

Representing the Movement / Presenting the Movable

Representar el movimiento / Presentar lo móvil

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Abstract

This article is proposed as an analysis of artistic works which were interested in including movement representation or pointing to the attainment of kinetic art. Before incorporating the real movement in art works, there have been different attempts to represent it: by poses, instant grasp, or action narrative suggestion, and also by giving form to different movement stages. Thus, in this study we define two possible itineraries: "Representing the Movement" goes through the different approximations to movement representation from the pictorial and photographic practice, and "Presenting the Movable" does the same from the sculpture practice. We will travel through a path that covers the first trials to represent and fix something that moves in order to conquer the movable art itself, where the work becomes process and event, and it is developed, finally, into a time and space expanded action.

Key Words: art, artistic creation, representation, time, movement, scientism, poetic machines.

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Resumen

El presente artículo se propone como un análisis de aquellas obras artísticas que incluyen la representación del movimiento o apuntan hacia la consecución de un arte cinético. Antes de incorporar el movimiento real en las obras de arte, éste ha intentado representarse de muy diversas maneras: mediante poses, captación de instantes, o sugerencia narrativa de una acción, o bien mediante plasmación simultánea de diferentes etapas de ese movimiento. Así, en este estudio definiremos dos itinerarios posibles: “Representar el movimiento” recorre las distintas aproximaciones a la representación del movimiento desde la práctica pictórica y fotográfica, y “Presentar lo móvil” hace lo propio desde la escultura. Transitaremos, por lo tanto, por la senda que recorre los primeros intentos de representación y fijación de algo que se mueve hasta la conquista del propio arte de lo móvil, donde la obra se convierte en proceso y acontecimiento, y se desarrolla, finalmente, como una acción que se dilata espacial y temporalmente.

Palabras Clave: arte, creación artística, representación, tiempo, movimiento, cinetismo, máquinas poéticas.

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Summary: 1. Introduction, 2. Representing the Movement, 3. Presenting the Movable, 4. Conclusions. References. Notes.

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1. Introduction

This article tackles specifically the representation of particular movement phenomenon, the plastic treatment of changing things.

Paul Virilio told us: “...consider for a moment a phrase of Paul Tarsus’s: “The world we see is in the process of passing.” We might now add: “We cannot see the world as it goes by.” We cannot naturally perceive its going slowly any more than we can perceive its speeding up, any more than we can perceive what might be the reality of time itself in which movement occurs. *Movement is blindness*”¹ (Virilio, 1995: 68). And it is due to this challenge of representing a reality in a constant change, a “world which is happening”, that we can say that in every age a concern and interest in representing movement has existed, concern in formalizing the time in a plastic way by movement; this means, recording the linked to displacement temporality.

We can say that movement research has been a constant since the first prehistoric painting discovered in caves, to the Winged Victory of Samothrace of Greek Art; or since the confusing and variegated Baroque works, the convulse Romantic landscapes, the Impressionist moments, and Degas’ ballerinas, until the first futuristic performances and also the abstraction professed by Kandinsky.

But we ask ourselves: “How can we visually formalize, once and for all, that thing which is defined only on the basis of placement changes in a given space? Let’s say, to begin, that nothing is simple within the statement “once and for all”.

The expression means catching, *as grasping a pose once and for all, taking it on the fly and only in a single movement, and gathering into a gesture all the other gestures within a series that becomes the action including the moving being of grasped one*²² (Translated from Salabert, 2009: 53).

In order to get a progressively more perfect and accurate image of movement, artists have looked for the most appropriated poses and foreshortening, those ones able to suggest the successive stages of a temporal development -we can remember, for example, the classic by Myron: *Discobolus* or *The Dance* by Matisse-. However, the maximum movement expression in art is presented when the work moves itself, when real mobility is inherent in the piece; this means: when art is mobile itself, then representing movement becomes presenting movement itself.

Below, we synthetically and selectively walk the distance traced between the movement and its own apparition in the work. First, within the images field and later in the optic of sculpture and artistic objects; we talk about the effort to create optic effects and to facilitate situations that involve the spectator transmitting the complex feeling of something that moves. Nevertheless, as Paul Klee's words remind us: "the beholder's eye, which moves about like an animal grazing, follows paths prepared for it in the picture... The pictorial work was born of movement, is itself recorded movement, and is assimilated through movement (eye muscles)". (Klee, 1973: 182).

2. Representing the Movement

Different movement images have been gestated in many different ways along history, always looking for the resemblance to a given reality. We fundamentally regard the possibility of grasping movement -which is always mediated by technology findings-, and also the possibility of representing this movement, and moreover, of simulating it by knowledge of physiology of vision and usage of visual effects.

In this respect, the figures of Eadweard Muybridge and Étienne Jules Marey, are very significant, they advanced the first photographic techniques in capturing images or sequences which split the movement of things in different parts. Their experiments "constitute the first questioning of the data given by the senses, exactly through the senses analysis. These essays motivations [...] are the distrust of transparency illusion that the glance produces, and the result is the evidence of a perceived thickness without any other proof than the perception surface itself" (Translated from Oubiña, 2009: 55). Definitely, their studies seem to make us aware of the fact that we cannot see exactly what we see, and they try to bring us closer to the reality inside things.

In California 1872, horse enthusiasts faced a controversy over the possibility of an instant, during a horse gallop, when both legs were not at the same time on the floor; among these men was the millionaire ex-governor of that state: Lelan Stanford. In order to solve the question, Stanford made a bet on it and contracted Muybridge. They used photography as the only unappealable evidence to prove the fact at that time. The photographer, knowing that this task was not affordable by the photographic technology at that time, acceded to photograph Occident -Stanford's preferred horse-trotting at approximately thirty five kilometers per hour in Sacramento hippodromes.

At this first attempt, Muybridge could not get a satisfactory effect because of the blur and lack of precision in the obtained images, and he abandoned his task for a while; later he decided to restart his works in action photography and he designed faster shutters and used different cameras shooting at the same time. On this occasion, Muybridge got better negatives where it was possible to recognize a horse silhouette; these images could clear up the initial doubt, and, at the same time, they showed Stanford was right: horses' four legs were off the floor during a short space of time.

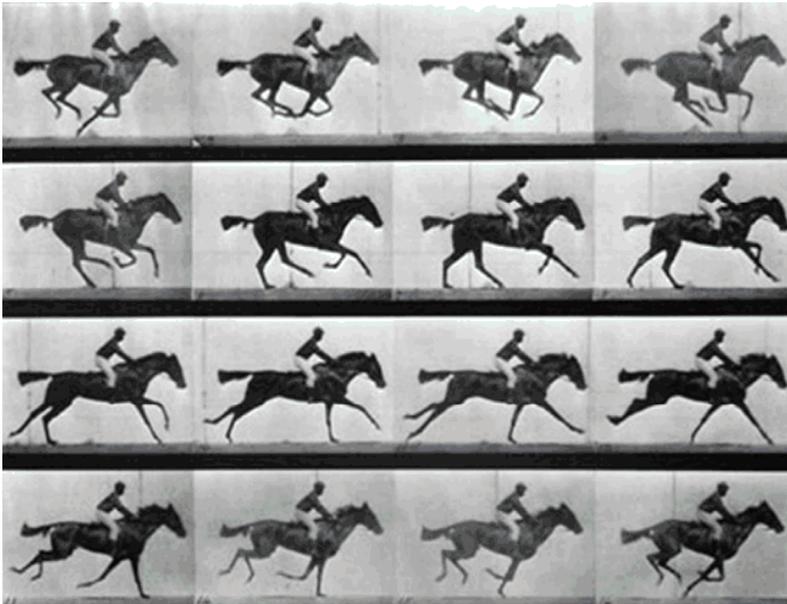


Figure 1. Eadweard Muybridge. *The Horse in Motion*. 1880.

Stanford, moved by the result of this experiment further known as “The Horse in Motion”, commissioned a research into a photographic study aimed at capturing every successive horse motion stages. Muybridge painted the negatives and he got a sequence of twelve photographs as a result, they were achieved in half a second, where, despite of a slightly insufficient exposure, every movement of a race mare called Sally Gardner were clearly visible.

Subsequently, the *Scientific American* journal published six engravings done on Muybridge's photograph enlarged negatives where a horse at trot and gallop was seen. At the same time, he proposed the readers to cut the illustrations and set them on a zoetrope³. After reading this article, Muybridge thought that it could be possible to improve the results by projecting images on a screen, and he invented a device which used light to project sequential photographs using a glass plate; he called it zoopraxiscope. Muybridge would have shown his horse-works to Thomas Edison and William K.L. Dickson as phonograph inventors, and he would have suggested

them the possibility of combining both inventions to cast sound images. Even when the idea was never become reality, Edison did use a series of horse-photographs in his Kinetoscope, cinema projector predecessor.

Etienne Jules Marey, as we have already announced, is another outstanding figure because of his movement photographic investigation. Marey was considered a scientist and his work system was, therefore, rigorous and methodical: his “graphic method” studied movement with register instruments like polygraphs or similar devices. They analyzed a human or horse walking, and bird and insect flights with diagrams.

According to Marey, chronophotography “is the application of instantaneous photography to the study of movement. It permits the human eye to see the different stages which would not be visible in direct way; and it recomposes the movement initially decomposed” (Translated from: Marey, 1899: 5, in Oubiña, 2009: 57) With respect to this considerations, he would be in charge of improving the photographic gun -inspired in the “revolver photographique” invented by the astronomer Jules Janssen, able to capture twelve exposures in a second- and he would have invented a camera with thin layers chromatographic plates, with a time shutter with which he would combine on a layer different successive images in a simple movement: “To express all the movement features, it is necessary to introduce the *concept of time*, that is got when we make the light to act in an intermittent way and already known time intervals”⁴ (translated from Marey, 1891, in Oubiña, 2009: 59).

Later, he would improve his invention by replacing the glass plate with a long sensitive paper strip, and after two years with a celluloid transparent film. Between 1890 and 1900, he was helped by different assistants and got an important number of movement analysis film strips with great technical and aesthetic quality. These strips were widely spread by international press and had a strong influence on cinema pioneer inventors like Thomas Edison and Louis Lumiere, when they created the cinematography, among others.

Linked to these concern about recording movement in an instantaneous way, we also found the interesting figure of Harold Edgerton, a scientific and researcher looking for new ways of seeing and perceiving the world around us. Edgerton’s investigations go one step further in movement capture, instead of trying to build faster shutters, he was interested in multiple flash units.

His stroboscope flash could register ultra-speed movements and visually demonstrated the pre-Socratic philosophic statements of Zeno of Elea, who maintained that movement is an illusion born of immovability, and who sustained that time and space are endless divisible, and an object movement is only the addition of all the different positions adopted by this object in the space during its trajectory.

Edgerton’s works covered from athletes’ images, like a golfer or a tennis player about to hit the ball, to flying birds pictures which would let calculate the flapping of a humming bird’s wings, and also liquids’ dropping or hitting on different surfaces images; in all this important images, Edgerton, could finally paralyze time.

This way, high-speed photography defies the prospects joined by technique and creativity, and becomes an invaluable instrument for science and technology; at same time, it shows time register beauty in a way impossible to perceive by humankind.

However, now we focus on the chronophotographic techniques development, close to cinema's birth we move away images capturing movement and deal with those which try to "represent it".

In this manner, we talk specifically about the pictorial manifestations concerned about the bi-dimensional movement "illusion" or representation; this means, by the possibility of dynamic images creation. Thus, by action instant decomposition or fragmentation, or using knowledge of physiological optics (specially about retinal fixation), different creators and artistic groups have been able to solve, in different ways, this problem in representing things at the same time they act.

If Impressionist movement was already involved in transience of movement capture by using light effects, or abstract paintings experimented with the idea of presenting dynamic compositions and rhythm, the futuristic movement will mainly be the one expressing a general concern about velocity and its pictorial representation in a radical way. By means of art, futurism tried to communicate the motion feeling, considered as the most characteristic feature of modern times by him: "We affirm the world's magnificence has been enriched by a new beauty: the beauty of speed". (Marinetti 1929, in Umbro Apolinio, 1973: 19-24).

Futuristic artists, driven by the poet Filippo Tommaso Marinetti, worked in Italy since 1906 until 1916, and they defended that the country was fixed in past triumphs and its necessity to enter future; because of that, his general objective was introducing the European culture into what they considered the new and glorious world of modern technology.

The concept "plastic dynamism" becomes a modern and new experience in a specifically pictorial space building, when light, colour, shape and materials are interrelated, according to the manifestos written by the group members⁵: "Everything moves, everything runs, everything turns rapidly. A figure is never stationary before us but appears and disappears incessantly. Through the persistence of images on the retina, things in movement multiply and are distorted, succeeding each other like vibrations in the space through which they pass. Thus a galloping horse has not got four legs; it has twenty and their motion is triangular..." (Marinetti, 1929).

Giacomo Balla's experiments on capturing movement of men and animals, Umberto Boccioni's transformations of shape and space, or Gino Severini's chromatic studies are among their proposals of incorporating velocity at the pictorial plane. Other artists, nevertheless, focused on studies about velocity related to machines, as Benedetta Cappa or Vittorio Tomassini did.



Figure 2. Jesús Pastor. *Untitled*. 1986.

But one of the essential contributions with regard to movement representations would be the “photodynamics” of Anton Giulio Bragaglia which, since 1911, try to overpass Marey’s “chronophotographic” experiences. This is done by movement capturing from *interestatics*, *inter-movementals*, and *inter-momentals*. As Bragaglia explains: “By photodynamisms, remembering what occurred between one space and another, the work overpasses the human condition and becomes a *transcending photograph of movement*. (...) *We look for the inner essence of things: pure movement. And we prefer to see all the movement*, because, when things are dematerialized through movement, they are idealized but they still hold, deeply, a strong skeleton of truth”⁷⁶ (translated from Bragaglia, 1913, in Oubiña, 2009: 100).

Furthermore, other pictorial experiences occurred since 1926, with the first Fedele Azari’s aero-painting work, entitled *Prospettive di volo*; nevertheless, aerial perspective provided the desired dynamism and, at the same time, it offered a vision of the reality. Constantly, we confirmed how this movement key word is “dynamism”, as a universal strength and what the painting must show; dynamism expressed as a synonymous of velocity leading to vertigo or to the vortex, the turmoil where the emotions defended by the British group named “vorticism” by Ezra Pound in 1913, were born.

But futurists used also dynamism to enhance violence, and burning museums was one of their proposals; they considered war as something fast, noisy and dramatical, and they reflected it in their manifestos. Critics to this movement, many of them cubism defenders, accused them of being plastically too photographic, and they compared their works with multiple exposition photographs. And, even when the

futurists knew the works of Eadweard Muybridge and Étienne Jules Marey, they broadly denied their influence, as another crucial artist for this study, and also for understanding contemporary art history did: Marcel Duchamp.

If we stop and look at the canvas *Nude Descending a Staircase* (1912) by Duchamp, we can see “geometrized” shapes which seem to form some kind of mechanical body. The work title itself points to the dynamic body, and, even when we cannot see the nude with the naked eye or the stair in a usual meaning of both terms, we can clearly see the instants successions and the steps needed by the body to descend the stairs; they are expressed by geometric figures superposition which produce the visual effect of movement in the composition.

These forms fragmentation and multiplication in *Nude Descending a Staircase* is inscribed in the period when Marcel Duchamp explored cubism, and at that moment, they were considered an evidence of vanguard painting break with artistic tradition. Octavio Paz, in his book *Apariencia desnuda. La obra de Marcel Duchamp* (1973), begins his dissertation denying Duchamp’s general opinion due to its futuristic movement’s influence, because, in his opinion, even when the figure slides leaving a trail of its walk through the picture, the idea transmitted is not dynamism or speed, it is statism. And also the metalized figure allegory is not an exaltation of machine or progress wonders, but something full of irony, par excellence Duchamp’s element according to Paz.

Duchamp his own told: “...Chronography was a fashion. I knew the horses in motion studies very well and also the ones jumping in different gestures which appeared in Muybridge’s albums. But when I painted nudes, my interest was nearer the cubist interest in decomposing shapes than the futurists’ one in indicating movement or even than Delaunay’s simultaneity” (Translated from Duchamp and Sweeney, 1946: 20).

Moreover, Duchamp defended himself against those who branded his painting as “too futurist” and who convinced him of removing its work from a cubist exhibition: “My goal was a static representation of movement – a static composition indicating the various positions taken by a form in movement – without seeking to produce any cinematographic effect by means of painting. I thought it was permissible to reduce a head in movement to a simple line. When a shape goes through space it will go across a line, and doing so, that line will be substituted by another and another one. Therefore, I felt authorized to reduce a figure to a moving line, and not to a frame. Then, going further on the same path, I thought that an artist can use anything -a dot, a line, the most conventional or less usual symbol- to say what he wants to say” (translated from Duchamp y Sweeney, 1946: 20).

Finally, the artist seemed to want to get further of the painting physics and was interested in painting and recreating ideas more than in generating visual products. Duchamp tried, as a last resort, “put again painting at mind’s service” (translated from Duchamp y Sweeney, 1946: 20-21).

Op-art statements about movement understanding and its two-dimensional representation are totally different in this respect. Op-art or Optical Art, as many critics decided to name it, was a pictorial movement born in the United States of America in mid-twentieth century (1958). It is a sort of abstract style fundamentally based on optical and kinetic effects⁷, and both on two-dimensional works and on

three-dimensional objects, it is based on movement illusion creation, by a set of shade, nuance, and distance contrasts; they deal with spectator's vision mechanisms and with the physiological eye reactions.

It should be pointed out the principal figure of this tendency: the Hungarian artist Victor Vasarely, according to whom kinetism was important because of two reasons: a personal one, the fact of the scientism idea which had obsessed him since infancy; and the other, the more general idea about the fact that the existence of the paintings based on optical effects takes place in the eyes and mind of the spectators, not on the wall.⁸ Vasarely assigned in 1955 his own "Yellow Manifesto", where he defined this Optical-kinetic Art principles.

So, his pictures, physically statics, are completed by the act of watching by the spectator, and "move" thanks to optical phenomena, as the eye tendency to produce "post-images" in front of very shiny contrasts. Another exponent of this optic-kinetic art was the British artist Bridget Riley, whose work, more instinctive than Vasarely's, seemed to try to represent nature movement without explicit reference to landscape.

In Spain, this kind of pictorial kinetism was represented by Equipo 57 and its interactions of colour planes assembled together in such a way that seem merging into themselves, matching adjoining spaces and producing a colourist rhythm of shapes and planes; and also by important artists like Eusebio Sempere, who gave colour a special sensitiveness. "Bergson used to say, "there is more in immobility." Whence the notion that representation will essentially depend on, in the West, until the innovation of the motor: immobility makes visible. The plastic arts will come to *immobility movement, thereby offering the illusion of seeing, of having time to see*"⁹. (Virilio 1995: 69).

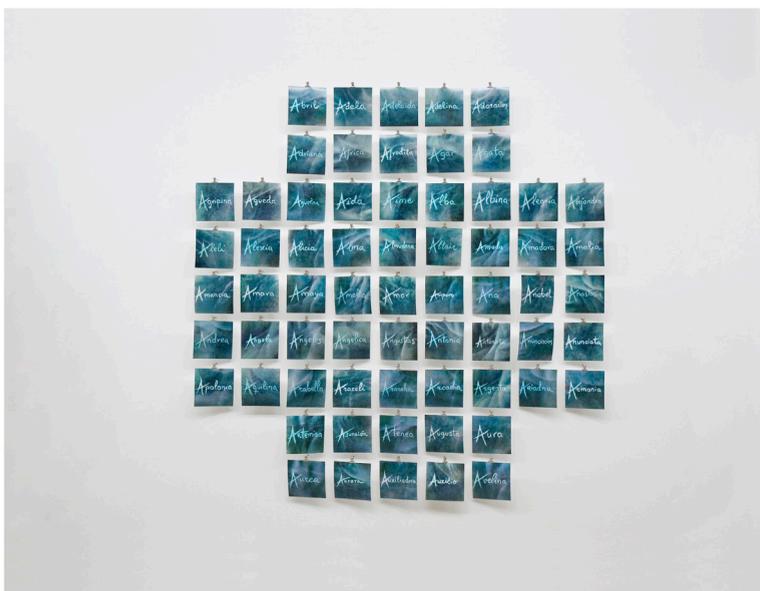


Figure 3. Yolanda Herranz. *Outstretched Woman Hands*. 2008.

3. Presenting the Movable

“Why must art be static? (...) The next step in sculpture is motion”. (Calder, 1932). This is the challenge launched by the artist Alexander Calder. Because of that reason, if we have been speaking about images trying to represent or capture movement, now we are dealing with those objects and sculpture works which advance towards mobility principles in their statements and which drive us to kinetic art, it does not imitate the other’s movement but identifies with movement until it becomes movement itself.

When we talk about movement sculptural representation it is worth mentioning two paradigmatic works which appeared in the vanguard artistic period: *Unique Forms of Continuity in Space* (1913), in futurist sphere, and *Monument to the Third International* (1920), of constructivist ideology.

Unique Forms of Continuity in Space, by the Italian artist Umberto Boccioni, shapes velocity and strength showing us a figure which moves forward, while its outline goes beyond the body limits and waves in curve and aerodynamic lines, like if the wind was modelling it on its way. Boccioni had developed these shapes in pictures, drawings and sculptures during two years by rigorous studies in human muscles, until he got this sculpture without face and made of concave and convex volumes where, at the end, the body seems to have been melted with clothing and the surrounding air.

Umberto Boccioni was on pursuit of catching not only the space feeling and movement, but also time; he tried it by simultaneity and dynamism, known fundamental concepts in futurist: it was a figure walking towards future, as if it was the modernized traditional nude figure itself; and where the polished and glittering bronze surface and its angle shapes turned the figure into a machine, more than into a human one. Boccioni wrote about this work: “The gesture that we want to reproduce will no longer be a *moment* in the universal dynamism *which has been stopped*, but the *dynamic sensation* itself, perpetuated as such”. (VVAA, 2009: 64).

Another paradigmatic mentioned piece is the Russian sculptor Vadimir Tatlin’s work. Tatlin’s interest in a space and movement sculpture by means of engineering and architecture culminated in this model for a huge *Monument to the Third International*. The tower was presented at the beginning of 1920, when the communist regime had just been established, and it had been projected for Saint Petersburg, then known as Petrograd. This work, known as Tatlin’s Tower after some time, should have been four hundred meters high and would consist of a bended metal spiralled structure, and it would have three glass modules (with cylinder, cube and cone shapes respectively). The modules would house conferences, and they would rotate slow and regularly¹⁰. This Tatlin’s model projects, finally, the interest in giving real movement to the structures.

We are also interested in what was finally known as “kinetic art”, as a result of an intense search for movement and plastic work transformation. The word “kinetic” was definitely introduced in art terminology around 1955, when the gallery Denise René showed an exhibition organized by Pontus Hulten entitled *The Movement*, where artists who based their creations in transformable and movable works participated: Yaacov Agam, Pol Bury, Alexander Calder, Marcel Duchamp, Egill Jacobsen, Jesús Rafael Soto, Jean Tinguely and Victor Vasarely.

Nevertheless, The word “kinetic” had already been used in 1920, within the “Realistic Manifesto” assigned by Naum Gabo and Antoine Pevsner, where it was spoken about kinetic rhythms -“We repudiate: the millennial error inherited from Egyptian art: static rhythms seem as the sole elements of plastic creation. We proclaim a new element in plastic arts: the kinetic rhythms, which are essential forms of our perception of real time...” (Gabo & Pevsner, in Chipp, 1968: 350-360)-. Later, in 1922, Moholy-Nagy and Kemeny referred to the different movement phenomena as “dynamism” in their “Dynamic-Constructive System of Forces”; in 1941 the book “The Kinetism” was published by the Czech artist Zdenek Pesánek, and Marcel Duchamp used the word “mobile” to refer Alexander Calder’s works.

Mobiles are structures made of thin metal coloured slices, installed in a complex system of balance and counterweight, where the pieces are floating in the air and moving rhythmically when they are simply actioned by slight air hits. Calder on his own, described mobile like an abstract structure, built mainly with metal plate, steel pipe, wire and wood. All its elements, and some of them, start to move because of the electric-motors, wind, water, or simply because of a hand. He said: “To most people who look at a mobile, it is not more than a series of flat objects that move. To a few, though, it may be poetry.” (Baal-Teshuva, 2008: 47).

With these works, Calder brought movement forward in sculpture, reason why he is considered one of the kinetic sculpture driving force: “Term *kinetic* -from Greek *Kinesis*, movement- refers to those works whose main principle is movement. This dynamism, real or virtual one, mechanical, optic or environmental, can be previewed by the artist, and also provoked in an uncontrolled way, and it originates the plastic form of kinetic realizations. Kinetism introduces the time-space value within the art core”. (Translated from VVAA, 1990: 254).

By this way, even when the kinetic works catalogue is made up by great variety of different works, we can find that all of them share the interest in the work movement, change and transformation; and it is done by effective mobility of the pieces on its own, whether optical resources usage, or by spectator’s movement, required to appreciate the piece along its space-time evolution and course.

Kinetic artistic works are defined by avoiding all kind of narrative or literary references, and also by the use of new materials in artistic creation; but they mainly tried to imitate life going beyond the traditional conception of the static and motionless artistic object. The works identified themselves with movement, demonstrating metamorphosis and change. The kinetic work itself becomes movement, then, and occupies space in a new way of arts, unknown until that moment -getting around it: “How can art be realized? Out of volumes, motion, spaces bounded by the great space, the universe.” (Calder in Baal-Teshuva, 2008: 86).

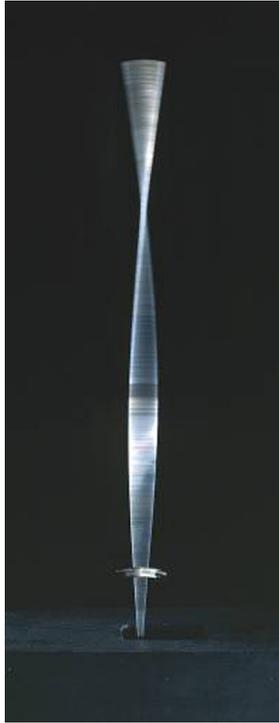


Figure 4. Naum Gabo. *Kinetic Construction (Standing Waves)*. 1919-20.

An early work inaugurating kinetism was made by Naum Gabo and consisted in a thin sculpture composed by a steel bar with an engine, when the spectator pressed the button to turn on the engine, it vibrated and its movement provoked the illusion of the bar waves. But the artist told us in 1937: “Mechanics have not yet reached that stage of absolute perfection where it can produce motion in a sculptural work without killing, through the mechanical parts, the pure sculptural content; because the motion is of importance and not the mechanism that produces it. Thus the solution of this problem becomes a task of future generations. (Naum Gabo, 1937).

We are interested in drawing the different tendencies and works which impulsed the kinetic art at its beginning, starting on the different varieties and directions; and so, if we have previously spoken about optical effects painting, we can see as the next stage of this type of painting was configured by works with a slight relieve, frequently used to set different colour planes “moving” with the spectator’s movement towards them.

Sergio Camacho makes his series *Relevos*, since 1963, in this direction. This series is composed by relieve works with light and floating characteristics based on geometric figures with white surface always; in the same way, Luis Tomasello, since 1960, used black and white polyhedral elements lying uniformly on a white surface, he produced some reflects on his series of works *Atmosphère chromoplastique*; the

Israeli Yaacob Agam creates tactile and transformable paintings, where an image is surprisingly replaced with another, depending on our point of view; or the Venezuelan Carlos Cruz Díez, who creates the “cromosaturaciones” or “fiscromos” since 1959, which are works with the same nature because “the central idea in a *fiscromía* is the one of a mono-chrome situation evolving in space and time along different chromatic climates, until it gets another monochromatic situations. The coloured light continuously changing atmosphere is produced by the chromatic, optic and environmental phenomena conjunction. The intensity and position of the light source and also the spectator movement in front of the work, are determining aspects in *fiscromía*’s transformation” (translated from VVAA, 1980: sp).

Another Venezuelan artist, Jesús Rafael Soto, executed hanging works where thin metal or plastic bars moved with the air and connected with other realizations which Soto called “Penetrables”. They induced spectator to get multiple sensations, not only visual but also auditive and tactile, due to the possibility of introducing the spectator inside the work: “Soto’s Penetrables are brilliant inventions of visualisation (even when they have no surface or plane). They are made of few valuable or renewable materials, and they make the contradiction between pictorial space and public world sand bigger; and people can go bodily from one to the other state. The optic game between dissolution and solidity establishes an easy communication between the people inside and outside the “work” becoming, then, a social experience” (translated from Brett, 2000: 31).

The Groupe de Recherche d’Art Visuel: GRAV, founded by Julio Le Parc, García-Rossi, Hugo Demarco, François Morellet, Denise René, Francisco Sobrino, Jöel Stein and Yvaral in Paris during the year 1960, was interested in artistic investigation of visual effects, especially lighting and chromatic ones. Therefore, they experimented optically -Morellet carried out the Sphere-frames around 1960, which were made of bars in right angles forming a cellular structure. This structure, by means of multiple perspectives, had weird kinetically effects over light, as it occurred in many cases with Julio Le Parc devices, which constituted experiments with gadgets- and even in a tactile or a “haptic” way.

We can finally define the Optic Art as a form of visual art, more that pictorial proposals which where referenced in the section “Representing the movement”. There, the object was grouped mainly composed by geometric figures, able to produce similar optical effects usually got by means of simultaneous contrasts, optic illusion devices or by the material reflections, and which try to provoke movement illusion in the spectator. The movement in op-works, therefore, is not fed by engines or electric pulses but it is produced by the retinal incapacity to perceive some static objects as that kind ones.

Because of that, there is a discussion about if Op-Art should be considered part of kinetic art. Many critics, among them Frank Popper in *L’Art Cinétique* (1970), defended that this optic art belongs to kinetism, extending the term kinetic to every two-dimensional or three-dimensional work with real movement (among them would be included machines, mobiles, and projections) and also the works with virtual movement.

It is worth mentioning that many of these artists who participated in this opto-kinetic art evolved towards kinetic and luminous works; and also many kinetic works can be considered optical due to the effects provoked by its movement. Nevertheless, light has been the favourite and fundamental means for many kinetic artists: "The light can accompany spatial movements or can act isolated in a non-spatial way, but it is always the active element in any possible movement" (translated from Marchán Fiz, 2001: 122).

In this sense, Laszlo Moholy-Nagy would be one of the openers investigating the relations between light and movement in its rotatory *Light-Space Modulator*, where he uses this to create sculpturing effects, and begins to think about the possibility of spectator participating within the work: "we must therefore replace the *static principle of classical art with the dynamic principle of universal life*. Stated practically: instead of static *material* construction (material and form relations) dynamic constructions (vital construction and *force relations*) must be evolved in which the material is employed only as *the carrier of forces*."¹¹ (Moholy-Nagy & Kemeny, 2000: 229).

The artist Nicolás Schöffner would create, in 1948, the *Space-dynamism*: a set combining plastic, mobile and coloured elements. In 1957, it evolved towards *Light-dynamism*, where kinetic sculpture movement was combined with light projections that extended movement around the space, including also music and sound effects. Later, he would carry out the *Chrono-dynamism*, a series of works with electric autonomous movement, among them the *Cybernetic Tower of Lieja*, in Belgium, stands out 52 meters high; it was built in 1961, with the Philips corporation collaboration.

Some years later, Martha Boto executed *Mouvements chromocinétiques* (1971), a work which investigates the optical light and movement variations; the North American artist Frank Malina built the light boxes with coloured templates constantly changing and they are projected on a screen, producing a picture in a continuous change (Deep Shadows, 1954): and the German Heinz Mack, in group Zero, used lights activated by electric engines to create sculptures, mainly vertical towers which were built on a bases of lighting and glittering.

Even more surprising, maybe, is the work of artists like Liliane Lijn, who carried out her work as if it were a planetary system of spheres, lights and reflections. In *Liquid reflections* (1966-68), for example, Lijn caught liquid drops under the transparent lid of a revolving table; on this lid, with an anti-clock wise rotation, there was a sphere or group of spheres of plexyglass, by this way the liquid trapped in the disc was broken in different and suggesting shapes and reflections, when they were affected by their movement.

Thus, we can see that many artists included in kinetic tendency used, further than light, all kind of matters and materials, an also all kind of powers and energies, like magnetism and wind and hydraulic impulses. The Greek artist Vassilakis Takis, for example, used magnets and electromagnets to give movement and energy to his compositions, and he could keep different elements floating and shivering in the air by their use.

Public and kinetic sculptures related to Alexander Calder's sculptures and impulsed by air and wind action appeared; they developed the idea of natural time and movement which move without auxiliary engine from the mobiles¹², like David

Ascalo's, Lyman Whitaker's, or George Rickey's ones. This last one developed simple buildings carried out with great precision, since small mobiles to large size sculptures.

On the other hand, we can point another type of works based in water power, as the fountains created by Pol Bury, since 1976, using cylinders, spheres, and triangles made of stainless steel which not only move but emit noises. But, his sculptures and mobile relieves were what got this artist to be known as master of "slowly movement". His works have hidden parts which move carefully, almost imperceptibly: "Between unmovable and mobility some kind of slowness reveals an action field where the eye cannot follow the objects trajectory any more (...) Only the slowness let us to eliminate its trace, to clean the memory, to make us to forget its past (...) The journeys avoid the "programming" as far as they are given a slowness condition; finally they got a real or fictitious freedom, a freedom which acts on its own account, or for pleasure" (translated from Brett, 2000: 35).

Finally, after this approach to some of the varied and different proposals of what was called kinetic art, and being conscious of the difficulty in apprehending in its totality, it becomes necessary to transfer the next reflection:

"Maybe it is necessary to re-think if the word kinetism is precise and comprehensible enough to assume all the tendencies and variations of a movement that flirts, since its foundations, with two usually irreconcilable extremes. To describe from the spinning and lightning baroque sculpture of Nicolas Schöffer to the mysterious corporeality of a chrome-saturated space of Cruz-Díez, kinetism is not the exact word: it is only the most useful. One of the most radical and necessary movements of the second half of twentieth century was born without the right word to define it, it lives without technical voice and this, even today, make imprecise some approximations to its real nature" (Translated from Suárez, 2007: 35).



Figure 5. Mª Covadonga Barreiro. *Untitled (Uqbar Sunset)*. 2010.

4. Conclusions

In this study, we have confirmed as along the historic art development, artists wishes have shown a tendency to represent the movement of an unstable reality; therefore, it opens a way in modernity by different means which evoke change rules. We can see how real movement decomposition can be reflected as a sum up of fixed attitudes or instant captures, and as a frontal break and unstable positions usage, tensions and falls.

However, movement needs not only space but also time in order to permit shapes to move and go by that space. And it is that way how, in Twentieth century, real movement arrives to sculpture, becoming art in action, happening and experience for an active spectator, who participates now in its reception phenomena.

“The function of the artist in correcting the unconscious bias of perception in any given culture can be betrayed if he merely repeats the bias of the culture instead of re-adjusting it. In fact, it can be said that any culture which feeds merely on its direct antecedents is dying. In this sense the role of art is to create the means of perception by creating counter environments that open the door of perception to people otherwise numbed in a non-perceivable situation. (...) In an age of accelerated change, the need to perceive the environment becomes urgent. New environments reset our sensory thresholds. These in turn later affect our outlook and expectations.” (McLuhan & Parker, 1969: 241-252).

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Notes

1. Italics by the author.
2. Italics by the author.
3. A zoetrope is a cylinder that reproduces the illusion of motion when it spins and the images are looked through the slits cut in the sides. The effect is based on the “retinal persistence”, because when the human eye sees a series of similar images, and with continual changes occurred with velocity enough -10 or more images by second- the brain interprets them as a real movement, seeming to be continuous.
4. Italics by the author.
5. “The gesture which we would reproduce on canvas shall no longer be a fixed *moment* in universal dynamism. It shall simply be the *dynamic sensation* itself. “Technical Manifesto of Futurist Painting, signed by Umberto Boccioni (Milán), Carlo Dalmazzo Carrá (Milán), Luigi Russolo (Milán), Giacomo Balla (Roma), Gino Severini (París). Italics by the author.
6. Italics by the author.
7. The word “effect” is principal in optic-kinetic art works consideration, because its movement is never real, it is subjectively perceived by the spectator..
8. Italics by the author.
9. (Lucie-Schmith, 1995: 166).

10. The tower was never built because of its expensive cost and the country difficulties at that time, just after the 1st World War and Russian Revolution.
11. Italics by the author.
12. The mobiles, as we have already said, are constructions hanging on the space, representing an unknown and irregular movement. Among the first works of this type, we find the Tatlin's Counter-reliefs (1914) or the Rodchenko's Suspended Constructions (1920), but, undoubtedly, mobiles consecrations were due to Calder's works.