

Non-Euclidean Space, Movement and Astronomy in Modern Art: Alexander Calder's Mobiles and Ben Nicholson's Reliefs

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Abstract. John Keats once wrote that 'there is no such thing as time and space' rather, believing that time and space are mental constructs that are subject to a variety of forms and as diverse as the human mind. In the 1920s through the 1930s, modern physics in many ways supported this idea through the various philosophical writings on the Theory of General Relativity to the masses by scientists such as Arthur Eddington and Albert Einstein. These new concepts of modern physics fundamentally changed our understanding of time and space and had substantial philosophical implications, which were absorbed by modern artists resulting in the 1936 Dimensionist Manifesto. Seeking to internalize the developments of modern science within modern art, this manifesto was widely endorsed by the most prominent figures of the avant-garde such as Marcel Duchamp, Jean Arp, Naum Gabo, Joan Miró, László Moholy-Nagy, Wassily Kandinsky and Alexander Calder. Of particular interest to this manifesto was the new concept of the fourth-dimension, which in many ways revolutionized the arts. Importantly, its interpretation varied widely in the artistic community, ranging from a purely physical four-dimensional space, to a kinetic concept of space in which space and time are linked, to a metaphysical interest in a space that exists beyond the material realm. The impact of modern science and astronomy on avant-garde art is currently a burgeoning area of research with considerable implications to our rethinking of substantial artistic figures of this era. Through a case study of Alexander Calder's Mobiles and Ben Nicholson's Reliefs, this paper explores how these artworks were informed by an interest in modern science.

Did you know that by the mid-1930s Ben Nicholson and Alexander Calder's artwork reflected their shared interest in modern science? The 1930s was a critical developmental time for Nicholson and Calder, with both artists embracing abstraction within their art. The role of science in this transition is critical to our understanding of their working relationship and just as important, significant to an analysis of the conceptual development of their artwork. The implications of modern physics, such as Einstein's Theory of Relativity and its resulting cosmological theories, were by the 1930s interpreted in varying ways by a variety of scientists, philosophers and artists. The ways in which Nicholson and Calder experimented with the new concepts of space and time differed considerably. Through an examination of Nicholson's Reliefs and Calder's Mobiles this paper will examine how a scientific interest in space and time shaped the creation of these sculptural artworks.

Ben Nicholson and Alexander Calder

It is understood that Nicholson and Calder first met in Paris in 1932 during Nicholson's travels throughout France with Barbara Hepworth. During these trips Nicholson became acquainted with a number of substantial modern artists including Jean Arp, Constantin Brancusi, Pablo Picasso, Joan Miró, Alberto Giacometti and Calder. For Nicholson these trips were vital social and artistic networking opportunities that ended up imparting long-term ramifications on his artistic development: through these travels Nicholson met influential painters and sculptors who introduced him to the new artistic trends and intellectual concepts taking hold in Paris.

At the time of their first meeting, Nicholson and Calder shared many similarities, the most significant of which was the influence of Mondrian. Calder visited Mondrian's studio in 1930 and later described how the experience transformed his understanding of abstract art. He wrote, "this one visit gave me a shock that started things. Though I had heard the word 'modern' before, I did not consciously know or feel the term 'abstract.' So now at thirty-two, I wanted to paint and work in abstract"[1]. In 1934, Nicholson also visited Mondrian's studio which he later described as "an astonishing room:... The paintings were entirely new to me ..."[2]. For both artists Mondrian introduced the importance of abstraction and brought to a forefront a serious rethinking of their treatment of form, colour and most importantly space and movement. Although his flat, geometrically abstract paintings at first appear static, Mondrian is known to have argued that the shapes in his paintings have the effect of moving very fast [3]. His novel rethinking of space and movement within these works was in part influenced by the developments of modern physics, particularly the Dutch physicist Hendrik Antoon Lorentz whose writings on physics were of interest to a broad population.

Through Mondrian's influence, both Calder and Nicholson began to implement an abstract approach to their art in the 1930s and at this time also decided to join the group Abstraction-Création. With over forty artists represented by the group, Nicholson and Calder's exposure widened to include many new artists in addition to already familiar ones including Arp, Mondrian, Moholy-Nagy, and Gabo. Many of these artists were avidly interested in modern physics and its applications in the arts. Thus, it is perhaps in part through this alliance that Nicholson and Calder develop their most significant commonality that marks the scope of this paper, that is, a renewed interest in space and time that is informed by modern physics and astronomy. However, to understand the significance of their interest in modern science and the nuances of their conceptual use of it, a brief background on the developments of science is necessary.

The Fourth Dimension, Space, Time and The Dimensionist Manifesto

Interest in space experienced a huge growth among the avant-garde in the early 1930s due to the mainstream popularization of new discoveries in modern science. One of the most significant discoveries, Einstein's 1916 Theory of General Relativity, became widely accepted in the sciences by 1920 and by 1930 non-Euclidean space and the space-time continuum had become concepts commonly explored in popular culture. Many avant-garde artists sought to incorporate this new awareness of space, and the larger universe, in their art. However, it was the 1936 *Dimensionist Manifesto* (Figure 1) that brought these avant-garde artists together, formulating a doctrine, which expressed their artistic interest in modern science as a diverse group [4]. Published by Charles Sirató in French, it bore the signatures of a variety of artists including Calder, Nicholson, Arp, Duchamp, Kandinsky and Miró. In this manifesto Sirató deduced that one common law could explain and relate all modern and avant-garde art. This law, which he expressed formulaically as $N+1$ and explained in the preface to his manifesto, was based on the assumption that all modern art sought to expand itself by an additional dimension. In other words, two-dimensional painting would seek to depict the third-dimension and all three-dimensional sculpture would seek to represent the fourth.

MANIFESTE DIMENSIONNISTE

ch. sirato

Librairie José Corti
6, rue de Clichy, Paris 9e

Le dimensionnisme est un mouvement général des arts, commencé inconsciemment par le cubisme et le futurisme, — élaboré et développé depuis continuellement par tous les peuples de la civilisation occidentale.

Aujourd'hui l'essence et la théorie de ce grand mouvement éclatent avec une évidence absolue.

A l'origine du dimensionnisme se situent également les nouvelles idées d'espace-temps de l'esprit européen (répandues plus particulièrement par les théories d'Einstein) — ainsi que les récentes données techniques de notre époque.

Le besoin absolu d'évoluer — instinct irréductible — qui fait que les formes mortes et les essences expirées sont devenues la proie des seuls dilettantes, oblige les avant-gardes à marcher vers l'inconnu.

Nous sommes obligés d'admettre — contrairement à la thèse classique — que l'Espace et le Temps ne sont plus des catégories différentes, mais suivant la conception non-euclidienne : des dimensions cohérentes, et ainsi toutes les anciennes limites et frontières des arts disparaissent.

Cette nouvelle idéologie a provoqué un véritable séisme et ensuite un glissement de terrain dans le système conventionnel des arts. L'ensemble de ces phénomènes, nous le désignons par le terme : « DIMENSIONNISME ». / Tendance ou Principe du Dimensionnisme. Formule : « N+1 ». (Formule découverte dans la théorie du Planisme et généralisée ensuite, en réduisant sur une loi commune les manifestations apparemment les plus chaotiques et inexplicables de notre époque d'art.) /

ANIMES PAR UNE NOUVELLE CONCEPTION DU MONDE, LES ARTS, DANS UNE FERMETATION COLLECTIVE (Interpénétration des Arts)
SE SONT MIS EN MOUVEMENT

ET CHACUN D'EUX A EVOLUE AVEC UNE DIMENSION NOUVELLE.
CHACUN D'EUX A TROUVE UNE FORME D'EXPRESSION INHERENTE
A LA DIMENSION SUPPLEMENTAIRE, OBJECTIVANT LES LOURDES CONSEQUENCES
SPIRITUELLES DE CE CHANGEMENT FONDAMENTAL.

Ainsi la tendance dimensionniste a contraint:

I. la Littérature à sortir de la ligne et à passer dans le plan.

Calligrammes. Typogrammes.
(préplanisme)

Planisme.

Poèmes Electriques.

II. la Peinture à quitter le plan et à occuper l'espace.

Peinture dans l'espace

« Konstruktivisme »

Constructions Spatiales.

Compositions Poly-matérielles.

III. la Sculpture à abandonner l'espace fermé, immobile et mort, c'est-à-dire l'espace à trois dimensions d'Euclide, — pour asservir à l'expression artistique l'espace à quatre dimensions de Minkovsky.

D'abord la sculpture « pleine » (sculpture classique) s'éventra et en introduisant en elle-même le manque sculpté et calculé de l'espace intérieur — et puis le mouvement — se transforme en:

Sculpture Creuse.

Sculpture Ouverte.

Sculpture Mobile.

Objets Motorisés.

Ensuite doit venir la création

d'un art absolument nouveau:

L'Art Cosmique.

(Vaporisation de la Sculpture,

Théâtre Synos-Sens dénominations provisoires). La conquête totale par l'art de l'espace à quatre dimensions / un « Vacuum Artis » jusqu'ici. La matière rigide est abolie et remplacée par les matériaux gazéifiés. L'homme au lieu de regarder des objets d'art, devient lui-même le centre et le sujet de la création et la création consiste en des effets sensoriels dirigés dans un espace cosmique fermé.

Voilà dans son texte le plus restreint le principe du dimensionnisme. Dédicatif vers le passé. Inductif vers le futur. Vivant pour le présent.

BEN NICHOLSON (Londres).
ALEXANDE CALDER (New-York).
VINCENT HUIDOBRO (Santiago du Chili).
KAKABADZE (Tiflis).
KOBRO (Varsovie).
JOAN MIRO (Barcelone).
LADISLAS MOHOLY-NAGY (Londres).
ANTONIO PEDRO (Lisbonne).

HANS ARP - PIERRE ALBERT-BIROT - CAMILLE
BRYEN - ROBERT DELAUNAY - CESAR DOMELA -
MARCEL DUCHAMP - WASSILY KANDINSKY -
FREDERICK KANN - ERVAND KOTCHAR - NINA
NEGRI - MARIO NISSIM - FRANCIS PICABIA -
ENRICO PRAMPOLINI - PRINNER - SIRI RATHS-
MAN - CHARLES SIRATO - SONIA DELAUNAY -
TAEUBER-ARP.

Fig. 1. Reproduction of the original *Manifeste Dimensionniste* (Paris, 1936). Supplement of the book Tamkó Sirató Károly: *A Dimenzionista Manifestum története* [Charles Tamkó Sirató, *The History Of The Dimensionist Manifesto*], Artpool – Magyar Műhely Kiadó, Budapest, 2010 (in Hungarian). See www.artpool.hu/TamkoSirato/book.html. Image courtesy of Artpool Art Research Center www.artpool.hu.

The manifesto starts by stating “It is, on the one hand, the modern spirit's completely new conception of space and time (the development of which, in geometry, mathematics and physics - from Bólyai through Einstein - is ongoing in our days), and on the other, the technical givens of our age, that have called Dimensionism to life.” The manifesto clearly outlines the goals for different types of Dimensionist artwork. For sculpture, it states: “III. *Sculpture stepping out of closed, immobile forms* (i.e. out of forms conceived of in Euclidean space), *in order that it appropriate for artistic expression Minkowski's four-dimensional space*”. It has been, above all, "solid sculpture" that has opened itself up, first to inner space, and then to movement; this is the sequence of developments: Perforated sculpture; *sculpture-ouverte*, Mobile sculpture; Kinetic sculpture.” Through its use of the more open-ended Minkowski's four-dimensional space, this manifesto allows artists with different understandings of this space to come together in one manifesto.

Unfortunately, shortly after publishing the first manifesto in 1936, Sirató fell ill and was unable to continue forward in promoting the movement. In consequence, the manifesto lost its traction; currently the manifesto is largely unknown and often left out of art historical discussions. Yet, it is not the success of the manifesto itself that is of importance here, but rather the manifesto's success in uniting all these artists, and putting into words their intention and desire to incorporate modern science into their artwork. In other words, it was not so much the power of this manifesto to change the route of art or of a particular artist or artwork but rather to document an interest in modern science by artists of this era.

Mobiles and Reliefs

The remainder of this paper sets out to examine how these ideas inform the work of Calder and Nicholson. Calder recalled that from a very young age he developed a deep interest in astronomy, which led him to read about the stars and deep space and to frequent planetariums in Paris [5]. This is an interest he credits in the development of his abstract sculptures, particularly his early series of Universe and Mobiles. In his early sculptural series of Universes, Calder used thin wires to explore abstracted and at times intersecting spatial planes, sometimes having one sphere within another or several spheres overlapping in the same space. As its title suggests, this sculptural series reflected Calder's interest in the possibilities of astronomical space, particularly the spatial relationships of cosmic bodies in outer space. As Calder's work progressed, he became increasingly interested in the understanding of four-dimensional space as space-time and began to incorporate kinetic movement into his sculptures [6]. The resulting sculptural series of kinetic Mobiles move according to the air currents in their surrounding environment. Through the introduction of movement within the Mobile, Calder heightens the relationship between the sculpture and its space. He writes, “Nothing at all of this is fixed. Each element able to move, to stir, to oscillate, to come and go in its relationship with the other elements in its universe. It must not be just a fleeting moment but a physical bond between the varying events in life” [7]. This physical bond between time and space that Calder refers to is informed by his interest in the movement of planets in outer space and the new understanding of the fourth-dimension of space-time.

By the mid-1930s, Nicholson and Calder had become quite familiar with one another's work, with one of Calder's *Mobiles* becoming part of Nicholson's collection. However, Nicholson and Calder's approach to science differed in significant ways. Calder's understanding and use of space and movement was informed by his scientific interest in astronomy and educational background in engineering. Nicholson, however, did not have the same background in science as Calder, yet, he was still struck by Calder's abstract *Mobiles*. It was this exposure to Calder, in addition to the work of Calder's close friends Miró and Arp that Nicholson later claimed made a lasting impression on him. “The particular value to me of the ‘Miró, Calder, Arp’ contribution of the 1920s but exh. in Paris in the 1930s was a new *freedom*. Miró- freedom of ptg.; Calder- of *Mobiles*; Arp- of free sculptural forms on a base: in fact a kind of liberation”[8]. What type of freedom or liberation Nicholson is referring to in this quotation is a significant question and one that perhaps is founded in the use of science as an avenue to seek freedom from the contingencies of the material world; as all

three artists were interested in varying degrees in the influence of modern physics in the development of their artwork. Perhaps it is this freedom that Nicholson admired in Calder's *Mobile* form, a type of sculpture that is freed from solid form, and that through its use of abstract geometric shapes and rhythmic movements attempts to reflect the movement of the cosmos.

For instance, let us turn our attention to Nicholson's White Reliefs produced between 1934-1937; this sculptural series emphasizes the relationship of abstracted spatial planes through the carved out layers of the wooden board. In this work, Nicholson creates a variety of effects ranging from projection to recession as well as separateness and interaction amongst its elements. This in many ways is reminiscent of Calder's early works from the Universe series in which wires outline and establish interacting planes of space. Further, within the 1930s both Nicholson and Calder's use of abstract geometric forms signifies a move in the direction of an international abstract style, such as that of Mondrian. In fact, in his monograph on Nicholson, Norbert Lynton suggests that the floating circles of Nicholson's early reliefs are a reference to the floating spheres of Calder's *Mobiles* at this time. Through a photograph of Nicholson's studio, we know that Nicholson placed one of Calder's *Mobiles* next to one of his White Reliefs, suggesting a relationship between the works. The use of circles and spheres by both artists very well could have an astronomical reading, as Calder openly spoke of his spheres as cosmic forms. Importantly, at the time of making these reliefs Nicholson frequently quoted Sir Arthur Eddington, the British astrophysicist whose observation of the 1919 solar eclipse brought Einstein's Theory of Relativity into the mainstream. In this context, it is telling to notice that Nicholson's circles are quite reminiscent in form to Eddington's famous photograph of the solar eclipse and that they appear to mirror one another in their circular shapes and implementation of light and shadow. It's quite possible that Nicholson's White Reliefs represent a spiritual universal realm that exists beyond the material world, an idea examined in Eddington's philosophical writings on modern physics and a concept that Nicholson had previously explored through other avenues such as Christian Science. By pairing Nicholson and Calder in this context we reveal a foil, where the interpretation of the same material, of interest to both artists, varies in revealing ways within their artwork.

Throughout the 1930s Nicholson and Calder maintained a close relationship; Calder travelled to England to exhibit with Nicholson in the 1936 exhibition *Abstract + Concrete* and participated with him in the 1937 catalogue of constructive art entitled *Circle*. Both *Abstract + Concrete* and *Circle* brought together many Dimensionist artists and *Circle* even included a prominent essay on art and science by J. D. Bernal titled "Art and the Scientist." As this paper has shown, it is through examining the nuanced ways in which these scientific ideas were implemented into art that we can begin to understand the reason the avant-garde was attracted to modern science. The examination of Nicholson and Calder reveals that this reason is twofold; modern physics was revolutionary in altering our understanding of space, time and the greater universe. Just as important, it allowed for various philosophical interpretations, which reflect the personal underlying interest of the artist. It is this freedom of ideas and interpretations that modern physics provided the avant-garde and perhaps this freedom that joins the artwork of Calder and Nicholson.

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