the same question in his poetic work -

*the transformation of one thing by another
thing, to arrive at the thing itself.*

Kosice has also explained:

*I have concentrated in particular upon the
problems of rhythm in space, upon the problem*

of rhythmic continuity in certain transparent forms - almost always parabolical in shape. In plastic terms, I have worked gradually towards the introduction of movement in my works, movement being taken to mean the development of a form. I used to take a form from its origin to its final development. In my first works, the movement was either frontal or lateral. Now it is developing in all directions. My personal ambition is to set up a sort of dialogue between the material plasticity of aluminium, the transparency of perspex and the many attributes of water.

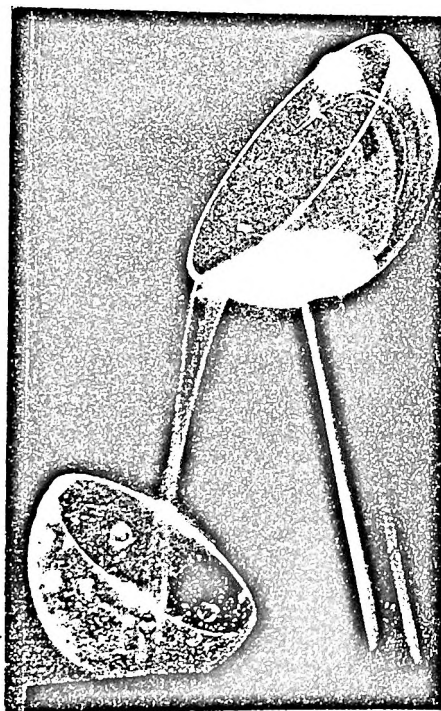
Kosice is fully aware that his sculptures tend to be enlivened by the movement of the surrounding world. In fact, he is anxious that they should have this supplementary element. This is perhaps why he likes to speculate on the possibility of creating large, anonymous works which will make use of the same elements but become a more integral part of the modern way of life. Among his projects we may instance the scheme for Buenos Aires Airport, and a ceiling for a suburban house in the same town, which has actually been completed. He has produced a design which is intended to create a link between architecture and the wider problems of town planning by the 'indeterminism' of a vast perspex construction which contains water in continual movement. A motor hidden in the base turns the axis of the half sphere, through 90° every four hours. Apart from this mechanical movement, the water is left to create its own patterns of rhythm within the half sphere. Kosice takes issue with those who are merely concerned with the 'integration' of plastic works of art into architecture and town planning. He feels that there should be a much more profound connection between the plastic element of movement and what he sees as the

increasingly humane qualities of modern social life.

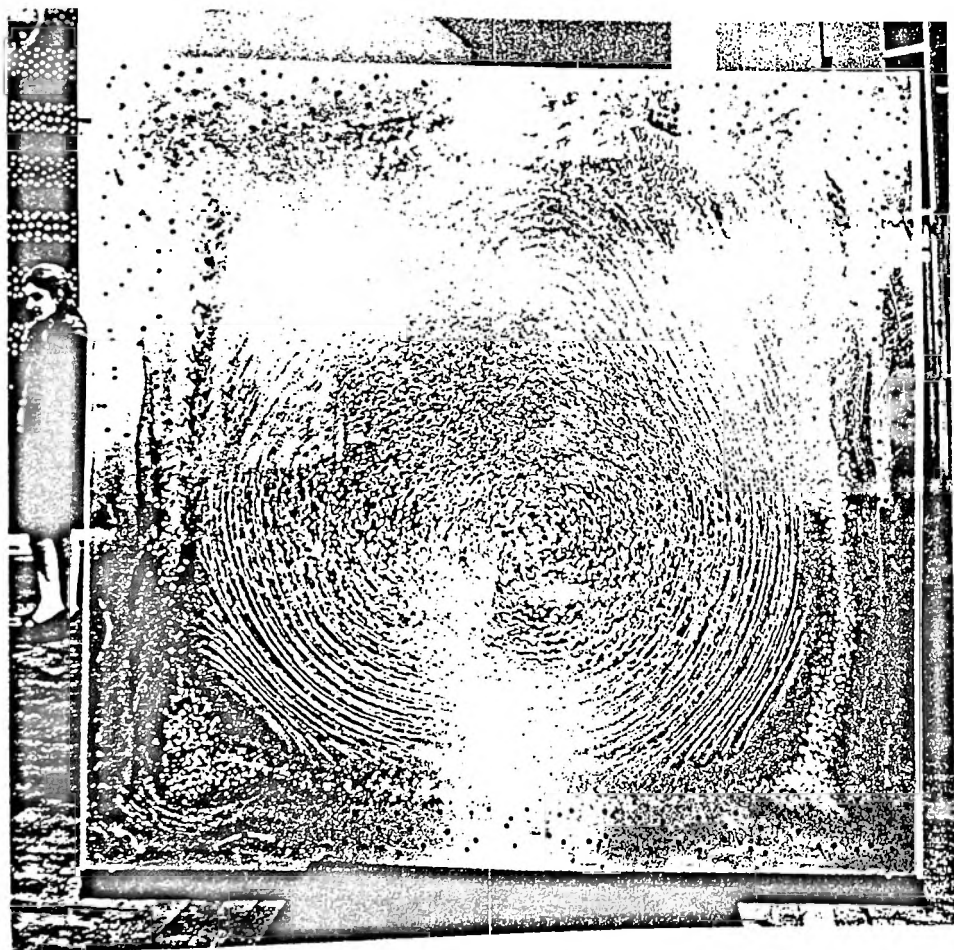
It should not be forgotten that Kosice's distinctive use of the element of water has its precursors, as well as its parallels, in the contemporary scene. The thirteenth century Polish philosopher, Witelo (or Vitellio) used a globe full of water to recreate the colours of the spectrum. Nowadays, the artist, Liliane Lisu, uses revolving circular perspex containers which display condensation on their internal surfaces. She picks out the drops of water with a beam of light, and accentuates the element of movement by allowing perspex spheres to circulate freely on the horizontal planes.

GYULA KOSICE





21. Gyula Kosice. Homage à ma femme Diyi (1964)



22. Gyula Kosice. Untitled.

CONCLUSION

Kineticism, an aesthetic of movement, has no theoretical basis that could be taken seriously today by a practising artist or art student. However, the label 'Kinetic' is most frequently used to describe three-dimensional works in motion. The work of Gabo, Duchamp, Moholy-Nagy and Calder would support the argument that Kinetic Art has never recovered the liveliness and originality that it had before World War II, and has become much more pretentious.

Gabo himself abstained from following up his important Kinetic Construction (1920), a single motor-driven vibrating wire on the grounds that electric motors were too crude for the kind of sculptural forms and movements that he envisaged. Certainly many Kinetic artists since World War II have elaborated on old ideas or relied on techniques whose heaviness and crudity Gabo would deplore. The device of the turntable, a rotating motor-driven surface embellished in some way or other, has dug its own particularly monotonous groove.

The idea of transformation is a basic one. Nothing could be more basic. But it takes us to the core of some of the most powerful intellectual disciplines of today. A new style of thinking that was developed over the past thirty years or more, known as cybernetics or general systems theory concerns itself fundamentally with the transformations undergone by systems in time. An exact notation and mathematics exist for the description of different types of transformation regardless of the physical characteristics. There is little doubt that cybernetics and general systems theory have given artists like Schöffer a single vocabulary and set of concepts for creating the most diverse types of system.

Some artists preferred to ignore computers and electronic devices, however rich their potential, and reverted to the automatic transformation process inherent in nature. Why use complicated

machines, it might be asked, when nature's automatism is cheaper and more reliable. Kosice held this belief and preferred to use more homely things: water, ice and air, thereby creating a kineticism which depended less on motors and mechanisms.

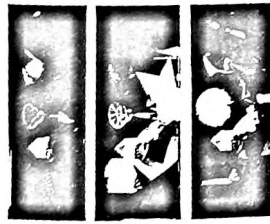
Kinetics is the brilliant and imaginative development of the idea of the three-dimensional work in motion, and has been the artifact whose own states are transformed in response to inputs from the spectator (and sometimes random inputs). The phrase 'man-machine symbiosis', already currently described as 'Symbiotic Art' is the use of electronic systems to introduce this extra element of participation, and to break down the repetitiveness of purely cyclical machines.

Kinetic Art, I believe, is a powerful springboard to the future, valued less for its own rhythms and oscillations than for its propulsive thrust, whereby such distractions as the deadend kids of conceptual art can be left behind to splash and piddle in a stagnant art world.

HISTORY OF KINETICS



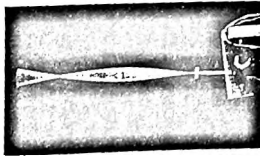
Jules-Edmond Maitre: Chronograph of figure doing standing jump, 1885



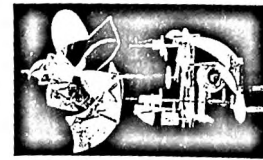
Giacomo Balla: Stage set for Fireworks, 1917



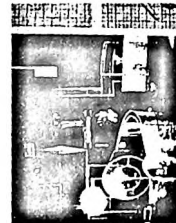
Umberto Boccioni: Unique forms of continuity in space, 1913



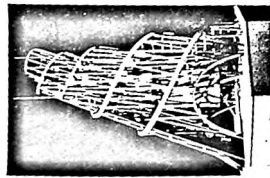
Naum Gabo: Kinetic sculpture, 1920



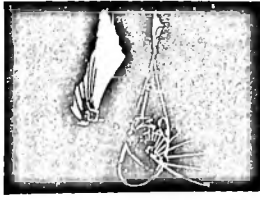
Fortunato Depero: Metagemonist Sculpture Complex, 1915



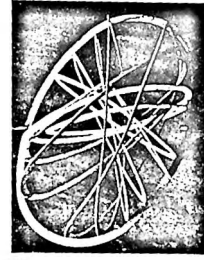
Naum Gabo and Antoine Pevsner: Stage set for La Chatte, 1926



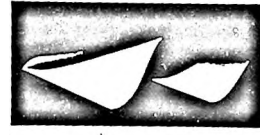
Vladimir Tatlin: Maquette for monument to the 3rd International, 1920



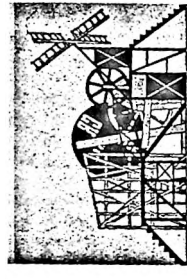
Vladimir Tatlin: Le Tatlin, c. 1930



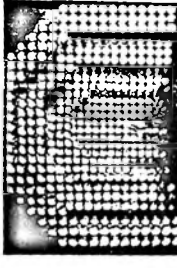
Alexander Rodchenko: Hanging Construction, 1920



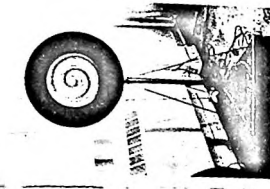
Man Ray: Paper Spiral, 1920



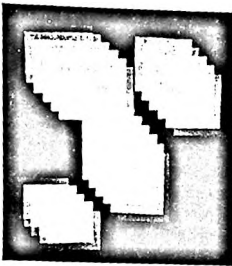
Lubov Popova: Stage set for The Magnificent Cockade, 1922



Francis Picabia: Set for Relâche, 1924



Marcel Duchamp: Rotorelief, 1925



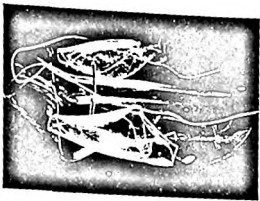
Ludwig Hirschfeld-Mack: Colour Light play, 1924



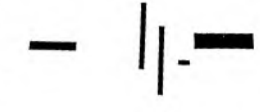
Laszlo Moholy-Nagy: Light-Space Modulator, 1922-23



Oscar Schlemmer: Metallic Dance, 1927

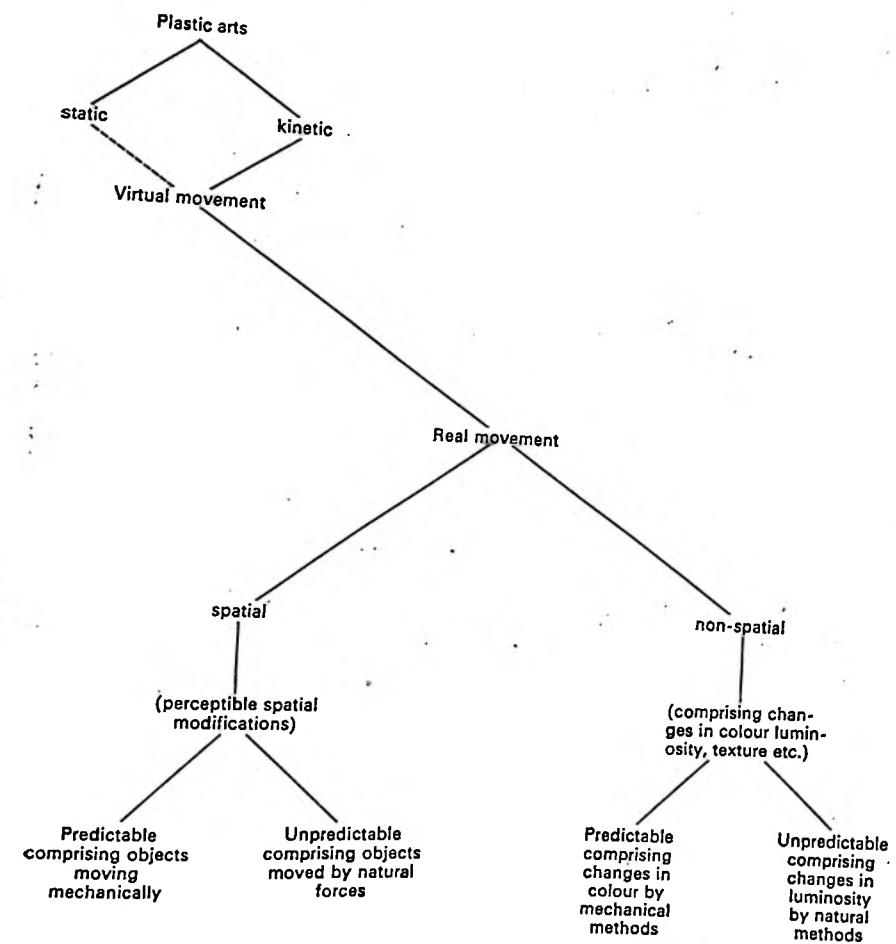


Laszlo Moholy-Nagy: Space Modulator, 1928, with mirror, 1940



Bruno Munari: Macchina Inutile, 1945, painted wood and nylon thread

Classification of kinetic art



Artistic tradition			Sources close to and outside the artistic field		
ANTIQUITY	Sculpture	Articulated statuettes, hydraulic automata			
MIDDLE AGES	Frescoes, tapestries, stained glass	Marionettes, Jacks of the Clock			
RENAISSANCE	Trompe l'oeil	Animated pictures			
BAROQUE	Painting and sculpture	First colour organs			
ROMANTICISM	Painting	Human automata			
1870	Objective movement (Impressionism)	Photography, colour organs			
1890	Subjective and sculptural movement (Redon, Rodin)	Cinema, theatre projections			
1900	Objective movement (Neo-impressionism)				
	Subjective movement (Pre-expressionism)				
	Art Nouveau				
Theme	Graphic effects in composition or materials	Interaction of colour	Three-dimensional effects	Light and movement	Spectacle
1910	Bl. Reiter Futurism Rayonnism Picabia M. Duchamp Klee Schwitters	Kupka Delaunay Malevich Mondrian V. Doesburg	Tatlin Archipenko Boccioni Duchamp Vantongerloo	Survage Valensi Rimington Hallock-Greenewalt Balla Depero Baranoff-Rossine	
1920	BIRTH OF KINETIC ART				
	Abstract visual inducements	Movement or intervention by the spectator	Machines	Mobiles	Light and movement
	Lissitzky Berlewi Bauhaus	Gabo Duchamp Moholy-Nagy	Man Ray Rodchenko Calder	Wilfred Klein Schwerdtfeger	Eggeling Richter
1930	Itten Herbin Albers Vasarely	Pesaneck	Munari	Hirschfeld-Mack Hausmann Theremin Pesaneck	Bauhaus Léger Lye
1950	DIFFUSION OF KINETIC ART				
	Vasarely Mortensen Grav Mari Riley Steele etc.	Agam Soto Debourg Cruz-Diez Malina Ascott Tomasello Boto Grav (Stein, Le Parc) Demarco Groups T; N Duarte Alviani Camargo Asis Greenham Sobrinho Gatti etc.	Schöffner Tinguely Pol Bury Kramer Group T Kosice Takis Grav Lye Kowalski Carrera Lijn etc.	Chadwick K. Martin Rickey Vardanega Le Parc Stein Yvaral etc.	Wilfred Palatnik Malina Schöffner Munari Sidenius Healey Calos Vardanega Boto Gerstner Dantu Demarco Megert Morellet Garcia-Rossi Mari Von Graevenitz Peeters Grav Groups T, N, MID Zero Dadzu etc.

FROM MANIFESTOS

1912

UMBERTO BOCCIONI

Extract from 'Technical Manifesto of Futurist Sculpture':

We must not forget that the tick-tock and the movement of the hands of a clock with the continual disappearance and reappearance of their little steel rectangles, the frenzy at a flywheel, the whirl of a propeller, all these are plastic and pictorial elements of which Futurist sculptural work must make use. For example, a valve opening and closing creates a rhythm as beautiful, but infinitely newer than that of a living eyelid.

1915

GIACOMO BALLA AND FORTUNATO DEPERO

Extracts from 'Futurist Reconstruction of the Universe':

The first plastic dynamic complex will be:

1. Abstract.
2. Dynamic. Relative motion (cinematographic) + absolute motion.
3. Very transparent. For the speed and volatility of the plastic complex, which must appear and disappear, very light and intangible.
4. Highly coloured and most luminous (using internal lights).
5. Autonomous, that is, resembling only itself.
6. Transformable.
7. Dramatic.
8. Volatile.
9. Odorous.
10. Noisy. Plastic noise simultaneous with plastic expression.
11. Explosive. Appearing and

disappearing simultaneously with explosions.

Necessary means: coloured wires of every thickness, of metal, wool, silk; coloured glass, tissue paper, celluloid, metal net, all sorts of highly coloured transparent materials, glass, metal laminates, coloured metal paper and all sorts of dazzling materials; mechanical, electronic, musical and noisy units, chemically luminous liquids of variable colour, springs, levers, tubes etc. With these means we will construct:

1. Plastic complexes that rotate on an axis (horizontal, vertical, oblique).
 2. Plastic complexes that rotate on more than one axis:
 - a) in the same direction, at varying speeds;
 - b) in *contrary* directions;
 - c) in both the same and *contrary* directions.
 3. Plastic complexes that decompose themselves:
 - a) in volumes;
 - b) in layers;
 - c) in successive transformations in the shape of cones, pyramids, spheres etc.
 4. Plastic complexes that decompose, talk, make loud noises and play simultaneously.
 5. Plastic complexes that appear and disappear:
 - a) slowly;
 - b) in repeated bursts (in scales);
 - c) with unexpected explosions.
- Pyrotechnics - water - fire - smoke.

1920

BY NAUM GABO

Extracts from 'Realist Manifesto':

We know that everything has its own essential image: chair, table, lamp, telephone, book, house, man... they are all entire worlds with their own

rhythms, their own orbits. That is why we, in creating things, take away from them the labels of their owners... all accidental and local, leaving only the reality of the constant rhythm of the forces in them.

We affirm that the tone of a substance, i.e. its light absorbing material body, is only its pictorial reality.

We affirm the line only as a direction of the static forces and their rhythm in objects.

We affirm depth as the only pictorial and plastic form of space.

We affirm in these arts a new element, *Kinetic rhythms* as the basic forms of our perception of real time.

Look at a ray of sun... the stillest of the still forces, it speeds more than 300 kilometres in a second... behold our starry firmament... who hears it... and yet, what are our deposits to those depths of the Universe? What are our earthly trains to those hurrying trains of the galaxies?

We say... Space and time are reborn to us today.

Space and time are the only forms on which life is built, and hence art must be constructed. States, political and economic systems perish, ideas crumble under the strain of ages... but life is strong and grows and time goes on in its real continuity.

1925

LASZLO MOHOLY-NAGY

Extract from 'Painting, Photography and Film' on Ludwig Hirschfeld-Mack's 'Reflected Colour Displays':

First to reveal a profusion of the most delicate transitions and unexpected variations of

coloured planes in motion. A movement of planes, prismatically controllable, which dissolves, conglomerates, resembling the colour organ in character. The establishment of a new space-time dimension of radiating light and controllable movement becomes even clearer in his spinning and plunging bands of light. (From section 'Static & kinetic optical composition'.)

1930

LASZLO MOHOLY-NAGY

Extracts from 'The New Vision':

The five evolutionary stages of sculpture:

1. Blocked out form.
 2. Modelled out form.
 3. Open or perforated form and assembled construction.
 4. Form in equipoise.
 5. Kinetic sculpture.
- Sensual apprehension of form has been overtaken by an intellectual grasp of form; cultural stylistics giving way to burgeoning technology. At the Bauhaus in the 1920s we had considered magnetic force and remote electrical control for invisible power sources. The first projects looking towards the dynamic-constructive system of forces can only be experimental, demonstrating devices for the testing of the relations between man, material, power and space. Next comes the utilization of experimental results for the creation of freely moving (free from mechanical and technical movement) works of art.

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