



Origins and development of Kinetic Art



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The date 1860 is a good point of departure for a study of movement in the plastic arts for several reasons.

It was in the 1860s that the new way of seeing which later became known as Impressionism contributed its first significant works. This period also marks the first stage in the 'isolation' of sense data – colours, lines, tones and eventually movement – that was to be the indispensable stage in the preparation of a pure or abstract art.

*In the scientific field, Fechner's *Elemente der Psychophysik* appeared in 1860. In the May of the same year, Herbert Spencer wrote his *First Principles* and the new theory of evolution was born. From this point onwards, there is a kind of chronological parallelism in the way in which the arts and the sciences evolve, or rather mutate. The date 1860 is also highly significant in the history of photography: witness the lively interest aroused by the photography of objects in movement and by stereoscopic vision, which was later to have important repercussions on cinematography.*

If the historical aspect is relatively clear, it is much more difficult to set boundaries to this subject from the purely logical point of view. There seem to be six different ways of envisaging movement which are of interest to the aesthetician.

First of all we have the element of movement in the work: this element that can be perceived could be called the 'image' of movement in the widest sense, extending further than the notion of 'representation'. Then there is the movement of the artist's hand, and of his whole body: the way in which these are involved closely affects the genesis of the work, and perhaps even its structure. Thirdly, there are the eye movements of the spectator, who registers the successive perceptions and finally comes to a judgement of aesthetic value. Obviously these movements can be subordinated to the actual movement of the spectator himself, as in the case of a walk around a sculpture or within an architectural monument.

There are three other problems involved in the logical classification of movement: the relationship between movement in the plastic arts and movement in the other arts, the relationship between physical, psychological or biological movement and movement in the arts in general, and finally the highly contemporary problem of real movement in the plastic arts.

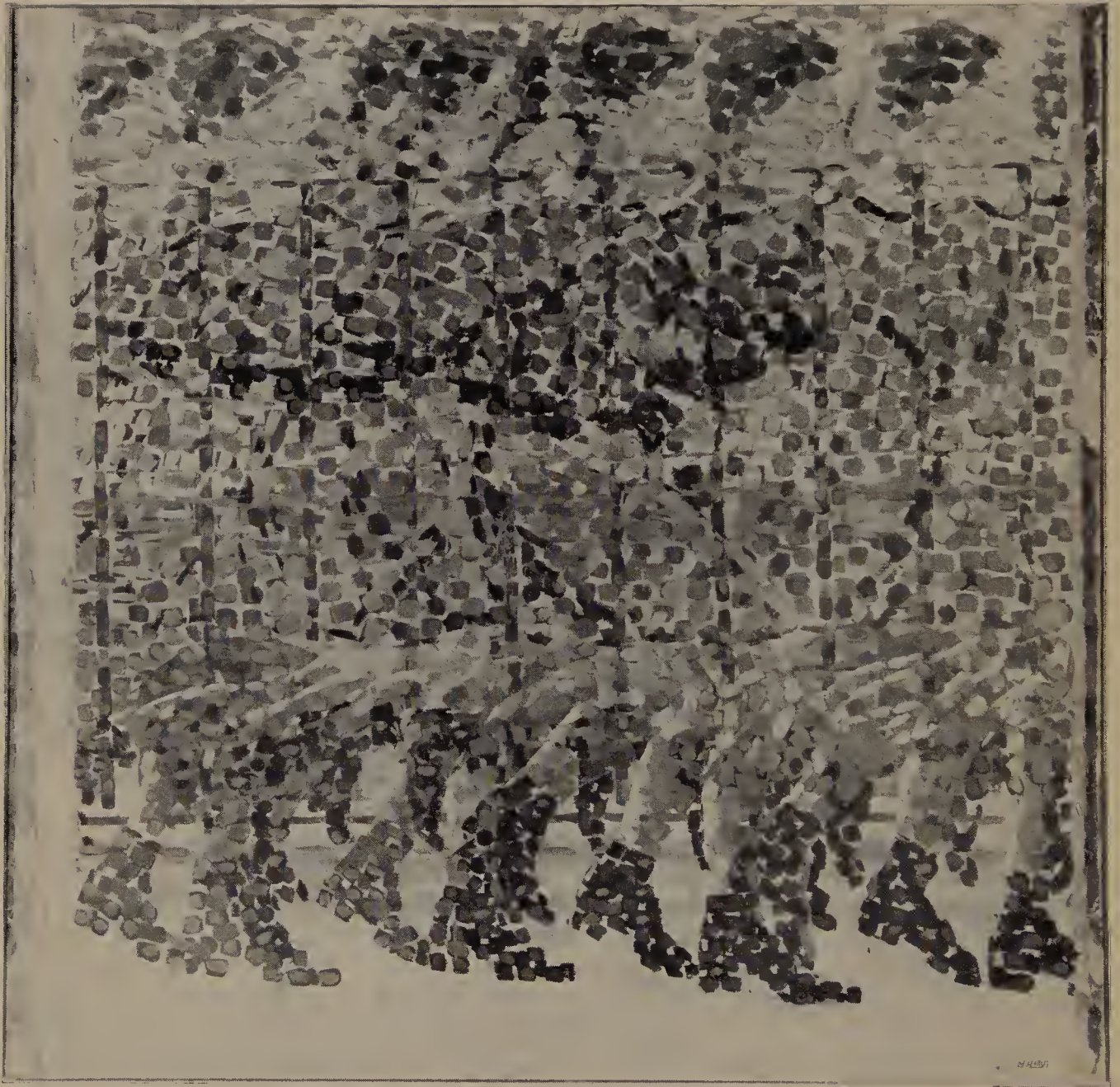
This study will be confined as far as possible to the analysis of movement in the work of art, but it will necessarily involve the treatment of spectator movement up to a certain point, especially where it is a question of experiencing the mobility

of the work and identifying with this aspect. Only incidental reference will be made to the difficult problem of eye movements, and the problem of the artist's gestures, since both of these topics require a completely separate study. But there will be some consideration of the three categories which were mentioned above: analysis of works in real movement, in particular, will occupy a substantial part of the book.

As far as the different arts are concerned, this study is devoted almost exclusively to painting and sculpture (and in a lesser degree to the graphic arts). These are treated in close conjunction, and it is the main intention of the author to show how the evolution of the use of movement during the period results in an entirely new category of art, which is frequently termed 'kinetic'. In this new category, the traditional division between the plastic arts loses a great deal of its relevance. Although the other arts are formally excluded from this study, there are occasional references to the cinema, music, drama and choreography in the historical section.

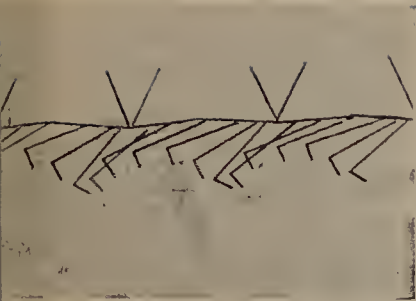
FRANK POPPER

Part 1





1 Movement and the Impressionist generation



The first part of this study centres upon the conflict between subjective and objective movement which renews itself in every generation – or did so, at any rate, until the early 1950s, when the element of movement became autonomous and so resolved the dilemma. Our starting point for this investigation is around the year 1860, when the revolutionary concerns of the Impressionist group first became apparent.

The Impressionists dealt above all else with visual data, and consequently with movement as an objective phenomenon. Among their most frequent themes were horses, railways and railway bridges, barges, sailing boats, crowds, flags, smoke, clouds, water and its reflections, and, of course, dancers. These subjects can be traced back through history, and related in particular to the immediate predecessors of the Impressionists: Turner, Jongkind, Boudin, Courbet, Corot and even Ingres and Delacroix. But the various threads were drawn together quite distinctively in the personalities, aims and ideas of the Impressionist generation. By examining a few selected works by Manet, Degas, Monet, Pissarro, Renoir, Sisley, Cézanne, Guillaumin, Bazille and Berthe Morisot, we can gain some idea of what has been called ‘the progressive conquest of light’ taken as the major theme of Impressionism.

● Manet – Impressionist vibration and conventional movement

Manet’s position in relation to Impressionism proper is rather hard to define. If we choose three pictures at random from the time at which his style was emerging, and analyse them summarily from the point of view of movement, we come to realize that Manet’s art, while remaining close to the classical and even academic manner, contributes in certain ways to the development of the new style – and in particular to the very first stages of the liberation of the element of movement in painting.

Le Ballet espagnol, which dates from 1862, clearly takes as its theme the art of choreography depicted through the classic medium of character attitudes. But the procedure which Manet has used conveys a new sense of movement. He makes contour coincide with gesture in such a way that the lack of equilibrium in the subject matter is strongly accentuated. The same thematic and plastic procedures are to be seen in the famous *Déjeuner sur l’herbe* of 1863, in which conversation and weekend activity as an expression of movement combine with

Giacomo Balla
La Bambina che corre sul balcone, 1912

the major preoccupation of Impressionism, the open air – represented by the nude in the landscape. Here we already have a new interpretation of light, and the spots of colour perform an entirely new function.

Finally, in *L'Exécution de l'empereur Maximilien* of 1867, a picture which hardly seems impressionistic except in the sense in which the word could be applied to Velasquez, the different motifs of movement – rifles, smoke etc. – convey in a dramatic and, at the same time, visually objective way the flight of the bullets and the act of execution. The plastic procedure is no different from that of the Renaissance (Uccello, Piero della Francesca) – except for the blurring of the atmosphere which dominates certain parts of the picture, particularly on the left. This is also the direction in which our eyes are led by the line of the rifles, a tendency reinforced by the diagonal counterpoint of the rifle which an officer (probably General Dias) is in the process of reloading.

● Degas – a modern collection of themes involving bodies in movement

Degas goes further than Manet in his investigation of subjects involving movement. His favourite themes coincide in at least two respects – race-horses and subjects from modern life – with those of the Impressionists. But it was his remarkable variations on the theme of the dance, pursued over several decades, that influenced subsequent painters most considerably and gave the greatest impetus towards the popularization of the Impressionist vision. In expressing himself principally through the arabesque, Degas also stands at the head of a tradition which leads to Toulouse-Lautrec and the artists of the Jugendstil.

Jeunes Spartiates s'exerçant à la lutte, a painting by Degas which dates from 1860, belongs recognizably to the lineage of David. But the kinetic theme of nudes in a landscape which was characteristic of the early 1860s is brought out in the placing of the bodies and the use of dramatic gesture, both of which combine to suggest an interpretation of youth in movement.

Degas' two favourite themes, the horse and the dancer – which were to dominate his work as a painter and as a sculptor – appear together in a picture dating from 1868 which is entitled *Mademoiselle Fiocre dans le ballet de la source*. The relationship between Impressionism and the academic manner in Degas' work here becomes manifest in the juxtaposition of the dancer at rest, the horse and the reflections of light on the water. The combination of motifs results in a quality at once calm and dynamic that is a frequent feature of his style. Another picture from this year, *L'Orchestre de l'Opéra*, introduces musicians in the foreground as well as the glimmering presence of dancers in the background – an allusion to the correspondence of different forms of movement in different arts expressed in the Impressionist manner.

Degas' statuettes of horses at the trot and at the gallop, which were spread over the years 1865 to 1881, contain elements which appear to derive from Géricault and Delacroix. However they are delightful studies of an almost photographic realism. Exactly the same applies to the pictorial studies of racing scenes which Degas produced in abundance. *Faux départ* focuses attention on a particular moment, while *Voiture aux courses* (1873) displays the horses in a striking perspective as if fixed by a snap-shot. In *Aux Courses: deux personnes*

parlant à un jockey, Degas' light and misty touch brings out the changing effects of light on the racecourse: the similarly named *Aux Courses: jockeys amateurs* is more directly concerned with the suggestion of movement, through a technique which recalls cut-outs and superimpositions. Another work, the *Jockeys* from the Vollard collection, is also concerned with this cut-out effect: forms and colours are directly juxtaposed and the accents of black which divide them increase the impression of dynamism. Finally *Chevaux de course* (1884), which takes as its theme the actual movement of the horses, successfully integrates this movement into a background of landscape. The way in which the movements are conveyed by successive phases in a rhythmic composition was prefigured in *Avant le départ*, a superb picture dating from ten years before.

Throughout his life Degas was attempting to give his own personal interpretation of the phenomenon of movement. He made use of photographs to add a kind of authenticity which could not be detected by the naked eye to the feeling of satisfaction which he both felt and transmitted in the consideration of movement. This becomes clear in a letter which he wrote to Henri Rouard. 'I am still at Paris. . . One must continue to look at everything, small boats and large ones, peoples' stirrings on earth and land as well. It is the movement of things and people which provides distraction and even consolation, if one can be consoled in such unhappiness. If the leaves on the trees did not move, how sad the trees would be, and how sad we would be as well! There is a type of tree in the garden of the house next door which stirs at the least breath of wind. Well, I may be in Paris, in my almost dirty studio, I can still that say this tree is delightful. . .'

The years 1872 to 1874, which were crucial in the development of Degas' pictorial technique for expressing movement, saw at the same time a high point in his series of racecourse pictures and a first stage in his subtle representations of choreographic movement. With *La répétition de danse au foyer* the figures of the dancers and the curve of the staircase combine to create an effect of correspondence between the two forms of movement. In *Danseuses vertes* the attitudes of the two dancers are emphasized by the presence of bursts of colour. Degas was to carry over into his wax statuettes of ballet dancers the technique of suggesting movement by fixing the human figure in extreme positions.



2 Eadweard Muybridge
'Chronophotography' of a horse at the gallop c. 1878

There are several reasons for regarding Degas as a precursor of the cinema. The point is not whether his pictures take the experiments of Marey and Muysbridge as their point of departure. Germain Bazin has shown that Degas uses a characteristic cinematographic procedure in several of his works. First of all, he makes use of 'mobility of scale and plane' – in *Le Ballet de Robert le Diable*



3 J.-E. Marey
Chronogramme, c. 1885

(Victoria and Albert Museum) the various planes are fused and in the pastel *Chanteuse au gant*, one overall plane is employed. Secondly, he uses 'spatial mobility', as in the *Salle de danse* (Jeu de Paume Museum, Paris), where the kind of multi-dimensional perspective which we associate with the cinema is set up through the obliqueness of the viewing angle and the dramatic division of space. Thirdly, he is particularly interested in 'successive' images, as in the series *Danseuse tenant son pied*, where the same action is followed from one work to another, and the *Femme aux chrysanthèmes*, which involves a decentralized type of composition very close to that of some photographers.

We must admit that Degas was preoccupied above all with interpreting his chosen themes, in particular those of the racecourse and the ballet. Yet it is possible to conclude at the same time that he was intimately concerned with the purely plastic problems which arose from his distinctive use of movement and light vibration.

● Monet – photography and landscape painting

It has been suggested that: 'If the eye of Monet was apt to grasp the least variations in light effects, that of Degas was acute enough to grasp the slightest nuances in movement.' This distinction reveals clearly the difference in the aesthetic aims of the two painters. But we must not overemphasize this difference in approach. Degas and Monet held one extremely important feature in common: both relied on a direct *retinal* impression for their experience of variation and movement – that is to say, upon an object or natural phenomenon which *came from outside*. Both must therefore be regarded as interpreting movement in an objective way.

Of course this approach can be related to the indirect influence which photography exercised upon Degas and Monet, as with the majority of the painters of this generation. Photography had a double significance, since it provided a model for imitation and at the same time challenged the painter to go further. The famous article on the relationship of photography and landscape painting which had appeared in the *Spectator* in 1842 had prophesied that 'only landscape painters, in imitating the colour of their surroundings and atmospheric effects, will be able to resist this formidable rival (photography), an emanation of nature herself. That is why they will have to apply themselves more than ever to the study of light and its effects on the tints of objects and the general tonality of the subjects represented, and attempt to render impressions of the movement of living creatures, foliage, water and clouds.'

Already at the stage of his work in the Gleyre studio, and especially in his Argenteuil period, Monet – with the painters of his entourage – can be termed 'visionary and cosmic, haunted by the movement of waters and the wheeling of light'. At the same time the painters of the Swiss academy and those of Pontoise, grouped around Pissarro, were working in a more stable vein, more 'earthy and bucolic, careful to take account of the construction of their pictures and very faithful to the spirit of Corot'.

The way in which Monet extended and developed his plastic treatment of light and light vibrations can be seen from a consideration of a few pictures in suc-



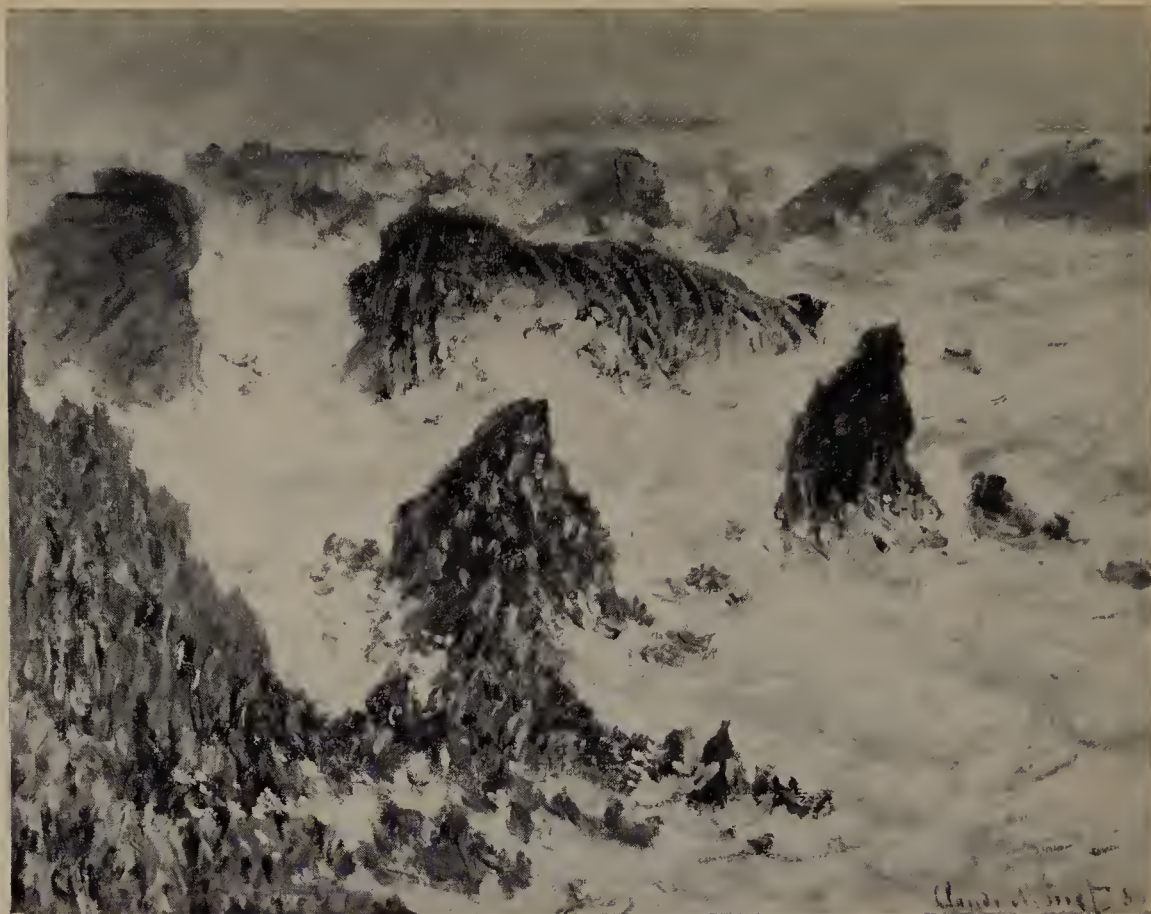
4 Edgar Degas
Danseuse

cession. Already in 1865, with *Le Pavé de Chailly-en-Bière* (Ny Carlsberg Glyptotek, Copenhagen), the motif of the forest road leading towards an ill-defined horizon brings into play the effects of light on a whole range of different textures. In a picture dating from the next year, *Le Déjeuner sur l'herbe* (Hermitage), Monet is beginning to represent the filtering of light by the plastic procedure of small brush-strokes, which foreshadow the vibrant colour effects of his later work. The composition is also extremely unusual, suggesting the influence of Japanese prints as well as that of photography. All these characteristics recur in *Les Femmes au jardin* (Jeu de Paume), which dates from 1866–7. But there is also a sudden brightening which seems to prove that Monet's discovery of new methods of expression took place in a rather sudden and dramatic way.

The pictures which Monet completed during this period refer to the central preoccupations of Impressionism. Earth, water, sky and human figures are fused together by the operation of light. Figures, gulls, barges, boats, sailing ships, smoke, waves, clouds and rainbows retrace the life of the sea in calm or agitated movements. Monet's plastic procedures range from a style involving the juxtaposition of strong touches of pure colour – still connected with traditional realism – to a final stage where wave and cloud seem to become one. In his wonderful picture, *La Grenouillère* (1869), he passes beyond the barges, the human silhouettes and the reflections on the water to a pure vibration which engulfs man and the elements. This impression of overall vibrancy is obtained through the use of streaks of pure colour.

There are four main landmarks in Monet's development as a painter. First of all, in a picture like *Impression, Soleil levant*, the element of vibration is extended to cover all natural phenomena: in plastic terms, this innovation is marked by the juxtaposition of complementary colours – orange and green in this case – which unify in a soft overall atmosphere that covers the whole area of the picture. Secondly, there is the renewal of Monet's vision which took place in the Argenteuil period, when the movement of water, clouds and other features of the landscape mingled with such passing features as the smoke of barges, the flapping of sails and the characteristically modern motions of the railway train. In *Régates par temps gris à Argenteuil*, Monet achieves technical mastery over the theme of movement, allowing the sailing boats to merge into the vibrant atmosphere.

Another stage is reached in *Le Bateau-Atelier sur Seine* (1875), which demonstrates the remarkable swiftness of Monet's touch. The same technical expertise is apparent in *Gare Saint-Lazare* (1877–78), which also illustrates the artists' interest in the modern theme of mechanical mobility. But the final stage in his long investigation of the impressions caused by the fleeting instant comes with his series of studies of the facade of Rouen Cathedral, and his remarkable *Nénuphars*. The light on the facade of Rouen Cathedral recalls in temporal or kinetic terms the way in which the passing moment is reflected in the moulding of architectural mass by colour and light, while the immateriality of the lilies on the water is conveyed by a minute and almost hallucinatory treatment of surface. If we admit that the essential feature of Impressionism is the technique of isolating the elements of colour, light and movement, then Monet is clearly one of the most significant pioneers in this revolutionary development. As it has been stated, he 'exalts and divides pure colour with unbelievable boldness, not merely



to make the most of the picture surface – a major preoccupation for any painter – but also to express in concrete terms the transparency and vibrancy of space, the bright revolutions of the sun, and all the movement of light which is the continual feast and life of nature.’

We must, however, modify our view of Monet as the direct interpreter of natural phenomena to leave room for the profound influence which Japanese art exerted upon his work. More than any other painter, Monet derived inspiration from nature – from the play of light on water, on a cathedral facade or on aquatic plants; but he also owed much to Japanese artists such as Hokusai, Utamaro, Hiroshige, Kiyonaga and Moronobu, whose vogue in France began around 1862, and of course to European painters such as Turner, Jongkind, Boudin and Pissarro. If Monet’s original discovery of the Tokugawa objects, with their powerful enhancement of vegetable life, left its mark upon his expression of movement in plastic terms, his later series of *Nymphéas* suggests that he was by no means insensitive to the wider context of Japanese art, as displayed to the French public in the Universal Exhibition of 1900.

If Monet is the painter of the Impressionist generation who was most successful in exploiting the types of vibration which arose from physical data perceived by the painter’s sensitive and analytic eye, there were other painters – in particular, Pissarro, Sisley and Cézanne – who investigated the possibilities of movement in connection with their own artistic preoccupations. There is no room to

follow the careers of each of these artists. But mention should certainly be made of Sisley's fascination for the sky, which he explained in these terms to the critic Tavernier towards the end of his life: 'It not only helps to give depth by its planes (for the sky has planes just as land has), but also provides movement through its form, and its arrangement, in relation to the general effect or composition of the picture.' Sisley went on to exclaim: 'Is there anything more magnificent and more full of movement than what takes place frequently in summer – I mean, the blue sky with its fine white strolling clouds. What movement! what pace, don't you agree? it gives the same effect as the waves when one is at sea, it exalts and carries one away.' We may also add that Cézanne, who was concerned from the very start of his career with questions of theory, displayed even during the Impressionist period a preoccupation with duration rather than with successive moments of time.

● Subjective movement in Redon

The Impressionist period also saw an expression of movement of an entirely different kind, which derived from the innermost recesses of the human personality and foreshadowed research into the unconscious. This was to be found in the work of Odilon Redon, a member of the same generation as Degas and Monet, but with closer affiliations to the later movement of Expressionism. Despite Redon's late development as an artist, it is possible to compare his use of movement in both stylistic and chronological terms with that of the Impressionists – particularly in the case of his graphic works.

It is in the works labelled 'Les Noirs', dating from 1869 to 1879, that Redon consciously adopts a different path from that of the Impressionists, and develops his own plastic and thematic use of movement. This departure had its origin in Redon's early experience, as he has indicated in a book entitled *A soi-même*: 'My father often used to say to me: "Look at those clouds. Can you see, as I can, the changing forms there?" Then he would show me, in the shifting sky, apparitions of bizarre, chimerical and marvellous beings.' Redon continues: 'Much later – I dare not say up to what age for you would regard me as immature – I passed hours, or rather the whole day, stretched out on the ground, in the deserted parts of the countryside, watching the clouds go by and following, with enormous pleasure, the fairylike glitter of their fleeting transformations.'

Redon shows a rare degree of lucidity in assessing the possibilities of utilizing movement for aesthetic ends. 'There is the static element and the dynamic element. Beauty can be calm and represent restfulness, or it can represent movement and life.' He is aware of the limitations in the use of contour and line. 'I feel only the shadows, and the elements that are clearly in relief; every contour being, without any doubt, an abstraction.' But he is responsive 'to the stimulus of line on its own – as to the charm of chiaroscuro'.

Once the elements in this plastic conflict are laid down, there is free rein for the rhythmic interplay which lies at the basis of Redon's art. 'The whole of my art is limited simply to the resources of chiaroscuro,' he maintains, 'and it also owes much to the effects of abstract line, that deep-rooted instrument which acts directly on our inner awareness. The art of suggestion can achieve nothing

without its unique recourse to the mysterious interplay of shadows and the rhythm of lines conceived in the mind.' In Redon's case this area of suggestion is dominated by dream and melancholy – a melancholy which, like Dürer's, is perhaps plastic in origin, since it exists 'on the confines of thought' and can be 'written solely in terms of line with its mighty powers'. Redon's 'art of suggestion' is in fact a premature form of Symbolism, which relies strongly on the arabesque. 'Imagine arabesques or various forms of meandering line winding themselves out not on a plane surface but in space, with all that is conveyed to our inner awareness by the deep indeterminate margins of the sky; imagine this interplay of lines carried forward and combined with the most diverse elements, including that of the human face; if that face has the particular features of the one which we meet every day in the street, with its fortuitous, immediate and wholly real truth, you will have the usual combination of a large number of my drawings.'

Redon reveals a profound knowledge of the conscious and unconscious elements in art when he states: 'We cannot move our hands without causing a corresponding movement in the whole of our being, in obedience to the laws of gravity. A draughtsman knows that. I believe that I have obeyed these intuitive promptings of instinct in the creation of certain monsters. They do not reveal, as Huysmans has suggested, the aid of a microscope in confronting the frightening world of the infinitely small. No. In making these creatures I was preoccupied with the more important task of organizing their structures.' Whether we accept Redon's disavowal of the microscope or not, it is certain that he has been influenced in this direction by the work of such artists as Dürer, Goya, Grandville and Gustave Moreau.

The theme connected with movement which plays the largest part in Redon's work is that of flight. Originally, and particularly around 1865, he was preoccupied with the frenzied activity of battle scenes and the motion of horses. His oil painting *Apollon*, which dates from around 1900, represents the final culmination of a research into movement which tended more and more towards the fantastic.

The plastic methods which Redon chose to underline the motifs of movement derived from the unconscious were directly related to the techniques which he preferred to use: charcoal, Indian ink, black-lead and lithography. Anyone who runs through a sequence of Redon's graphic works will see how he has made use of two types of movement – the one a product of contour or linear tension and the other a kind of unstable chaos resulting from a range of tonal values that extends from a troubled white to an almost absolute degree of blackness. Movement in Redon's work is inseparably linked with graphic technique and the choice of materials. But its particular importance lies in the fact that here, for the first time, the image of 'scientific' movement is challenged in a context which relates to modern psychology.

● Rodin – metamorphosis

From the point of view of movement, Rodin the art theorist interests us almost as much as Rodin the sculptor. This artist has left behind a great number of views on the aesthetic problem of movement, as it applies to both painting and

sculpture. A contemporary of the Impressionists, he felt the need to remain faithful to natural appearances. But he held that the mind was also a part of nature, and explained his working method in the following terms: 'I take down on the spot the movements which I observe.' Rodin's classical preoccupation with the model in fact concealed an element of complete novelty – a desire to coordinate his expression of movement with the effects of light. 'In my art,' he explained, 'the illusion of life is obtained by good modelling and by movement. Those two qualities are like the blood and the breath of all fine works.'

Rodin's written works contain several analyses of pictorial movement, such as those which deal with Delacroix' *Barque de Don Juan* (Louvre) and Watteau's *Embarquement pour Cythère*. In the first he interprets the movements as mainly symbolic, in the second he makes a distinction between the lengthy dramatic enactment and the gestures of the passengers. Rodin also makes a minute analysis of certain sculptures, such as Barye's *Les Fauves*, Carpeaux' *La Danse* and Rude's *La Marseillaise* and *Le Maréchal Ney*. In discussing the last of these, he states



6 Odilon Redon
Angélique et Roger, 30 cm x 27 cm.



7 Auguste Rodin
Les Bourgeois de Calais, Bronze (plaster
from 1886)

a particularly important point: 'The movement of this statue is simply the metamorphosis of an initial attitude... into another... There you have the whole secret of gesture interpreted by art.'

In fact Rodin claims to see the separate phases of an action in the single sculptured figure, which the spectator must interpret according to the intentions of the artist. 'The maker of the statue compels, so to speak, the spectator to follow the development of an action through a person. In the case which we have just chosen, the eyes are bound to rise from the legs to the raised arm and as, in the course of their journey, they come across different parts of the statue represented at successive moments, they experience the illusion of seeing the movement draw to completion.'

Rodin has also analysed his own works. He has left technical descriptions of the movement in *L'Age d'airain* (1877), *Saint Jean-Baptiste* and the *Bourgeois de Calais*, which was begun in 1884 and finished in 1894. In the last work, there is a kind of order which represents the varying degrees of heroism in the persons represented. The arrangement of the figures leads us from Eustache de Saint-Pierre, past the figure with the key, to one man who is walking quickly and another who is gripping his head, and finally to the one with his hand in front of his eyes and the youth. It is interesting to recall that Rodin anticipated one of the most important aspects of contemporary research into movement when he arranged for the placing of this particular work. The 'Burghers of Calais' were to have been bolted, one after the other, directly on to the flags in front of the Hôtel de Ville at Calais, so that 'the present inhabitants of Calais, who would almost have rubbed shoulders with them, would have had a stronger sense of the traditional solidarity which linked them to these heroes'. What Rodin described to Paul Gsell as potentially 'a powerful impression' seems to us very close to the present goal of 'spectator participation'.

Two of Rodin's main preoccupations can be classed as 'kinetic': his desire to interpret movements and his search for 'the science of animating marble' and bronze. Both of these qualify him to be classed as an innovator. For Rodin, 'movement is the transition from one attitude to another' – a true metamorphosis.

● Intellectual and technical development around 1860

The great events in the physical, biological and psychological sciences around the year 1860 point to the importance of the 'dynamic' element at this crucial stage. Darwin's *On the Origin of Species* dates from 1859. Spencer's *First Principles*, which were at the centre of Darwin's theory of evolution, were to be published in the following year. 1860 also saw the publication of Fechner's *Elemente der Psychophysik*, while R. H. Lotze, a follower of Leibnitz, composed his *Mikrokosmos* between 1856 and 1864.

It should be noted that the physicists and philosophers who originated these new theories were in general older than the artists whose work we have been considering. Darwin was born in 1809, Spencer in 1820 and Lotze in 1817. We may therefore decide in principle that the physicists and philosophers of the generation born around 1820 should be discussed in relation to the artistic generation born twenty years afterwards. This conjunction can also be made

in the case of Auguste Comte, the founder of Positivism, who was born in 1798 and exerted great influence in the 1860s through the mechanical and mathematical notions contained in *Cours de Philosophie positive*. Comte saw the historical development of mathematics in terms of a transition from concrete to abstract, and held that the major principles of mechanics – equality of action and reaction, inertia etc – were the result of *observation*. It therefore followed that a great number of the properties of movement which had at first been determined by direct methods could be transformed into demonstrable theorems.

Mention has already been made of the physiologist Marey, who clearly influenced the Impressionists and Post-impressionists by his teaching and his scientific writings as well as by his photographic work which led to the development of cinematography. Marey's *La Machine animale* and *Du Mouvement dans les fonctions de la vie* both contained a large number of statements which lent themselves to partly scientific and partly artistic discussion on the subject of movement. J. B. Pettigrew's *Animal locomotion* also belongs to this framework of parallelism between physiology and artistic expression.

From a philosophical point of view, we can say that the years 1860–70 saw a return to Kantianism after the rout of the Hegelian school in Germany. New versions of vitalism and dynamism began to make their way.



2 Movement in the Post-impressionist era

It was in the years around 1890 that there began to be a genuine interaction between works of art and scientific or intellectual preoccupations. The artists born around 1860, who produced their first work of importance roughly between 1887 and 1894, were aware of the initial investigations of Théodule Ribot, who had published an article on the psychological importance of movement in 1879, and they also knew of the theories of David Sutter, who had classified 167 scientific principles specially for artists in an article published in the following year. The thesis of Paul Souriau on the perception of movement, which was written in Latin, dates from 1881. The same author's *Esthétique du mouvement* followed in 1889, which was also the year of Bergson's *Données immédiates de la conscience*. If we shift our emphasis to the study of colour, we find that this was the period when Ogden Nicholas Rood's work on 'Chromatics' and Chevreul's theories of colour contrast first began to exercise a perceptible influence on painters. And this was also the stage at which the experiments of Muybridge and Marey, both of whom were born in 1830, reached their apogée.

The painters and sculptors who succeeded to the heritage of the Impressionists continued their investigation of movement and took it one stage further. The Impressionists had taken observation of nature – whether objects or human beings – as their point of departure. The next generation was to apply scientific method to the same fundamental problems.

● Objective movement – Seurat and the scientific study of colour

The art of Seurat bears a direct relation to scientific theory. But this relation is not easy to define. As far as movement is concerned, the technical and scientific influences are apparent chiefly in the drawings: they can also be traced in Seurat's method of setting out theories of colour. The influence of photography – in particular, the 'chronophotographie' of Marey – can clearly be sensed.

Seurat's interest in movement increased towards the end of his life. At the beginning of his career he tended to concentrate on a type of 'fixed' movement which is perhaps akin to that of photography. *Le Chahut*, which dates from 1890, shows us the theme of the dance treated in such a way as to 'paralyse' the movement. 'There remains only one movement,' Germain Seligman suggests, 'as if the music had been suddenly interrupted and the dancers were waiting for the next beat to put their feet back on the ground.'

Later in his life, Seurat made use of a new type of circular rhythm. ‘The construction of *Jeune femme se poudrant*,’ writes the same critic, ‘comprises circles and ellipses, which bind together the brightest and most important points on the canvas. In *Le Chahut* the rhythms are on the surface, parallel to the canvas: in *Le Cirque* there is movement in depth, and the characters fall with a circle.’

André Lhôte has stated that ‘composition is the art of uniting in a coherent mass of colour the contradictory elements which tend, in everyday life, to separate one from another and become fragmented under the influence of light and movement.’ He elaborates this point in relation to the ‘engineers of painting’ – Brunelleschi, Uccello, Piero della Francesca. ‘In the pictures of these painters (to whom we must add Rubens, Tintoretto and several others who are less austere in appearance). . . you feel, behind the pictorial subject, that something secret and vastly important is going on: the rhythmic articulation of the parts.’ Lhôte sees Seurat as the modern representative of this tradition, which he continues to describe in the following passage. ‘A carefully mounted mechanical system allows its beating and rumbling to be sensed deep down below the rustling of the surface. The spectator is unconsciously affected by this architecture in motion which disturbs him without him being able to decipher the complex rhythm. It is like the way in which the mechanics of breathing and blood circulation lie hidden behind the epidermis of every living form.’

But it was Seurat’s intensive exploitation of the theories of colour which he found in the Impressionists that allowed him to develop a truly scientific use of movement. He responded to the Impressionist vision – with its vibration of small strokes of colour and its objective forms of composition – as to a scientific and artistic wager. His main concern, which was stimulated by the reading of contemporary works of theory, lay in the attempt to convey light through chromatic means. The new technique which he finally evolved was that of ‘pointillisme’.

We may state with certainty that Seurat’s search for harmony between tonal values, cold or warm tints and ascending or descending lines was the result of his need to establish a new dynamism in the work of art. This generalized ‘vibrancy’ is in fact the most characteristic mark of Post-impressionism. The technique or ‘aesthetic’ which was Seurat’s special contribution conveys to perfection the way in which the work moves from the registering of sensations to the creation – in a controlled, conceptual manner – of the luminous image. We might say that linear directions, given a chromatic treatment and endowed with a concealed emotional charge, served him as a point of departure in his search for new plastic values. But it was the relationship between light and colour which provided the foundation of his new technique.

Seurat’s method of working was as follows. After sketching the outline of his picture, he applied local colour in large strokes of the brush as Corot had done. Next he succeeded in obtaining a vibration of local colour by placing neighbouring tints in juxtaposition and ‘breaking up’ the colour in the manner of Delacroix. Next he added touches of ‘solar’ orange on the surfaces which were irradiated with light. Later he set to work with ‘warm’ and ‘cold’ colours, corresponding to light and shade, and in this way was able to indicate the reflection of the colour of the sky in the shadows. The last two stages of the process involved the addition



8 Georges Seurat
Le Chahut, 1890. 169 cm. x 139 cm.

of small points of colour to indicate the reciprocal reflections of neighbouring objects, as Rubens had done, and the final application of complementary 'environmental' colours – green, purple, red, blue-green, yellow, ultramarine, violet, greenish yellow, orange, cyanide blue.

This was how Seurat obtained his 'contrast of tints'. The other factor which must be taken into account is his contrast of 'tonal values', which involved making the brightest passages even brighter and the darkest even darker. This tonal contrast also helped to control the contrast of tints. Once this theory of colour had been applied over the whole surface of the canvas, the result was the formation of a kind of chromatic movement, which dominated the other elements of the picture.

Seurat's 'scientific' procedure did not always win him the approval of contemporary critics. 'Perhaps it would be right,' wrote one of them, 'to mention . . . the unhappy Seurat with his science – in itself so sterile – of the decomposition of light and linear rhythms.' The mention of linear rhythms recalls Seurat's graphic work, which was strikingly similar to the 'Noirs' of Redon, but struck a note of its own in the use of large numbers of lines in many directions. The dynamic quality introduced by this use of line was in fact reproduced in the development of Seurat's painting, which slowly evolved towards a new vision of movement.

The stages in this evolution can be sketched quite shortly. Like many of the painters in his generation, Seurat began his career as a draughtsman influenced by Ingres. His appreciation of movement was therefore academic. But his various *Casseurs de pierres* of 1882 make us fully aware of a transformation in the thematic and plastic treatment of movement which is almost complete by the time of *Un dimanche après-midi à la Grande-Jatte* (1884–6). The various sketches, drawings and versions of this work display a wealth of procedures and motifs which are entirely characteristic of Seurat's ambiguous use of movement. These appear once again in the *Poseuses* and especially in *Parade*, which dates from 1887–8. They are accentuated even more strongly in his last masterpieces, *Le Chahut* (1889–90) and *Le Cirque* (1890–1). Yet the *Chenal de Gravelines* series, which dates from 1890, reminds us that Seurat was fundamentally a painter in the Impressionist tradition who gave the picture an objective type of vibration by his scientific treatment of the surface.

● Paul Signac – Neo-impressionist theorist of movement

Seurat's observation of movement in nature and his development of a fairly rigid theory of movement were reflected in the work of several of his friends and disciples. Paul Signac (1863–1935), who was the most fruitful successor to Seurat's tradition, responded not only to the scientific theories and chromatic technique of his master, but also to the brand of decorative and dynamic abstraction which was characteristic of his times and later became identified with the style of 'Art Nouveau'.

Signac's portrait of Felix Fénéon, which dates from 1890, deserves a lengthy analysis from the point of view of movement. An astonishingly modern picture, it has been described in terms of 'a rhythmic base of angles and measurements,

tones and tints', Other pictures dating from the same year, such as the portrait of the artist's mother, testify to similar concerns.

In his capacity as a theorist, Signac warns us that the 'neo-impressionist' painters, since they are 'respectful of the permanent laws of art – rhythm, measure and contrast – have been led to this particular technique by their desire to achieve a maximum of luminosity, coloration and harmony, which they do not believe it possible to attain by any other method of expression.' Throughout this account, Signac is clearly defending the method of animation and vibration for its capacity to 'give colour the strongest possible impact' – the objective of Delacroix and the Impressionists as well as the artists of his own generation. But he realizes that the basic problem is one of adapting plastic effects of movement or vibration to a general or particular kinetic theme. So he criticizes Delacroix in these terms: 'The tragic effect of the *Naufrage de don Juan* is due to the dominance of a deep glaucous green, darkened by lugubrious blacks. The funeral note of a white, shining sinisterly amid this sombre scene, completes this harmony of desolation. . . . And yet Delacroix has not yet attained the full possibilities of colour impact and harmony.'

According to Signac, therefore, the Neo-impressionists were indebted to the Impressionists for their palette and to Delacroix for their scientific and methodical technique: they took the notion of optical mixture from both Delacroix and the Impressionists. But Signac could also see a direct evolution in one of the most interesting aspects of painting – the creative gesture. Delacroix' hatchings gave way to the 'comma-like or sweeping touches' of Impressionism, and finally to the Neo-impressionist system, where each touch was broken into separate elements. He held that this '*division* did not necessarily imply touches in the form of a *point*'.

By this stage in the history of painting, plastic elements such as touch and movement were beginning to supplant thematic elements to an increasing degree. Signac saw the process quite clearly, and wrote of the 'painters who are truly painters': 'We are searching simply for beautiful lines and beautiful colours, with no concern for fashion, anecdote or literature.' The literary men of the period did not see the problem in the same light. An interesting passage by Aurier demonstrates this point with finality, while at the same time throwing a sidelight upon the popular taste for real movement in late nineteenth-century France. 'In music and in painting the public seems even more avid for novelty. My concierge used to have a musical picture. When the small clock, inset into a belfry which you can just imagine, stood at midday, an ingenious carillon hidden behind the canvas played 'Ah! vous dirai-je, maman. . . .' It was very amusing. All the visitors remarked on it without fail. But a month ago my concierge, like everyone else, was bitten with the bug of modernism – artistic modernism. He had his picture repainted by a pupil of M. Signac. He had the mechanism of the carillon changed. Now the belfry rises up in a hail of small multicolored blobs, and, when the clock is at midday, the new carillon plays the Ride of the Valkyries. An impressionist picture with Wagnerian music – there you have the summit of modernity in art.'

● Subjective movement – Van Gogh

There is a direct link between Odilon Redon, whom we have already considered under the heading of subjective movement, and the major painters of the so-called ‘tragic’ generation, who were born around 1860. This link is evident in their respective methods of treating the element of movement. Van Gogh and Gauguin, in particular, interpret movement by an attempt to translate highly subjective feelings, organic internal forces, the pulse and breathing of the individual, the biological rhythms and the life-force. This subjective attitude distinguishes them from the post-impressionist painters with their objective and scientific concerns.

Van Gogh, the most tormented painter of his generation, has left an abundant correspondence which enables us to disentangle the element of ‘subjective’ movement which is so apparent in his work. It appears first and foremost in graphic and gestural terms (line and touch), but it is also evident in his attention to colour. These two features contribute greatly towards the kind of cosmic synthesis which he was approaching towards the end of his life.

If we were not aware of the curious features of Van Gogh’s personality and of his art, we would be tempted to take the following extract from a letter to his sister as the judgement of a painter serenely preoccupied with plastic problems. ‘What strikes me here, and what makes painting here so attractive to me, is the transparency of the air: . . . you can distinguish the colour of things at an hour’s distance away . . . line remains firm up to a very great distance, and form remains recognizable. It gives an idea of sky and spaciousness.’ In fact, Van Gogh had been tormented from the beginning of his career by violent activity among men and movement in nature. He remarks in an early letter to his brother Theo: ‘Here is a sketch of the potato market at Noordwal – the teeming movement of workmen and their wives, with the baskets being unloaded from the barge, presents a very fine spectacle. Those are the motifs that I would dearly like to paint or draw. The life and movement of such a scene, and the type of people in that particular world.’ In another letter to his brother, he writes: ‘Here is another scribble of the dunes. There were some little bushes there whose leaves – white on one side and dark green on the other – shone and were in continual movement.’ Once again: ‘The waves followed one another at such a short interval that each was hustling the other; the collision of these masses of water produced a kind of foam like moving sand, which covered the sea like a veil. Still, it was in a furious bustle . . . when you looked at it for a long time, all the more impressive because of the small amount of noise which it made.’

Van Gogh was particularly interested in the problem of gesture. ‘Some draughtsmen,’ he believed, ‘work with a nervous hand, so that their technique acquires so to speak the characteristic resonance of a violin – artists like Lemud, Daumier and Lançon – whilst others such as Gavarni and Bodmer make you think of a piano, and Millet of a solemn organ.’ The year after he had made this remark, Van Gogh wrote of the movement of machines, referring to the work of Rappard, who had ‘brought into his drawing all kinds of machines in action, a subject which virtually no one would dare to venture upon, as it is outside the field in which we are *used* to discovering what are generally known as picturesque subjects’. At the same date, he made a very interesting attempt to analyse the

9 Vincent Van Gogh
La Nuit étoilée, 1889



movement in his own *Arracheurs de pommes de terre*: 'I made a careful study of it, with that express intention, and I drew a man sinking his fork into the ground (first movement), another tearing out the plant (second movement), the shape of a woman in the same attitude and finally a third figure of a men tipping the potatoes into the basket.'

Here Van Gogh's attitude is primarily objective. But from 1885 a highly subjective attitude to movement began to dominate his work. He wrote that he admired Delacroix for the way in which he 'made you aware of the life of things, of expression and movement, to the point of finding himself all at once out of the sphere of colour, and of paying no attention to colour.' And he also worked towards an expression of movement through the artist's personal touch. 'I should say that nowadays I am trying to discover a kind of brush-work which does not involve dots or anything else – just variations of touch.' Later he expanded on this theme: 'what a curious thing *touch* – the stroke of the brush – is! In the open air, exposed to wind, sun and people's curiosity, you work away according to your capacity, furiously filling up your canvas. And yet you capture what is true and essential – that is the most difficult thing. When you take the study up again after a time, and arrange your brushstrokes to fit the objects, it certainly becomes more harmonious and agreeable to look at, and you add to it whatever you may have in the way of smiles and serenity.'

Van Gogh's transition from graphic movement to generalized or 'cosmic' movement takes place in parallel stages to his almost pathological intensification of colour. It was at Nuenen, probably in April 1885, that he first became aware of the theory of complementary colours and the law of simultaneous contrast. He became a colourist during his period in Paris, developing a technical range which corresponded to a complete scale of violent emotions. In his view, the work of the Impressionists had hardly gone beyond Delacroix and Puvis de Chavannes in the treatment of colour. His own treatment was to be entirely different, as he emphasizes in the following passage: 'In my picture, *Café de nuit*, I tried to express the fact that the café is a place where you can ruin yourself, become mad or commit crimes. Through contrasts of tender pink and blood red, or the red that you find in the lees of wine, of soft Veronese and Louis XV greens and yellowish or hard blue greens – all in an atmosphere of pale sulphur, like a furnace in the underworld – I tried to express what you might call the power of darkness in a loaded trap. All this under an appearance of Japanese gaiety and a bonhomie like that of the *Tartarin*.'

Van Gogh was tempted to move in the direction of pure abstraction, but showed an understandable reluctance. 'Aurier's article would bring me encouragement,' he explained, 'if I dared to let myself go, and take the great risk of moving out of reality and using colour to make a kind of music of all things, as with some of Monticelli's works. But truth is so dear to me, as is *the search to make true*, and I believe that in the last resort I would rather remain a shoemaker than become a musician of colour. In all events, the attempt to remain true is perhaps a remedy for fighting the illness which still continues to trouble me.'

Yet, despite this statement, and despite his violent use of colour, Van Gogh aimed to discover a kind of serenity which was connected in his mind with the ideal of music. He wrote to his sisters: 'But in playing with all these colours you manage to create a calm, a harmony. And something happens which is analogous to what happens in the music of Wagner, which is no less intimate for being played by a large orchestra.'

Van Gogh's final period involved an attempt to express in a complex and personal manner subjects that were ordinary and even banal. In addition to his *Café de nuit*, there are a large number of pictures from the years 1888–90 which demonstrate the different degrees of movement – and different types of deformation – that Van Gogh exploited. A study of cypress trees which he sent to Aurier was accompanied by the following note: 'The study which I have done specially for you represents a group of them at the corner of a wheat field on a summer's day – around the season of the Mistral. You therefore get the accent of a particular kind of black enveloped in the blue that moves about in the open air, circulating, and to provide a contrast to the black accent, the vermilion of the poppies.' From Arles to Saint-Rémy and Auvers, Van Gogh's 'cosmic' style developed towards a final crescendo. 'First of all the twinkling stars vibrated, but remained motionless in space, then all the celestial globes were united into one series of movements. At Auvers-sur-Oise, firmament and planets both disappeared, but the mighty breath which gives life to all things and in which all is bound up, remained.'

● Gauguin – the arabesque

Several of the quarrels which have arisen in the course of art history have a positive interest which transcends their anecdotal value, in the sense that they are concerned with particular plastic problems of the first importance. Gauguin, the other protagonist of the 'tragic generation', was involved in two of these. First of all, he had a quarrel with Van Gogh which was essentially that of two draughtsmen and colourists holding very different conceptions of the role of art. We read in one of Gauguin's letters to Emile Bernard that Van Gogh 'admires Daumier, Daubigny, Ziem and the elder Rousseau, all artists whom I cannot stand. By contrast he detests Ingres, Raphael, Degas, all of whom I admire; . . . He is a romantic while I am more inclined towards the primitive. As regards colour, he looks for chance events in the pigment, as you get in Monticelli, while I detest a botched-up *facture*.'

The second quarrel which Gauguin embarked upon was with Emile Bernard, his correspondent in the letter which has just been quoted. In this case, the difference between the two artists lay essentially in their different interpretations of movement. Gauguin's characteristic contribution to the liberation of 'subjective' movement lay in his use of the arabesque. The qualities of line which he observed first of all in nature, then in Maori women and in primitive art, were to become essential, and indeed almost autonomous elements in his painting. They held both a sensual and a symbolic significance.

Victor Segalen, Gauguin's friend and shrewd critic, writes on this subject: 'From the shoulder to the finger-tips, the Maori woman traces, whether in motion or bending, a continuous line.' He continues: 'The whole leg is another moving spindle; motionless, the legs are two powerful columns. . . The small of the back is cleanly cut, drawn for action, for the rhythms of dance or pleasure.' Gauguin's remarkable sensitivity to nuances of rhythm, whether in moving or motionless objects, is demonstrated in the following passage from a letter which he sent to André Fontainas in 1899, during his stay in Tahiti: 'Animal figures of a statuesque rigidity: an indefinable trace of the ancient, the august and the religious in the rhythm of their gestures, in their rare immobility. In their dreaming eyes, the troubled surface of an unfathomable enigma.'

Is Gauguin's 'world of rhythm' dynamic or static, when it comes to the point? As far as line, contour and the discreteness of forms are concerned, he was doubtless aiming for life and movement. But we must remember that he was intimately aware of the dialectic between life and death, and tried to express this in his art. His aim was to create a form of art which was complete or 'synthetic'; he had no interest in 'piecemeal' presentation. Therefore he made extensive use of linear rhythms and arabesques, even of the classic diagonal, to emphasize the quality of continuity.

In his use of colour, Gauguin was far from insensitive to the possibilities of colour vibration, which he identified with the internal forces of nature. In a letter to Fontainas, he exclaimed: 'Think of the musical role which colour will be playing in modern painting from now on. Colour, which is vibration just like music, is capable of attaining what is most general and, in its origins, most vague in nature: its internal force.' Hence his counsel to Sérusier that he should paint colours as he saw them and not as they were – a piece of advice that resulted

in the famous *Talisman* which Sérusier painted in Gauguin's company and which was to inspire the research of the Nabis.

A detailed study of the evolution of the use of movement in Gauguin's work would have to take into account both the way in which he isolated this element by his use of the arabesque, the contour and the arrangement of figures in space, and his expressionist treatment of colour, which in fact added to this isolation by cancelling the illusion of three-dimensional space. In spite of the degree to which he made use of procedures from other periods and other civilizations, his use of the arabesque was original and important. We can concur with the opinion which Gauguin himself expressed a few days before his death in a letter to Charles Morice: 'So I can say: no one has taught me anything; it is true that I know very little! But I would rather have this small amount which is my own. And who can say whether it will not be exploited by others and become something considerable? How many centuries it has taken to create an *appearance* of movement!'

● Ensor – Crowds in movement: Munch – the expressionist touch

The artists of the post-impressionist generation who went to the furthest extreme in their expression of subjective movement were not Van Gogh and Gauguin, but their contemporaries Ensor, Munch, Nolde and Jawlensky, who can be regarded as the first Expressionists. Their work was to lead them outside the confines of rationality towards an art of the imaginary and the transcendent.

James Ensor, who was born in 1860, completed his work as an innovator in the 'brief period of thirteen years between his nineteenth and his thirty-second year'. His art is a mixture of the social and the macabre. His final masterpiece, *L'Entrée du Christ à Bruxelles*, combines elements of the realistic and the imaginary in an expression of crowd movement which is accentuated by the jarring interplay of colours. His drawing, *Les Cuirassiers à Waterloo* (1891), is a *mêlée* of graphic movements, in which he took an evident pride. As it has been suggested: 'Ensor has mastered the art of bringing crowds in movement on to the stage. He knows, without insisting on the point, how to give them an epic character: he makes use of the magic of his art to endow their to-and-fro movements with meaning and indeed with cosmic implications.' Engravings like his *Bataille des éperons d'or* (1895), or his *Bains* at Ostend (1899), demonstrate many other aspects of the irony and caricature in his graphic treatment of crowd movement.

It may, however, be Ensor's treatment of nature and the elements that constitutes his most important achievement in the expression of subjective movement. In pictures like *Le Christ apaisant la tempête* (1891), he shows himself to be one of the very first artists to interpret movement through a distinctively expressionist use of colour and touch.

The expressionist universe of Edward Munch began to take shape in the years 1889–90. As in the case of Ensor, his new method of observation and expression first became perceptible in his treatment of crowd movements, in such pictures as *Bande militaire dans la rue Karl-Johan à Oslo*. Munch returned to this theme with a new note of anguish in *Soirée de printemps dans la rue Karl-Johan à Oslo* (1892), where the dominant emotional tone was expressed both in the treatment

of the faces and in the range of colours used. This note of anguish was to become more and more common in later years – in his graphic work, for example, where the line of the engraver and the lithographer is used to express the uneasiness of the soul. Munch's distinctive use of line and movement was to have considerable influence on the various Central European painters who were later to form the *Secession*, *Die Brücke* and *Blaue Reiter* groups.

Munch's most ambitious project was an incomplete 'Frieze of Life' which involved a synthesis of different types of movement – including tensions produced by the use of gesture, dynamic treatment of contour and symbolic elements drawn from nature and humanity. The various pictures which are held to belong to this cycle – some of which were assigned to it by the artist at a later stage – represent the joys and trials of the individual, as Munch himself expressed it. The frieze was therefore conceived as a series of decorative paintings which, in conjunction, gave an impression of the continuity of life, especially as they were all crossed by a continuous line beyond which the image of an eternally moving sea was presented. For Munch the sea possessed a particular symbolic value as the element which unites all manifestations and phases of life.

Munch also evoked the eternal forces of nature in a cycle of paintings which he completed on walls within the University of Oslo. Here he did in fact achieve the ideal which he had held before him throughout his years of maturity: that of creating a synthesis in cyclic form on a monumental scale, and so exorcising the demon.

As a contemporary of the Symbolists in literature, Munch was constantly preoccupied with the movements of the inner life. His comments on the art of his times remind us of Plato's famous allegory. 'In realism, it was the facade which counted, in Impressionism the character. Now it is shadow and movement... the shadows which a prisoner sees in his cell, the trailing shadows which disappear and return again, separating softly and uniting once again like fans, inclining, bending, dividing.' In his use of movement, he was the decisive influence upon the early Expressionists of the turn of the century. This was not only a question of his plastic techniques – the use of waving lines and the juxtaposition of symbolic colours – but also a matter of content. For Munch had succeeded in imbuing his work with the fruits of profound psychological experience.

● The primitive dynamism of Nolde – Jawlensky and the development of a theme

Emil Nolde, who was born in 1867, belongs strictly speaking to the 'tragic generation'. But he completed his first oil painting in 1896, and his most interesting works from the point of view of movement came as late as 1910, in the post-Fauvist period. In spite of this, he belongs directly after Munch in the essentially nineteenth-century tradition of the Expressionists. He is the great solitary of German Expressionism, symbolizing the reaction against materialism and positivism which began around 1890.

In Nolde's art, there is a subtle marriage between dynamic elements that derive from primitive art and the mythical and dionysiac outpourings which

sometimes tempted him into the realm of the grotesque. Already in 1901, he was showing a taste for this frenzied type of movement in a picture entitled *Before the dawn*, which involved two flying monsters. He took up similar themes in a few graphic works which date from the same period – when he was in sympathy with the *Brücke* of Dresden, but did not formally belong to the group. But it was in 1909–13 that he gave the best demonstrations of expressionist technique applied to kinetic themes. Throughout his long life, Nolde maintained this interest in the portrayal of ecstatic movement which evidently drew its strength from his unconscious. As late as 1940, he painted three canvases which recalled the themes of his earlier years.

Of the remaining painters who belonged at one stage to the Expressionist movement, Jawlensky and Kandinsky were born in 1864 and 1866 respectively, and, like Nolde, joined the movement at a relatively late stage. Kandinsky really belongs to the next generation, and his important work as an artist and a theoretician will be discussed in its relation to the development of non-figurative art around 1910. Jawlensky, who brings in a connection with the *Blaue Reiter* group, is relevant here because of his custom of painting a series of pictures on the same theme, whether portraits or landscapes, in a strict order. This was his way of working over a long period of years. In addition to his subjectivization of colour, Jawlensky was directly concerned with expressing ‘religious sentiment through the human face’. He claimed that he subordinated the act of painting to ‘what one feels in the soul’, and so managed to reconstitute ‘by form and colour whatever of the sacred’ there was in him. What he created was therefore the result of a genuine ‘movement of the soul’. Before his time Jawlensky had established a permutational art of human suffering.

● Hodler – parallelism

German Expressionism belongs properly speaking to the maturity of the generation of artists born around 1880. The Fauve painters, with the exception of Matisse, who was born in 1869, also belong to this generation. A painter from a still earlier date who shows affinities with both Expressionism and Art Nouveau is Ferdinand Hodler, whose work is particularly interesting from the point of view of movement.

1890 is a significant date in Hodler’s career, since it was at this stage that he painted *Night*, the first of his works to incorporate his key notion of parallelism in a clear form. By parallelism, Hodler meant a search for unity through the repetition of similar component parts. The fundamental plastic problems which he had to solve were those of the order, succession and sequence of these parts.

Hodler’s art has been described in terms of a dialectical relationship between the will of the artist, his personal and to a great extent arrhythmic dynamism, and the rhythmic movement implied in his ‘series’. It is the relationship between the parts and the unity of the series that gives rise to the expressive movement. Swellings in the form of the human body, different types of gesture and pantomime can be used to stress this movement, which appears merely superficial when it has been followed to the finish, since the psychological agitation of the person depicted seems to come to an end at the same time.



In *Eurythmie* (1894–5), the theme – as the title suggests – is one of measured movement, conveyed by means of a group of people. Movement therefore becomes an important element in the formation of the series. In *Day* (1899–1900), the series is made up of a flawless succession of individual movements, which bind together and bring to the fore the psychological content of the movement in each episode.

On the subject of ‘parallelism’ itself, which may be a theory deriving from nature or alternatively may have arisen from a study of the Egyptian and Assyrian collections in the Louvre, Hodler has left these remarks: ‘the parallelism of the emotions is translated on an external level into a formal (or plastic) parallelism’. Here we have the key to several of his works which clearly reveal a unity of emotional states. Again, in specific relation to the ‘artist’s mission’, he explains that the eye should practise sensitivity to ‘the whole rhythm of forms which are produced by man’s movement, attitudes and gestures’. At the same time, the artist should take note of ‘the grouping of figures in the relationships of everyday life.’ ‘The unpractised eye is slower to catch the movement of things,’ he claims. And he goes on to underline the importance of drawing: in his view, the draughtsman’s line alone ‘expresses infinity’ and ‘man’s contour is modified according to the movement of the body and is in itself an element of beauty’.

Hodler is entirely conscious of the importance of contour in Expressionism and Art Nouveau. ‘Today contour is made to play a fine role,’ he admits, ‘graphic line is stressed and, as a result of this very fact, it becomes ornamental.’ He also has a lucid view of the possible isolation of the formal elements of the future’. ‘Colour has a penetrating and musical charm which is independent of form,’ he suggests, ‘and when it is associated with form, it comes across even more strongly and brings out the rhythms which arise from variety and repetition.’ As the last sentence bears witness, Hodler’s aim was to create a type of work in which different types of movement combined in a new order: the work was to testify to this order by the ‘idea of wholeness’ to which it gave rise.

● Art Nouveau – Loie Fuller and her influence on artists – Klimt

The expression of movement by graphic methods clearly derives from the British tradition of Blake, Burne-Jones and William Morris, represented in this period chiefly by Aubrey Beardsley and Charles Rennie Mackintosh. Where



11 Kolo Moser
La Danseuse Loie Fuller, Sketch for a poster

Blake's use of line had been devoted to largely symbolic ends, that of Beardsley and Mackintosh was decorative and ornamental. Besides these two British artists, the most characteristic exponents of Art Nouveau were the artists from Holland and Belgium, like Van de Velde, Khnopff and Toorop. But at the same time in France the Nabis – Maurice Denis, Paul Sérusier, Paul Ranson and later Bonnard and Vuillard – in addition to Maillol, the painter of *La Vague*, and of course Toulouse-Lautrec – were all developing the possibilities of line in movement and the arabesque. In L. F. Johnson's terms, 'Lautrec created characters with movement directly in view. He made use of the divergence between forms and lines, the angular area cut out by the décolleté and the tensions arising from juxtapositions of angles and forms. In his case the movement inheres in the energy of shapes and lines and tones, and in the tensions among them, rather than in the action of the figure represented.'

The movements of choreography, and in particular the arrival at the Folies Bergères of the American dancer Loie Fuller, which took place in 1892, had had a profound effect upon the imagination of artists. Loie Fuller's dance of veils or 'serpentine dance' was carried out with long swathes of material, which were lit by groups of coloured lights as they swirled around her head. Anatole France claimed that she 'gave us back the lost marvels of Greek mime, the art of these movements at once voluptuous and mystical which interpret the phenomena of nature and the metamorphoses of beings'. Loie Fuller herself has left some interesting comments on the relationship between colour, light and movement. She writes: 'In the peaceful atmosphere of a greenhouse with green panes, we make entirely different movements from those which we would make in a greenhouse with red, yellow or blue panes. But we give no attention to this correlation between movements and their causes. These are nonetheless the things which must be watched when you are dancing to the accompaniment of light and music in harmony. Light, colour, movement, and music. Observation, intuition and finally comprehension.'

Some of Klimt's work was also conceived in terms of the decorative dynamism of Art Nouveau. But his aim was to go much further in an attempt to divide the composition into arabesques. In origin his art was directed against representational values, tending towards an increasing suppleness in its contours. But he was undecided in his style between 1880 and 1890, using pastels like Degas, imprecise borders like Carrière and graphic elements that recalled Khnopff and Toorop – as well an impressionist sense of colour and a type of composition deriving from Puvis de Chavannes.

Shortly after 1890, he began to move towards a style which combined rich ornament with the rhythmic interplay of female forms. As Max Eisler has put it, 'Ornament absorbs even the structure of the surface and becomes the vehicle of a moving rhythm. . . and yet the monumental art of Klimt looks beyond, and seeks to suppress, the decorative; it seeks to establish the complete dominance of a more elaborate rhythm which manifests itself in two "forms" – that of the monumental decor, which is rhythmic and flat, and that of the monumental painting, which is rhythmic and spatial.' If we can say that Klimt's aim was to give the plastic arts a musical quality through the use of ornament, then we can understand readily why one of his major preoccupations was time and movement.

● **Architecture and the minor arts – Sculpture: Von Hildebrand, Bourdelle, Maillol**

References to movement in the minor branches of Art Nouveau are very numerous. In the Munich Werkstätten, artists like Hermann Obrist, Hans Schmithals and August Endell succeeded in realizing graphic projects of an astonishing complexity as well as ornaments in relief, embroideries and other works. In France, the so-called Nancy school, represented by Emile Gallé and Louis Majorelle, put the accent upon floral ornament. But this was a 'logical' ornament, based on structures which had been studied from a botanical point of view and applied with due consideration of function. At the same time in Paris, a group of artists formed around Bing. Its principal members were Gaillard, Georges de Faure and Hector Guimard.

In England the draughtsman Walter Crane acknowledged the influence of Blake's 'linear expressive rhythm'. '[Line] does not require us to stop and think,' he wrote, but to 'appreciate the rhythmic silent music which the more formalized and abstract decorative design may contain, quite apart from the forms it actually represents.' In its vital, organic aspect, line is for Crane an image of 'growth', and undulating line – which he prefers above all else – is not simply capable of suggesting movement to a fine degree, but also of conveying direction and force.

It is extremely difficult to give logical, geographical and historical definitions for the sculpture associated with Art Nouveau. Adolf von Hildebrand can be regarded as a precursor of the style, however, and his book *Das Problem der Form in der bildenden Kunst* merits close consideration. Von Hildebrand makes a distinction between 'optical representation' and 'representation of movement'. He describes the latter as 'the sculptor's "spiritual" substance, which comes to him in part directly from the movement of the eye, and in part from optical impressions. The sculptor then carries them into effect manually in a material substance which, in its turn, provokes an optical impression and at the same time gives unity to the image.' At another point, von Hildebrand suggests that: 'Our comprehension of space depends on a movement of our field of vision executed in depth.'

Von Hildebrand's conclusion from these observations is that it is very difficult to determine the difference between nature in movement and in repose. In both cases the life of the form depends upon an effectively managed representation of movement. As a result the representation of actual mobility would be a factor not of perception but of representation in the mind.

These 'representations of movement' must be managed differently according to whether the sculptor is working with plaster or stone. In the case of stone, the representation of the form is transmuted into real representation of movement. whilst in modelling the sculptor shows us representations of movement at the start, but has to wait until the process is complete before the optical effect can be truly appreciated. Von Hildebrand mentions the art of Michelangelo as an example of the identity of representation in the mind and representation pure and simple.

The sculptor Emile-Antoine Bourdelle is less directly associated with the movement of Art Nouveau. He took his inspiration from ancient Greek art,

in particular from the work which he saw at Aegina and Olympia. His own work is dominated by contained force and passionate *élan*. 'It is the *élan*,' he writes, 'that is the supreme law. Go on your way, whoever you are. Live, go on your way, hurry past. All is in turmoil, all is in a process of becoming, all is in a whirl. You are just one more whirl.' But he pays tribute to the timeless quality of Greek art. 'Austere Olympia. . . Nothing in all the concrete universe measures up to your rhythms.' It is not surprising that he saw a modern equivalent to these 'rhythms' in the dancing of Isadora Duncan and the 'savage liberty of movement' which he found in Nijinsky.

At the start of his career, nonetheless, Bourdelle was a 'dynamic' sculptor in the tradition of Rodin. His astonishing monument to the *Défenseurs de 1870-71* at Montauban, which was completed between 1893 and 1902, displays an almost abstract treatment of masses and lines of force. This is an expressionistic style in which movement plays a fundamental role. Yet it becomes increasingly stylized until, in *Héraclès archer* (1907-10), the final point is reached. The various versions of this sculpture suggest that Bourdelle's free treatment of masses has been replaced by a system of unequal tensions. The sculptor has become a 'constructor' or 'sculptor-architect'.

At first sight Maillol (1861-1944) seems to be concerned simply with classical and sensual harmonies of form. But his work in the last years of the nineteenth century suggests a more dynamic vision of art. In his paintings he took great pains to render the movement of the waves in a convincing manner. In his sculptures also, there are inflections of the arms and feet, effects of light disequilibrium and forward projection, which are lively and dynamic in feeling.

In a sense the influence of Rodin in sculpture and Cézanne in painting persists in the work of the tragic generation. At the same time there are two distinctive types of synthesis between objective or scientific movement and subjective or expressive movement that arise at this stage. The first is Art Nouveau, with its tendency towards the abstraction of line. The second, which is no less of a synthesis, derives more directly from Cézanne and the previous generation. It is characterized particularly by a dynamic treatment of volumes and an abstraction of forms, colours and their vibrations in the Impressionist tradition. Cézanne wrote to Emile Bernard on 15 April 1904: 'Treat nature in terms of the cylinder, the sphere, the cone, all in perspective, (so that) each side of an object or plane, is directed towards a central point. Lines parallel to the horizon give the breadth, or if you like a section of nature, or if you prefer it, the breadth of the spectacle which the *Pater Omnipotens Aeterne Deus* spreads out before our eyes. Lines perpendicular to this horizon give depth. Now nature, for us men, is more in depth than on the surface: hence the necessity of introducing into our light vibrations, represented by reds and yellows, a sufficient quantity of blueness to let us feel the air.'



3 Movement in the arts around 1910

Perhaps the most potentially fruitful period in the whole history of modern art was the space of a few years around 1910. Yet, partly because of the large number of different currents which combine at this stage, our distinction between objective and subjective movement ceases to hold good. This does not mean that it must be abandoned completely. The Cubists, for example, belong on the whole to the category of objective movement. And it can be seen in quite a number of cases that groups of artists who are opposed to one another on a theoretical level do in fact share common procedures for the representation of movement.

● The Cubists – Picasso, Braque, Juan Gris

Cubism, which derived from the work of Cézanne and was intended to be the very opposite of Impressionism, took as its basis an imaginary movement around the object. This later became stylized, and fixed in an overall decorative scheme. The subject was ‘essentialized’ through a combination of multiple views, and the resultant impression was one of ‘static movement’ or stable rhythm. In spite of the fact that Cubism involved a secondary intellectual process, we should class it with ‘objective’ movement, since the visual observation always represented the first stage.

In the early stages of Cubism, movement as a theme also continued to play an important part. Numerous plastic procedures involving the use of line, colour and composition were exploited. One of the most original of these was the dislocation of the axes of the picture: another was the use of flat areas of colour in such a way as to create effects of vibration. The Futurist system of ‘lines of force’ finds a direct parallel in the linear networks of cubist compositions.

It is worthwhile recalling, in connection with the graphic dynamism which characterizes the origins of Cubism, that Picasso made use in his *Demoiselles d’Avignon* of flat negro masks with the facial planes picked out by stripes and hatching rather than by implied relief. Perhaps this was the dynamic element which Apollinaire referred to when he wrote:

‘We hear from Montrouge
that friend Picasso
is making a picture which moves
just like this cradle.’

*‘On apprend de Montrouge
que l’ami Picasso
fait un tableau qui bouge
ainsi que ce berceau.’*

The most important characteristic of Cubism as far as movement is concerned was, however, the abandonment of the unique viewpoint. Picasso the sculptor has left a bronze *Tête* which is enlivened by an emphatic turning movement: the spectator is obliged to look at it from all angles before he can gain a complete idea of it. And this effort makes him see a good many more details than he would in the ordinary conditions of vision. This strong accentuation of detail is also a feature of the work of Juan Gris, who came to Cubism at a later stage. Gris was also concerned with the problem of total or 'synthetic' organization of distinct elements in a single image.

It is interesting to look at the opinions of some of the more intelligent painters and critics on the subject of movement and time in the work of the Cubists. In 1910 Allard made this judgement: 'the very antithesis of Impressionism, (Cubism is) an art which does not concern itself with the occasional cosmic episode, but offers to the intelligence of the spectator in their pictorial fullness the essential elements of a synthesis situated in the field of duration.' Two cubist painters, Gleizes and Metzinger, were ready to write of Cézanne: 'He teaches us to dominate the universal dynamism. He reveals to us the modifications inflicted on one another by supposedly inanimate objects . . . He prophesies that the study of primordial volumes will open up vistas beyond our dreams. His body of work, which forms a homogeneous block, moves under our glance, contracts, becomes drawn out or takes fire – proving irrefutably that painting is not – or is no longer – the art of imitating an object by lines and colours, but of giving our instinct plastic awareness.'

It was in fact Metzinger who first recognized free movement around the object as one of the innovations of Cubism. 'Cézanne,' he explained, 'shows us living forms in the reality of light. Picasso supplies a material account of their real life in the mind, he brings into being a free, mobile perspective. . . To visible perceptions he adds tactile perceptions.' Again Metzinger writes of Braque: 'When he paints a face or a fruit, the total image radiates in time; the picture is no longer a lifeless section of competing masses.'

We have seen that several of the protagonists of Cubism took as their point of departure an acute sense of 'objective' movement. They were aware from the start of the need to render this in terms of multiple views which followed a precise itinerary around the object. But although they were aware of this need, they continued to work towards a single image, or occasionally an analysis of different views which remained separate. Eventually the original sense of the artist's movement around the object disappeared altogether from their work, at least as far as the spectator was concerned.

The part which movement plays in the work of Picasso is largely determined by the character of his earlier paintings. The *Demoiselles d'Avignon* (1907), *Le Nu à la draperie* (1907) and *Trois femmes* (1908) depend for their animation much more on the attitudes of the figures and the way in which they fit into the composition than on any challenge to the spectator to make an imaginary journey around the object which is represented. Elements that recall the work of Cézanne become more and more noticeable in Picasso's pictures after the Horta and Cadaques period. But even so this dynamic quality inherent in the figures is never completely eliminated from Picasso's work. It appears in certain of the

cubist pictures, and is even reflected in the still lifes, especially in cases where elements of collage are introduced. It is in fact a kind of expressionist movement which reappears in a different form at every stage in Picasso's subsequent career.

In the work of Braque, this dynamic quality is entirely a matter of visual and atmospheric effects. *Le Grand Nu* (1908) already has a highly ordered architectural movement, despite its mixture of techniques, its curving contours and its almost expressionistic finish. *La Maison à l'Estaque*, which dates from the same year, and *Paysage de l'Estaque* are both animated by the ordering breath of nature, whilst the works which date from 1909–11 are permeated by the movement of light. Braque's collages – more so than Picasso's – follow musical rhythms which transcend the object that is represented, whether the theme of the work is musical or not.

The dynamic elements in the work of Juan Gris have already been mentioned in passing. Gris' *Portrait de Picasso* (1911–12) is dominated by an analytic treatment of movement, often involving diagonals. His still lifes in the Kröller-Müller Museum, which date from 1912–13, are masterpieces of this particular style. On the other hand, the fact that Gris introduces real objects into his works – such as the fragment of mirror in *Le Lavabo* (1912) – sets him apart from Braque and Picasso, who undertook similar experiments but did not introduce this hard touch of realism.

● Léger: Dynamism of modern life

Fernand Léger shows little interest in the possibilities of unifying different views of his models in a single image. He makes use of the range of distinct points of view for the specific purpose of acquiring greater freedom in his manipulation of pictorial forms. His constant theme is the dynamism of modern life, expressed particularly in new methods of transport such as the locomotive.



12 Fernand Léger
Skating-rink, 1922.
Stage-set for Swedish Ballet of Rolf
de Maré

Léger himself has left an interesting description of the procedure by which he placed graphic and chromatic elements in dialectical opposition and so created a movement or a form of mobility. 'Concentrate your curves with the greatest possible degree of variety that is compatible with their remaining united; frame them by bringing them into relation with the hard, dry surfaces of houses, dead surfaces, which will take on mobility by virtue of the fact that they are coloured in a way that is contrary to the central mass, and contrast with forms that are alive...'

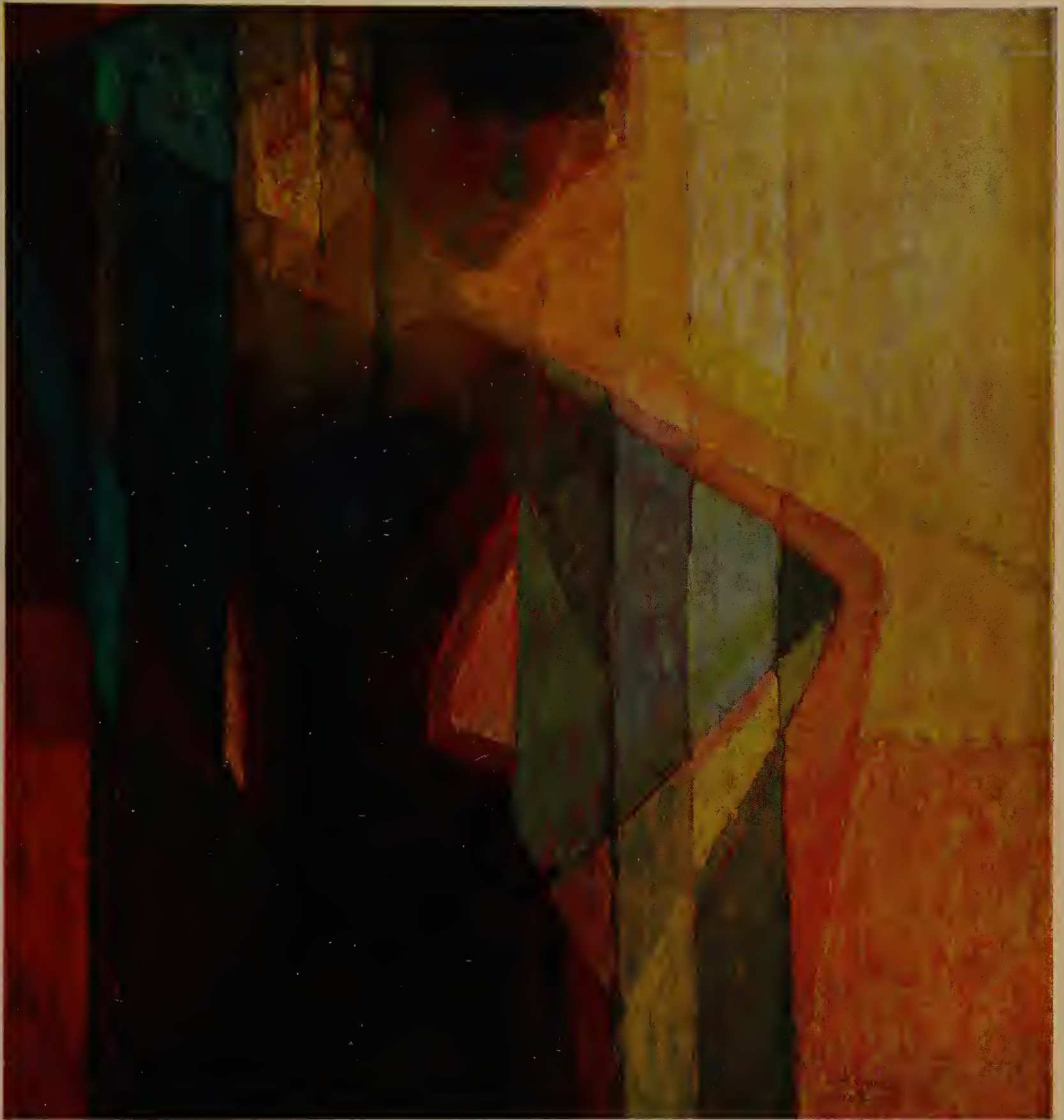
In his *Fumées sur les toits*, Léger uses the mobile element of smoke to animate an urban landscape in his very personal manner. But his *Nus dans la forêt* (1909–11) reveals a more characteristic use of movement. Frequently his solution to the problem on the purely plastic plane involves the introduction of a series of short, energetic diagonals to consolidate the composition.

It was in 1917 that Léger began to take particular notice of the forms of machine civilization, and to introduce them into his work in a series of paintings which suggested a synthesis between the cubist dynamic and the theme of movement as it appeared in the work of the Futurists. A decisive step came in 1920, when he began to employ real movement in a number of different ways. He designed the sets for two ballets, *La Patinoire* (1921) to music by Honegger and *La Fin du Monde* (1922) to music by Milhaud. Both of these, which were performed by the Swedish Ballet of Rolf de Maré, incorporated elements of real movement in their decor. But Léger's most interesting departure was in the realm of the cinema. 'I made the *Ballet mécanique* with Murphy in 1923–4,' he later recalled. 'The true subject of this film is the object and it is this that I have set in rhythm and movement... A straw hat, the moment it starts to move – well, it becomes even more interesting. Between the principle and the form, there is an abstract element.' Léger also wrote: 'The *Ballet mécanique* represents an experiment into the value of the object in itself, both fixed and mobile. It is an anti-romantic work.'

Léger's predilection for movement is carried over into his work in more traditional fields. 'For me,' he claimed, 'a picture is the very opposite of a wall – that is to say, it is *éclat* and movement.' Yet his passion for movement always remains at the level of everyday life. He maintained that the link between his own work and that of Delaunay lay in their common 'love of life' and their common concern with movement. Even more than Delaunay, he was ready to yield to kinetic inspiration wherever he found it.

● Delaunay and simultaneity of colour

Delaunay's contribution to the study of movement was the result of his intensive research into the use of chromatic light. This programme of research, which took him from Chevreul to the Impressionists and Seurat, finally led to his distinctive method of bringing out the dynamism of colour through the use of 'simultaneous circles'. Delaunay's view of the relationship of movement and colour, which places him among the pioneers of abstract art, distinguished him from the Cubists of the first generation. 'I was the *heresiarch* of Cubism,' he later claimed. 'Great discussions with my friends who had banished colour from





14 Robert Delaunay
Disques, 1938. 538 cm. x 396 cm.

their palette, and thereby deprived it of any element of movement.'

Delaunay's term 'simultanisme' was the origin of the famous quarrel between Boccioni and the Futurists, on the one hand, and Delaunay himself, on the other, in the autumn of 1913. Boccioni also used the term, but in the sense of a state of mind, a synthesis between memory and vision. Delaunay insisted on using it to signify the interaction of colours and their role of creating a sense of form and space in the picture. Léger had yet another interpretation, based upon the notion of the simultaneous presence of line, form and colour.

Delaunay has explained the origin of his particular usage in these terms: 'Around 1912–13 I had the idea of a type of painting which would be technically dependent on colour alone, and on colour contrast, but would develop in time and offer itself to simultaneous perception all at once. I used Chevreul's scientific term of *simultaneous contrasts* to describe this.' The importance of Delaunay, and of his wife Sonia Delaunay, lies precisely in the fact he succeeded in making colour the unique vehicle of movement. His writings on several occasions confirm that this was his aim. There is his letter to Kandinsky about colour and movement, and a letter to Mlle de Bonin in which he proclaimed: 'I make no rigid distinction between painting and sculpture. *Everything is colour in movement* (depth), that is the construction of what I call *simultaneous representation*. There are qualities of colour movement for all degrees of force: for *slow* movements, complementary colours, and for *quick* movements, dissonant colours. This is not the *descriptive* movement of the Cubists and Futurists which painters refer to as *dynamism*. The movements which I mention are actually felt – I do not simply *describe* them. They are simultaneous, working by contrast, and not successive.'

Sonia Delaunay has explained that both she and her husband were concentrating on the 'infinite rhythmic' properties of the various colours. They assumed that each colour had its own life, but was transformed completely by its relationship to other colours. Colour was in fact a genuine language which offered unlimited possibilities of variation. 'No one will ever know all there is to be known about colour,' she has stated. The principle was put into application in her *Rythmes sans fin*, which is a somewhat paradoxical work in the sense that the 'endless rhythms' do in fact come to an end, in her system, with the colour black.

Sonia Delaunay assures us that, apart from some pictures painted in Madrid and Portugal, her husband's work was always more directly concerned with colour than with light. His first period, which has been termed 'destructive', lasted till 1913–14. Delaunay was still preoccupied at this stage with architectural themes such as *Villes*, *Tours* and *Saint-Séverin*. But there were indications of a dynamic use of colour, and he himself referred to these works in terms of a 'total dissolving dynamism' – 'catastrophic art'. A work like *Ville de Paris* (1910–12) suggests the 'transition towards constructive colour', whilst *Fenêtres sur la ville* (1911–12) is 'the first germ of colour for colour's sake'. Delaunay's first *Disque* and his *Soleils* followed in the course of 1912. Here 'colour was used in terms of gyration: the form developed in a dynamic circular rhythm of colour.' Finally, in *L'Equipe de Cardiff* (1913), he completed his first large-scale demonstration of 'realization in colour on a large surface. . . alive and simultaneous; the whole picture is a coherent set of rhythms.'

Delaunay's second step in giving colour a full dynamic treatment came in

1914, when he began to associate this aim with an 'optimistic and cosmic ideology of life.' His *Hommage à Blériot* contains a 'simultaneous solar disc', that is to say, a representation of the 'constructive mobility of the solar spectrum'. From this point he set out upon a long period of research, in which investigation of the 'rhythm' of abstract colour alternated with figurative periods – such as that of the *Football* series in 1917–18. He pursued movement through the spiral in his *Hélices* (1923), and followed with the *Coureurs* (1924) and the *Rythmes sans fin*. Perhaps his pictures under the title *Rythme: joie de vivre*, which date from 1930, mark the summit of this optimistic and constructive style of affirmation, carried through by means of the resources of chromatic movement. But the decorative panels which he designed for the Paris international exhibition of 1937 are his most impressive achievement.

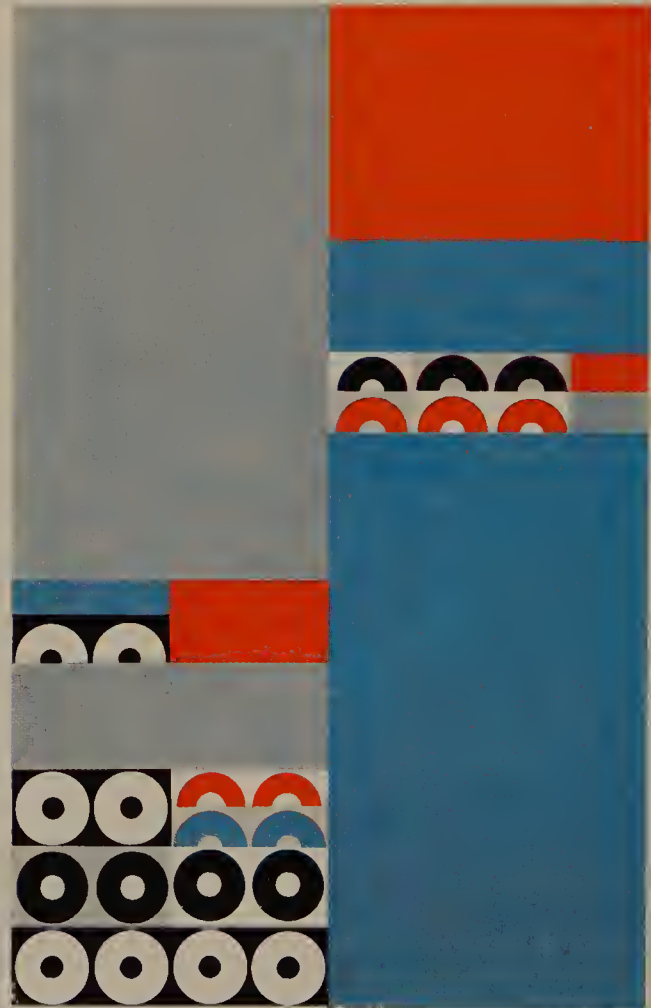
Delaunay's 'art of movement' – a term which he originally used to describe the 'simultaneous' textile designs of Sonia Delaunay – can be related to his own career in a variety of ways. Besides the features which have been discussed, it fits in with his passionate concern with the relationship between art and life – 'the great movement', in his terms – and his interest in correspondences between the arts. He wrote on one occasion: 'I shall always remember seeing Cendrars' poem 'Le Transsibérien' (illustrated by Sonia) for the first time, the way it looked with all its rhythms of savage and lively colours.'

● Intellectual movement – The Futurists: Boccioni, Balla, Carra, Severini

Many references have been made to the intellectual character of Futurism. Here for the first time in modern art, the *idea* of movement takes precedence over the perception of movement or the emotions associated with it. Not all futurist works observe this criterion, however, and it is necessary to add that the procedures used by the Futurists to indicate movement are very often similar to those of the Cubists – in particular to the methods of Léger and Delaunay.

In terms of our original categories, the forms of movement which appear in the works of the Futurists stand half-way between the objective movement of the Impressionists and Cubists and the subjective movement of Expressionism. The new category which they suggest could perhaps be called 'conceptual movement'. But here it is necessary to mention the exceptional cases of Boccioni, who puts the emphasis on states of mind, and Balla, who undertakes to analyse and dissect the phenomenon of movement in several of his drawings and paintings, including the well-known *Dinamismo di un cane al guinzaglio* (Dynamism of a dog on the lead). These cases can just be fitted into the general scheme because it is clear that the emotion, on the one hand, and the optical impression, on the other, were preceded by the artist's reflections on the concept of movement.

Boccioni, who as painter, sculptor and theoretician was the most wide-ranging of the Futurists, managed to render in concrete terms the most important ambition of the group: to find a modern artistic equivalent for speed and movement. In a sense he represents most clearly – at least as far as the plastic arts are concerned – the achievement of a dynamism which is at once an object of thought and an object of feeling.



Besides his theoretical and practical work on the subject of 'plastic dynamism', Boccioni was also extremely original in his wish to introduce a dynamic element through the juxtaposition of materials in sculpture. 'The traditional aim of fixing gesture in a line,' he claimed, 'and the nature and homogeneity of the materials employed (marble or bronze) have played their part in making sculpture the static art *par excellence*. I therefore came to the conclusion that, if I broke down this unity of material into several materials – each of them serving to characterize by its natural distinctness a difference in the weight and expansion of molecular volumes – we would already have achieved one element of dynamism.' Boccioni has also left a statement of his aims and intentions in the treatment of space, form, light and movement. 'I would like to make a synthesis from the unique forms of spatial continuity, to effect a fusion of a head and its environment, to show how objects are prolonged in space, to model light and atmosphere, to fix human forms in movement.' It is interesting to note that he relates Manet to the various ambitions of Futurism both on the basis of his chromatic innovations and on that of his morphological characteristics. Futurism is held to be concerned with the 'plastic abstraction', which is a synthesis of form and colour, reveals the interior and the exterior of objects in 'simultaneous copenetration', and finally does not neglect the subject or state of mind of the beholder.

From 1909 onwards, Boccioni's work developed apace. The exaltation of speed and movement expressed itself in a number of ways – through gestures, sweeping views, and graphic motifs representing lines of force and rays of light. His triptych *Stati d'animo* (1911), which was divided into the sections *Gli addii*, *Quelli che restano*, and *Quelli che vanno*, is dominated by a spontaneous graphic expression of movement. Shortly afterwards, when Boccioni had visited Paris, he completed another triptych on the same theme which was by contrast very 'organized' and testified to the influence of the Cubists. His sculpture during this period was already tending towards the juxtaposition of disparate elements in a coherent whole, as in *Fusione di una testa e di una finestra* and *Testa + Casa + Luce*. His painting, which reached its peak in 1913 as far as the expression of movement is concerned, continued to tackle the problem of reconciling the graphic dynamism of his early work with the multiple viewpoints and surface organization that he discovered in Cubism.

Giacomo Balla, who was more than ten years older than Boccioni, did not share the fanatical interest in dynamism which was characteristic of his colleagues. But this does not mean that he was any less interested in using movement as a plastic element. Although his writings were less copious than those of Boccioni, it is possible to reconstruct his 'kinetic' procedures from the innumerable graphic studies which he made from 1909 onwards, in particular in notebooks dating from 1910–11. As early as 1909 we find that his interest in sweeping views and structures of scaffolding has led him to make a systematic study of colour and light vibrations, the fruit of which appears in a painting like *Lampada al arco* (1909).

In 1912, Balla painted his *Cane al guinzaglio*, which involved a recomposition in plastic terms of an analysis of movement and gave rise to research of a similar nature into analytic and geometrical abstraction. We can see similar links between his analysis of movement in *Le mani del violinista* (1912) and the entirely non-



18 Umberto Boccioni
Forme uniche nella continuità dello spazio, 1913. Bronze, height 110 cm.

figurative composition of the *Compenetrazione iridescente*, dating from the same year.

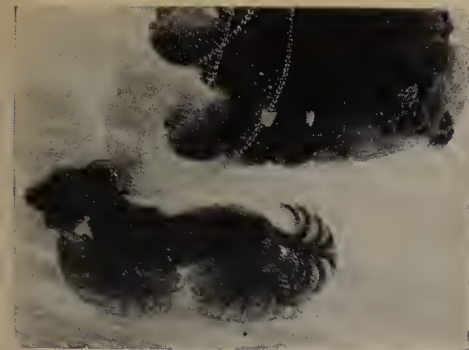
The next stage in Balla's evolution comes with *La Bambina che corre sul balcone*, a painting composed of pointilliste touches which continues his analytic research into the problem of movement. A picture dating from 1913 which directly derives from this – the *Volo di rondine* – shows that Balla is drawing closer to Boccioni and the other Milanese Futurists, although his work retains a more abstract and geometrical character. In *Spessori di atmosfera* we can distinguish quite clearly the headlamps of a moving car, but the structure which they set up within the picture can also be seen in non-figurative terms. In a similar way, the lines which indicate speed in several works dating from 1913 lead up to the 'iridescent copenetrations' of his *Vortici* and *Orbite celesti* of 1913–14.

Balla's emotional reactions to movement and speed are therefore controlled both analytically and plastically, so that he arrives at a synthesis of movement, in which the graphic elements form a network of lines and hedge in the colour. In thematic terms, movement is suggested through human activity, through the displacement of objects and machines, or through astronomical motion. The latter is the subject of Balla's masterpiece in this field – *Mercurio passa davanti al sole visto dal Cannocchiale* (The planet Mercury passes before the sun, seen by telescope). The work of Delaunay and Kupka also comes to mind.

Balla was interested not only in movement, but in the phenomena of light, expansion, noise and perfume. But however wide his concern with a whole range of forces, he preserved at all times his lucidity of thought and his precision of *facture*. His pictorial essays in the field of movement occupy an important place in the Futurist achievement. But his work with real movement, as in the *Complessi plastici* (1913–15), was closer to the domain of humour and playful experiment, for all its aesthetic interest.

The manifesto entitled *Ricostruzione futurista dell'universo*, which Balla published with Depero in 1915, contains a great number of interesting remarks about movement. At one stage, after reflecting upon 'universal vibration', they wrote: 'We shall find abstract equivalences for all the forms and all the elements in the universe, and then put them together, according to the whims of our inspiration, to form plastic complexes which we shall set in motion.' After describing the events which led up to the creation of Balla's first *complesso plastico dinamico*, they went on to enumerate the eleven characteristics of this 'sculpture': it was abstract, dynamic, ultra-transparent, coloured and luminous, autonomous, transformable, dramatic, volatile, odorous, noisy and explosive. They then proceeded to a technical explanation of the way in which this object had been constructed in purely material terms. Finally, after sketching an aesthetic, they put in a plea for fusion between art and science. But their manifesto ended with an unfortunate degeneration into aggressive nationalism. Concluding with the judgment that Futurism would dominate our sensibilities for several centuries, they signed themselves: 'Balla – Depero, astrattisti – futuristi.'

In 1918–19, Balla set up a small theatre in his home, where he gave performances of a spectacle involving movement in which the protagonists were two fishes. Experimental music by Kleen accompanied the spectacle. At this stage,



19 Giacomo Balla
Dinamismo di un cane a guinzaglio,
1912. 91 cm. x 100 cm.

he had already produced an interesting set for Stravinsky's *Feu d'artifice*, which was performed by Diaghilev's Russian Ballet at the Costanzi Theatre, Rome, in 1917. A contemporary wrote that 'Balla's work, which allows the most unexpected interplay of colour and light to enter the theatre in plastic form, destroyed the normal equilibrium of the stage.'

Of the other Futurists, Carrà began by sharing his colleagues' interest in the dynamism of water, light and crowds. But the influence of Cubism led him to apply a new type of dynamism in his collages. This was derived from the *parole in libertà* of Marinetti, but showed considerable originality. Severini, on the other hand, had been in contact with Picasso and the Parisian Cubists from the outset. He joined the Futurists in 1910 probably because of his wish to react against the structural analysis of the object which had become characteristic of Cubism, and his desire for colour. Maritain has written that, in this period: 'Futurism arrived in France like a fine attack of lyrical impatience and generosity from beyond the Alps. Under the cover of theories of becoming and universal copenetration which were outrageously Bergsonian, it displayed above all, in conjunction with a spirituality that was in reality quite paltry, a candid return to nature – not a copied nature, but one that was simply loved – and an animal delight in rolling oneself in its flood of colour.'

Severini himself has confirmed that the Futurists held strongly to colour. 'I would like to recall,' he writes, 'that in 1910 a group of painters, taking Seurat as their point of departure, expressed the wish to put into practice certain aims which were based precisely on colour: these were the Futurists. They believed in 1910 – though their researches had begun in 1909 – that the doctrine of complementaries should be taken as the essential basis of their research. This research into colour was soon supplemented by studies in the expression of movement, studies of the dynamism which is to be found in a motionless chair or table as well as that of a car on the move. The first period of research into movement carried on the tradition of the Impressionists. But when these painters went more deeply into the problem, they understood that it was not the aim of painting to express a body in motion, since the cinema was able to do this. Yet in one sense, some ideas and some pictures by Renoir so to speak anticipated the cinema. Ultimately, this research into movement was directed towards the experience, in plastic terms, of linear contrast in colours. Today the most important element in the dynamism and movement is colour.'

Severini omits to mention the influence of the dance upon interpretations of movement, although, in his particular case, it was decisive. In 1910 he became completely free from the influence of the Neo-impressionists and began to introduce the themes of dancers and moving crowds in night-clubs into his pictures. With the aid of certain elements from the vocabulary of Futurism and Cubism, he continued to develop this type of theme, combining the various elements with the skill and patience of a mosaicist.

● De La Fresnaye: Cubo-futurism – Villon, Metzinger, Gleizes: geometry and movement – Kupka: musical rhythms – Valensi: 'musicalism'

Although Roger de La Fresnaye cannot strictly speaking be associated with



20 Jacques Villon
Galop, 1921. 45 cm. x 81 cm.

Futurism, it is clear that, like Severini, he relied partly on the discoveries of the Futurists and partly on those of Cubism. Two of his most interesting pictures from the point of view of movement are *Le Cuirassier* and *L'Artillerie*, which were derived from a series of drawings to illustrate Claudel's *Tête d'Or*. Conversations with his brother about the future of aerial navigation served him as a pretext for the picture entitled *La Conquête de l'air*, which dates from 1913.

Jacques Villon and the *Section d'Or* group, who began to be active in 1911–12, were heavily dependent on the experiments of the Cubists. But their principal aim was to find 'a plastic translation of movement'. 'The Cubism of Braque and Picasso,' said Villon at a later stage, 'interested us very much, but it seemed too static to us... We thought, on our own account, that it was rhythm, and the breaking down of surfaces into coloured planes that made the picture live.' Villon's group contained a wide range of personalities, and it is not surprising that they differed in their interpretations of movement. Metzinger and Gleizes, who were Cubists but also belonged to the *Section d'Or*, treated it primarily in its geometrical aspects. The varying approaches of Léger, La Fresnaye and Delaunay, who were also in contact with the group, have already been indicated. Le Fauconnier and Kupka provided an additional element of variety.

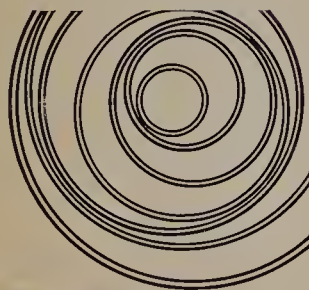
Kupka, who was born in 1871, began to paint in a non-figurative manner at a very early stage. At first he was interested in making analogies with musical rhythms, but around 1910 his approach became more 'conceptual'. 'Music,' he wrote in 1913, 'is the only art of sound which does not exist in nature and must be almost wholly created. Man has created words to articulate his thought. He has created writing, the aeroplane and the locomotive. Why then should he not create in painting and sculpture, independently of the forms and colours which surround him in the world?... I believe that I can find something between vision and hearing and that I can produce a figure in colours just as Bach did in music. In all events, I shall no longer be satisfied with a slavish copying of nature.'

Kupka is therefore searching for a 'true known reality' as opposed to the 'false seen reality'. The way in which he proceeded can be followed either through the sequence of his oil-paintings or through his many drawings and gouaches. These contain many striking examples of the use of astronomical and biological themes of a kinetic type, which demonstrate Kupka's importance in the development of a non-figurative art at the same time 'lyrical' and 'geometrical'. But the musical analogy is always present in his work.

Kupka's subjective form of dynamism perhaps reaches its highest point in the series of variations on the theme of universal gravitation entitled *Autour d'un point*, which he completed between 1911 and 1930. These works gave rise to a large number of paintings and drawings on similar themes. Kupka's interest in physics is expressed particularly in the *Plans en fuite* (1912–13) and *Disques de Newton*. His appreciation of the dynamic possibilities of physiological and biological phenomena can be seen in such works as *Traits, plans et profondeur*, *Contes de pistils et d'étamines*, and *Bleus mouvants*.

Henry Valensi, who exhibited with the *Section d'Or* and took an important part in their discussions at Puteaux, pursued a similar path of research, which lay between music and plastic dynamism. He was the inventor of the theory of

21 Frank Kupka
Abstraction, 1928–30.



22 Jacques Villon
Soldats en marche, 1913.
65 cm. x 92 cm.



'musicalism'. His contribution to the art of light and movement will be discussed in Chapter 7.

● Picabia – Marcel Duchamp

Picabia and Marcel Duchamp, who did not share the positive ideals of the *Section d'Or*, were to set in motion a programme of research into analytic movement, and later into 'real, spatial' movement. Picabia has in fact been classed with the painters who went under the title of Orphists – a word chosen by Apollinaire to signify a connection with the study of light and not with the so-called Orphic lyrics. Although the painters associated with this movement did not in any sense form a homogeneous group, it is possible to state as a general principle that they had little interest in the pictorial transposition of musical impressions, but aimed at a more direct expression of movement through contrasts of coloured forms.

The theme of machine movement, signifying a 'new symbolism of modern reality', began to occupy Picabia's attention in 1913, when he visited America for the first time. It is hard to establish how much he owed to Duchamp in his interpretation of mechanical movement and its 'ironic' implications. But there is perhaps some interest in citing Picabia's *boutade* from 1921: 'The first mechanical work was created by Madame Tzara the day she brought little Tristan into the world, and yet she didn't know FUNNY-GUY (Picabia).'

It cannot be denied that besides the reciprocal influences of Duchamp, Delaunay, the Futurists and poets such as Whitman and Verhaeren, America played a decisive role in the evolution of Picabia's art. 'Almost as soon as I

arrived in America,' he wrote, 'I experienced the revelation that the genius of the modern world is the machine, and that in the machine art can discover a living form of expression.' What Picabia chooses to display in his work is usually the absurd qualities of the machine, as an emblem of industrial civilization. But it is important to bear in mind that the earlier works, which date from before his journey to America, are haunted by the theme of the dance, which he attempted to recreate in figurative terms.

Picabia's decision to join the Dadaists in 1919 was a passing episode dictated primarily by personal loyalties. His 'Dadaism' is essentially thematic, relating to his concern with a machine aesthetic, and cannot be compared with, for example, the purely plastic researches of Jean Crotti, whose *Développement de l'amour en mouvement* dates from 1915–16.

The cold and detached personality of Marcel Duchamp qualified him to be the first painter of his generation to indicate the successive phases of movement in a logical and schematic way. His famous *Nu descendant un escalier*, which was the dominant work at the Armory Show, New York, in 1913, seems to establish that we must grant to him 'the initiative in applying *machinism* to the human being, as La Mettrie had done at an earlier stage.' In order to appreciate the use of movement in this picture, we should compare the four separate versions which exist: a pencil sketch, an oil study (both dating from 1911), the picture which was originally withdrawn from the Salon des Indépendants in February 1912 and later exhibited both with the *Section d'Or* in October 1912 and at the Armory Show, and finally the picture traced photographically on the preceding one and later executed in water-colour, ink, pencil and pastel in 1916 for the Arensbergs, who own all four versions.

The movement in the pencil sketch is in the opposite direction to that of the others. A figure is mounting a staircase. This sketch was in fact originally conceived as an illustration to Jules Laforgue's poem, *Encore à cet astre*, whose title had struck Duchamp. If the movement in this sketch had a literary connotation, the oil study was a fusion of movement in the Futurist tradition with a rather elementary attempt to break down movement into its component parts. In the Armory Show picture, Duchamp aimed for a much more comprehensive interpretation of movement, and chose the method of putting together a number of experiences simultaneously. He was attempting to capture the entire course of movement and the entire form of the moving figure in the same image. The continuous downward movement was expressed by subtle effects of transparency and lines leading from one stage to another. In the 1916 version, Duchamp decided to make the figure half-woman and half-machine, underlining this by his use of the photographic process and above all by his choice of steel blue and grey as the dominant colours, which gave a definitely 'mechanical' atmosphere. There is in fact a fifth version of the *Nu* – a pen and pencil drawing for Carrie Stettheimer which dates from 1918.

Duchamp himself has written of the Armory Show picture: 'This picture is not a *painting*, but an organization of kinetic elements – an expression of time and space through the abstract presentation of movement. . . . But we must bear in mind that, when we consider the movement of form in space over a certain time, we are entering the realm of geometry and mathematics, as when we



23 Marcel Duchamp
descending a staircase



24 Marcel Duchamp
Nu descendant un escalier, 1912. Second
version, 144 cm. x 88 cm.

construct a machine.'

If Duchamp's Nudes, Kings, Queens and Virgins were primarily machines in movement, his *Mariée* – a preliminary study for the *Mariée mise à nu par les célibataires, même* (Bride stripped bare by her bachelors, even) which was completed in Munich during the summer of 1912 – is a 'silent machine'. To continue Marcel Jean's description, it is 'static, but ready to revive with a human ardour which is betrayed by the ironically impassioned radiation of some of its wheels. . . The image only appears motionless in so far as it is a *snapshot* of a motor in action.' The work on glass, or 'delay' in glass, for which this was a study, was only '*incompleted* in 1923', to use Duchamp's own phrase. It was a 'collage in space', which can only be understood with reference to Duchamp's involvement in the Dada movement. Already in 1913 he had invented the *ready-made*, an 'anti-art object' which was intended to 'desacralize the ikon'. The point was that Duchamp selected these objects from their original context by a *preliminary act of will*. As he himself put it, 'he (Richard Mutt, i.e. Duchamp) took an ordinary element out of everyday existence and arranged it in such a way that the utilitarian significance disappeared under the new title and point of view – he created a new thought for this object'.

The process which Duchamp describes here would be interesting to study from the point of view of movement. Clearly the gesture which takes place in the selection of the ready-made is quite different from the creative gesture in painting and sculpture. Another point of interest is the way in which the ready-made leads Duchamp eventually to the incorporation of real movement. There is a direct line of descent from his *Roue de bicyclette* (a bicycle wheel mounted on a stool) to his *Rotative demi-sphères*, the *Anemic cinema* and finally the 'suitcase' which contained the sum total of his 'pictorial, optical and kinetic experiments' up to the outbreak of the Second World War. We shall return at a later stage to Duchamp's work with real movement.

If we return to Duchamp's masterpiece in the Dadaist vein – the *Mariée* – we can find a number of connections with movement. Duchamp's choice of glass in place of the many different materials which he originally planned to use, opened up wide 'kinetic' possibilities through the exploitation of transparency. The area devoted to the Bachelors is invaded by 'machine groups' and the 'bride-machine' is conceived as a moving element. Both serve to symbolize 'erotic machines'.

● The Vorticists: Wyndham Lewis

Among the groups of artists who were directly concerned with objective movement of a cerebral type in the years around 1910, the English group known as the *Vorticists* occupies an important place. As with all other general designations, the word Vorticism covered a wide range of artistic experiments undertaken by a number of very different personalities. It would be wrong to take Wyndham Lewis at his word and to agree with the opinion expressed in his catalogue to the Tate Gallery exhibition of Vorticism in 1956: 'Vorticism, in fact, was what I, personally, did, and said, at a certain period.' There can, however, be little doubt that it was Wyndham Lewis who gave the movement its initial momentum in the

autumn of 1912. If Vorticism inclined towards some of the currents which have already been mentioned, and was a matter of establishing the independence of colour and form and creating a visual language 'as abstract as music', it was also directly inspired by the world of the machine, which Wyndham Lewis considered 'real – or more than real' in relation to the world of natural forms. We should note in passing that Wyndham Lewis abandoned this particular set of values completely around 1920, and that his book *The Demon of progress in the Arts* takes exactly the opposite line to the principles which lay at the origin of Vorticism.

Wyndham Lewis defined the movement in the following terms in the catalogue to the 1915 Vorticist exhibition: 'by Vorticism we mean a) ACTIVITY as opposed to the tasteful passivity of Picasso; b) SIGNIFICANCE as opposed to the dull or anecdotal character to which the Naturalist is condemned; c) ESSENTIAL MOVEMENT and ACTIVITY (such as the energy of a mind) as opposed to the imitative cinematography, the fuss and hysterics of the Futurists.' Besides the hostile reactions to other contemporary artists, it is worth noting the insistence on movement and the fact that activity is presented in an intellectual context.

Wyndham Lewis' most interesting pictures, from the point of view of movement, are *The Vorticist* (1912), which is executed in chalk, ink and water-colour, *Creation* (1912), which is now lost but was exhibited at London in the same year, *Composition* (1913), in pencil, ink and water-colour, *New York* (1914), in ink and gouache, and finally *The Revolution* (1915), which is in oils. Among other Vorticist works which present features of equal interest are *In the Hold*, by David Bomberg, *Bicyclists* by William Roberts, *Rock-drill* by Epstein and several sculptures by Gaudier-Brzeska.

The fact that a large number of important Vorticist works have disappeared or been dispersed makes it particularly difficult to gain a coherent idea of the ways in which they used movement. But if we cannot make a methodical comparison between the ideas which they expressed and the works which they completed in practice, we can at least identify the ways in which their ideas differed from the various other movements. The Vorticists put the main emphasis on *energy* rather than on the analytic investigation of movement undertaken by the Futurists. In Wyndham Lewis' case, at any rate, this energy was intellectual in origin. And Gaudier-Brzeska's manifesto, published in *Blast* No. 1, ended with these words: 'Will and consciousness are our VORTEX.' It would be fair to say that the Vorticists viewed the intellect as the artist's most valuable instrument. As Geoffrey Wagner has concluded, the 'Vortex' was 'a principle of unity in the maelstrom of life's diversity and change'.

In spite of these primarily intellectual associations, the dance was also of great importance in the origins of Vorticism. Walter Michel has claimed that the art of Wyndham Lewis was based on a duality: the dancers expressed the intense vitality and energy which binds us to the natural order, while the artist's detachment and his creation of 'monuments of egotism' represented the rational faculty which puts us outside this natural order. The way in which Wyndham Lewis creates a synthesis between these two factors suggests that his satirical powers conceal a profound humanism.

If the Vorticist style can be characterized by the use of elements which are

well defined by straight lines or geometrical arcs, and of forms with snipped contours making up almost abstract compositions, the use of movement is a separate issue, which can often only be understood in relation to the machine aesthetic. It is significant that Epstein was in fact considering the possibility of adding a working pneumatic drill to his *Rock-drill*, but eventually rejected the idea as being too 'childish'.

● Rayonnism: Larionov, Goncharova – Suprematism: Malevich

If there is a lack of Vorticist work, which makes it difficult to study their use of movement, there are even greater obstacles in the way of getting to grips with Russian art around 1910, since there is so great a variety of tendencies and so little chronological exactitude.

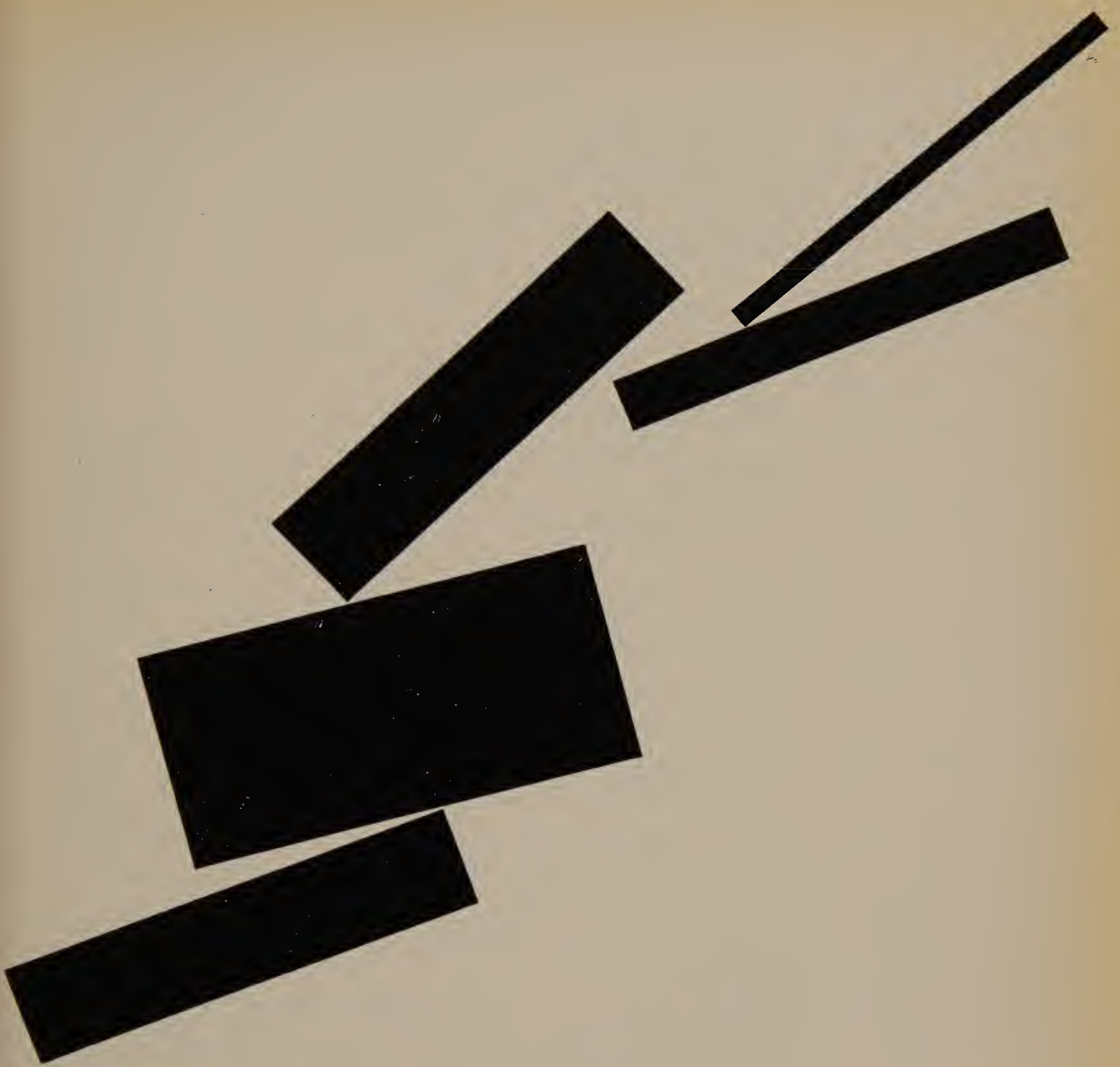
Larionov developed the theory of Rayonnism in 1913. But his experiments in the relationship of light and movement began as early as 1909, and his works anticipated the theoretical formulation. Larionov took as his point of departure Einstein's theories on light, which he wished to interpret through representing the radiation of objects and spaces. His works *Rayonnism*, *Blue Rayonnism*, *Beach*, and *Red and Blue Rayonnism*, which extend over the period 1909 to 1912, must be counted among the first examples of 'abstract' art in their reliance on light and movement. Larionov's 'rayonist' experiments went hand in hand with a tendency towards geometrical abstraction.

Larionov also used real movement in the stage-sets which he designed for Diaghilev in 1915. And it appears that he incorporated a mechanized ventilator in one canvas which he exhibited in the 'Year 1915' exhibition at Moscow. This was intended 'to give the boat a natural movement'.

Natalia Goncharova, who also designed sets incorporating real movement for Diaghilev, put greater emphasis on the theme of movement in her rayonist works than did her colleague Larionov. She tried to discover 'the inner essence of the work through graphic and coloured rhythm'. Her taste for ornament was always well to the fore. Already in 1907, she was inclined to arrange the figures in her pictures in arabesques. She began her rayonist period with *The Reapers*, *The Cats* and *Electricity*. But her masterpiece in this style, the *Forest* series, dates from 1910–11. The abstract treatment of movement in this series contrasts with the rather more cubist treatment of movement in certain other pictures which she completed at this time. And her eclecticism also extended to the treatment of movement in terms of the machine aesthetic in a number of works.

The theory of Rayonnism depended upon a notion of invisible energy: 'the total of (invisible) rays emitted by object A is intercepted by object B. The form created by the painter appears to our eyes within the presumed limits of the space situated between these two objects. . . . The rays which emanate from the objects and cross over one another give rise to the rayonist forms. The artist transfigures these forms by bending them and submitting them to his desire for aesthetic expression.'

Movement plays an important role in the work of Casimir Malevich (1878–1935) from 1909–10 onwards. This is no doubt related to the fact that Malevich seems to have been constantly tormented by man's relationship to the cosmos.



From the time of the first exhibition of the 'Knave of Diamonds' group in 1910, his work was clearly influenced by his interest in 'fluid and cosmic rhythms'. In the last pictures of this early series, Malevich 'reduced all volumes to the cylinder and the cone and made them "turn" by means of a violently stated chiaroscuro, while limiting the spatial cube by bringing the background very much closer'.

Once Malevich had passed the stages of 'super-rational realism' and 'cubo-futurist realism,' he was able to develop his own 'Suprematism' – an abstract style in which the element of movement played a predominant role. The date at which Suprematism first appeared as a plastic phenomenon is still under dispute. Some critics consider Malevich's first black and white squares, which were prepared in 1913 for the set of Kruchenik's futurist opera *Victory over the Sun*, to be the first suprematist works: others believe that the crucial point was between the 'Tramway W' and '0.10' exhibitions, in 1915. If this date could be established with any certainty, it would be possible to determine whether some of Tatlin's works, in particular the first 'counter-reliefs', did in fact have an influence on the development of Suprematism.

But our main subject of interest is Malevich's use of movement, both as a means of 'dynamizing' form and colour and as a method of conveying ideas relating to the cosmos. Malevich's writings, in particular the manuscripts on Suprematism which date from 1922–24, clearly demonstrate his preoccupation with movement. Yet they can hardly be said to contain any coherent general theory. In fact they are often contradictory. Malevich notes that the scientific phenomena of wave vibration have a certain interest, but he asserts that, in relation to eternity, vibrations of this order must be considered immobile – or, on the other hand, artificially increased in speed. In any case, we can state that Malevich imagined that there was movement in every space – a principle that applied to pictures as much as to the universe. He also held that the movement of thought was in all respects comparable to the movement of light or the movement of the comets, and that, by taking stock of various forms of movement through human thought, it was possible to arrive at new concepts which would reflect the movement of the universe.

Suprematism itself was for Malevich 'the supremacy of pure sensation in the plastic arts'. Pure sensation was the result of tensions and movements between colour, form and ground. Malevich believed that simple forms were akin to the drawings of primitive man, which were not ornamental in their aims, but served to express rhythmic sensation.

These forms in movement, which at first sight seem to be entirely abstract, are the summit of Malevich's art. Their significance is explained in an interesting letter which he wrote to Moholy-Nagy in April 1927, in which he stated: 'the non-objective sensations which should put me in harmony with the cosmos are the content of my works'. According to this principle we can follow the range of Malevich's sensations through his use of forms in movement and vibrating colours. In the majority of his pictures, the ballet of Suprematism takes place around a diagonal axis, as in his *Ballet* of 1916 which gives rise to the series including *Sensation of the space of the Universe* (1916) and *Sensation of a mystic wave coming out of the Earth* (1917). Finally, in 1917–18, he reaches the culminating point of Suprematism in his *White on white* series. Even when he had

announced that Suprematism had come to an end, in 1919, Malevich still continued to study the problem of movement.

● Tatlin: juxtaposition of materials – De Stijl: Mondrian

Tatlin's Constructivism seems to date from 1913, though certain historians situate it in 1914 or later. In any case, the question of whether he or Malevich deserves the priority as an innovator must take second place to the undeniable fact that their conceptions of art were radically different. This difference of opinion became apparent at an early stage, and grew more and more acute. The echoes of their final rupture have not entirely died down, even today.

If Malevich stood for the rights of pure art and for the idea of art as a spiritual activity, Tatlin, by contrast, foretold the death of painting and the rise of applied art. He made himself the spokesman of the doctrine that artists should be re-trained as qualified technicians in order to be able to make use of modern materials and tools. While Kandinsky, Pevsner and Gabo rallied to Malevich, Tatlin attracted Rodchenko, Stepanova, Alexander Vesnin, Alexandra Exter and Liubov Popova to his chosen method of 'culture of materials'.

Tatlin was also one of the most important pioneers of real movement. His suspended 'counter-reliefs' and his model for the *Monument to the Third International* will be discussed in Chapter 6. But it is noteworthy that his very first Reliefs, which date from 1913–14, involve a dynamic, open form of construction which 'sculpts space'. This method lent itself to the use of real movement, which was to be added in due course. In fact the concept of the 'real' and the search for the 'real' were extremely important features of the Constructivist programme. Tatlin set out to recreate real space, and he did so with the help of real materials and real movement. Rodchenko and Gabo followed a similar path up to 1920, while Popova and Exter investigated 'spatial force' and the 'mutual chromatic tensions and their rhythms'.

All these artists, together with Pevsner and El Lissitsky, can be legitimately placed with the next generation. They were born around 1890, and their main influence took place around 1920 and later. We shall return to their work at a later stage.

The path of research in the plastic arts which was being developed in Holland at this time does not appear, at first sight, to have dynamic or kinetic associations. The Dutch group *De Stijl*, which was founded at Leyden in 1917, took as its programme the following sentence: 'Style is: to contemplate truth in peace.' It was probably the philosopher Schoenemaekers, of Blaricum, who invented the term 'new plastic' and defined it as 'a new organization of the surface'. It is also possible that the theoretical origins of 'neo-plasticism' lie in Kandinsky's book *The Spiritual in Art*. But even if this is granted, and if we admit that Van Doesburg, Van der Leek and Huszar took an important part in launching the movement, it remains true that Mondrian's work deserves by far the most detailed attention. Mondrian's slow but sure evolution towards a form of abstraction which, even in its origins, was not wholly devoid of movement, culminated in a joyful and optimistic style where movement was very much in evidence.

There were three important stages in this process. The first led, from the

abstraction of moving themes like the tree, the sea and perhaps scaffolding in Paris, to the crystallization of the horizontal and vertical elements which were to serve henceforth as the basis of composition. The second involved the choice of planes of colour which were truly abstract, that is to say based exclusively upon geometrical forms. The third, which began in 1935 and has been called the stage of 'victorious dynamization', began with a lightening of the dividing lines, and then with them being coloured: finally came Mondrian's last masterpieces in which spirituality was combined with a newly discovered *joie de vivre*. Somewhat paradoxically, Mondrian found happiness in dynamism.

He had already written in his notebooks in 1914: 'Positiveness and negativeness are the causes of all action. They are the causes of the loss of immobility, which is happiness. They are the causes of the eternal movement, which is vertiginous and undergoes successive changes. They explain the impossibility of happiness in time.' This dualism is reflected in another central passage. 'The rhythm of relationships between colours and measurements brings out the absolute in the relativity of time and space. So the new plastic art is dualistic in its composition. Through the plastic exactitude of cosmic relationships, it is a direct expression of the universal. Through rhythm, through the material reality of its plasticity, it is an expression of the subjectivity of the artist as individual.'

When, at the end of his research, Mondrian allows himself an outbreak of dynamism, he is not betraying the intellectual and spiritual basis of his development. As he explains: 'It is important to distinguish between two kinds of equilibrium: 1. static balance; 2. dynamic equilibrium. Because of this, it is quite understandable that some people are opposed to equilibrium in art, while others defend it. The great struggle for the artist is to annihilate the static equilibrium by the continuing statement of the means of expression. It is a feature of human nature to love static balance. But the vitality of the continuing sequence of time destroys this balance all the time. Abstract art is a concrete expression of this vitality.' The position which Mondrian here describes is of course not very far removed from that of Malevich as far as dynamic abstract composition is concerned. And like Malevich, Mondrian combined the use of movement in its conceptual, intellectual and spiritual forms with a passion for life, music and the dance. Although it may seem surprising for an artist of so austere a character, the dancing which Mondrian delighted in was that of public festivities and street fairs.

● Subjective movement: Matisse and the Fauves

It cannot be said that the subjective movement which is based on an emotion or a sensation is directly opposed to spiritual movement or objective (and mainly visual) movement in the work of the generation born around 1880. If Kandinsky, whom we have placed within this grouping, places the emphasis on the spiritual in his own work, he often gives the impression of a reasonably well-defined expression of feeling. He is in fact trying to awaken precise emotions in the spectator by means of dynamic elements. In the same way, the German expressionists often look for emotional participation by the spectator on the basis of a directly plastic use of movement.

In the case of Rouault, the French expressionist, and the group of painters known as the Fauves, the fact that feeling is the origin and the desired end of the exercise is much less obviously in the foreground. It is nevertheless permissible to interpret their use of movement from the angle of subjectivity. The Fauves, with their tendency to abstraction through colour, attempt to underline the 'instinctual' origin of painting and are thus compelled to put the *act* of feeling at the very centre of their preoccupations. Their art is consequently the product of a deliberate, and often violent, act of will. According to Vlaminck it can be identified from 1903 onwards with an aggressive touch, full of implied movement.

In the case of the more thoughtful Matisse, this taste for movement belongs particularly to the final years of the nineteenth century, when he was under the influence of Rodin. But Matisse was also greatly impressed by the rising reputation of Cézanne, and was ready to write in 1899: 'Tones are forces in the picture.' Since he was born in 1869, Matisse was already over thirty at this stage. But he only realized his true vocation with the coming of the new century, when he began to make use of the wonderfully subtle type of arabesque which was to be characteristic of his future style. By 1905 he had added colour to line, and although his method of application was still fragmented, his painterly touch was becoming more pronounced and more rhythmic. By 1906 he was learning to elevate everyday themes 'by rhythm so that they expressed essential themes' – an objective which betrays his relationship with the 'pantheistic' research of German painters like Franz Marc. Finally, in 1907–08, the musicians, dancers and bathers made their appearance.

Matisse underlined the element of movement in these works by strong black lines. Perhaps the project which illustrates this concern with movement most successfully is the scheme for three panels representing dance, music and a scene of repose. Only the first two were completed. Matisse himself wrote of the first. 'My first panel represents the dance, the round taking flight over the hill.'

Throughout the years 1903 to 1909, Matisse found a plastic equivalent for thematic movement either in the arabesque or in the overall composition and treatment of colours. This was the stage at which Fauvism had most to contribute in the way of isolating the various plastic elements – line, colour and eventually movement. And in this respect it stood clearly in contrast to the work of the Expressionists. But, despite this difference, it must be added that the art of Matisse, and of the Fauvists in general, was concerned with the expressive – and sensuous – properties of pure colour. They intended colour to make itself felt 'in a purely instinctive way', and indeed some of their number – Vlaminck and Derain in particular – developed a cult of primitivism similar to that of the painters of *Die Brücke*. If we wish to identify the characteristic qualities of the Fauvists, we might say that Derain's work is dominated by virtuosity and variety, Dufy's work by an increasing attachment to pure line, and Marquet's work by a 'love of movement, a taste for precise observation, often relieved by humour, and an inward bent for contemplation.' In the case of Matisse, the goal is purity and tranquillity, to be achieved through the dynamic qualities of the various plastic elements. 'What I am searching for above all is expression,' he explains. 'Expression, in my case, does not reside in the passion that breaks out on a face or makes itself felt through violent movement. It exists in the whole arrangement

26 Henri Matisse
Le Luxe



of my picture: the place occupied by the bodies, the empty spaces around them, the proportions, all of these play their part . . . The drawing must possess a force of expansion which animates the objects surrounding it . . . The expressive aspect of the colours comes to me in a purely instinctive way . . . I have to paint an interior, I have a cupboard before me, it gives me a sensation of very lively red, and I put down a red, a red which satisfies me . . . What I dream of is an art of equilibrium, purity, tranquillity, with nothing to disturb or preoccupy . . .'

● German Expressionism – Die Brücke: Kirchner, Schmitt-Rottluff

In contrast to Matisse, the German Expressionists specifically tried to instil psychological and metaphysical unease into their works, although they did not for that reason renounce the aim of thematic and plastic equilibrium. The painters belonging to the group called *Die Brücke* (The Bridge) began by practising a spontaneous form of art which, in Kirchner's case particularly, involved a 'natural' eroticism. But although Kirchner's favourite subject at this stage was the nude in landscape, his means of expressing movement frequently made use of retinal effects.

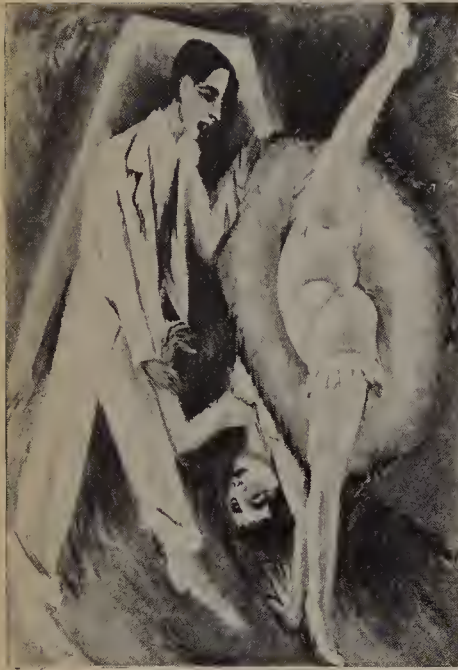
The techniques of wood engraving played an important role in forming the styles of the *Die Brücke* group, and clearly affected their methods of conveying movement. So did their interest in primitive wood statuettes, which Kirchner claims to have pioneered in his *Chronicle* – though his colleagues did not accept the claim. Around 1907, when Kirchner was exploring this field, Schmidt-Rottluff was refining his techniques of chromatic rhythm at Dangast, whilst Heckel was making use of the 'brushstrokes full of colour and movement' which Buchheim has described by the term *Pinsel furioso*. Heckel's 'Flowering cross' is a good example.

It is significant that Kirchner wrote in the preface for his own exhibition at Berne – composed under the pseudonym of 'de Marsalle': 'He (Kirchner) has devised a personal way of studying movement which is opposed to the academic study of the model.' But in spite of this claim, Kirchner seems to have clung too closely to the subject for his purely plastic aims to be realized. Although he frequently dealt with themes of movement, he was not entirely successful in integrating them into the work and bringing out the dynamic element in plastic terms. Towards the end of 1911, when he was painting his series of 'Spectres in a modern city' at Berlin, the initial style of *Die Brücke* gave place to a new, less coherent approach. In Kirchner's case it heralded a concentration on dance themes, which were more and more closely associated with the circus.

Schmitt-Rottluff, whose temperament was heavier and more melancholic than that of Kirchner, was also influenced by negro sculpture. It represented for him and for Kirchner a direct parallel to the research into closed composition which preoccupied the painters of *Die Brücke*. Around 1910 Schmidt-Rottluff's consuming interest in rhythmic and violent colour resulted in the formation of a style which reflects the aims of the group but is distinctively personal.

● Der Blaue Reiter: Marc, Kandinsky

The artists of *Die Brücke* have been called the first German Expressionists.



27 Ernst Ludwig Kirchner
A couple of dancers, c. 1913.
90 cm. x 63 cm.

After they had rallied to *Die Sturm* at Berlin in 1911, it was the artists of *Der Blaue Reiter* who took the tradition one stage further. Although the artists who have just been mentioned were far from neglecting the element of movement, the *Blaue Reiter* group went well beyond them in their acute sense of the potential importance of movement as an aesthetic element. This was already foreshadowed in the programme which was laid down by its future members in the *Kunstlervereinigung München* in 1909. Of course it was implicit in the choice of the title 'Blue Rider', which recalled the motif of the horseman that Kandinsky had been developing since 1906.



28 Franz Marc
The Great Blue Horses, 1911.
62 cm. x 160 cm.

According to Marc and Kandinsky, two of the most prominent members of the group, the artist's task was to make comparisons in plastic terms with the mystical internal structure of the world. Often these comparisons would take the form of the 'rhythms' and movements of the universe as 'felt by the painter'. Each work would be the sum total of a large number of similar feelings and experiences. Or as Paul Klee, who exhibited with the *Blaue Reiter* in 1916, was to put it: 'I adopt a detached and primitive creative attitude from which I can put forward signs for man, animals, plants, minerals and the elements – for all the revolving forces.'

Both Futurism and Orphism, arriving through the intermediary of the *Sturm* group of Berlin, influenced the way in which the artists of the *Blaue Reiter* presented movement. Kandinsky, who was from the outset preoccupied with the spiritual dimension of the work of art, learned from both these movements. August Macke, on the other hand, was particularly attracted to Orphism, while Franz Marc's water-colours betray a strong Futurist influence. And behind the linear and ornamental work of Kandinsky and Marc there are clear signs of the dynamic approach pioneered by the masters of Art Nouveau.

Marc's most individual achievement was that of assimilating himself to the movement of the world beyond humanity by identification with the animal world. He wrote: 'I am attempting to increase my capacity for sensing the organic rhythm in all things, I try to make a pantheistic identification with the trembling and circulation of blood in nature, in the trees, in the animals and in the air – then I try to make a picture from it, with new forms of movement and with colours that make a mockery of the old easel paintings.' By 1908 he had made a profound study of animal anatomy, and had even ventured into sculpture. The decisive event in his career took place in 1912, when he visited the Futurist exhibition at the Tannhäuser Gallery, and decided to replace his so-called 'dynamic' style, which consisted in repetition of contour and parallel movements, with the principle of 'interpenetration of forms'. In the last years of his life he succeeded in anticipating abstraction in a particularly rational way, but his most memorable works were the animal paintings produced between 1911 and 1913, though foreshadowed in the *Rider in the Sea* of 1907. This series of works, though rich in nuance, was an illustration of the Expressionist motto – 'Detachment from Nature'.

Kandinsky became aware at a very early stage of the notion that art was an intuitive or psychic process. This belief can be found on almost every page of his book *On the Spiritual in Art*, and in other writings which date from the *Blaue Reiter* period. It was to be one of the essential features of his teaching at

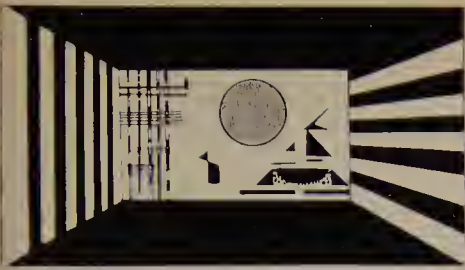
the Institute of Artistic Culture, Moscow, and the Weimar Bauhaus. Two of Kandinsky's other principal points are the correspondence between music and painting and the need for a personal interpretation of the 'spiritual mission' of art.

These three aspects of Kandinsky's thought are reflected in his treatment of movement, on the theoretical and practical planes. In his preface to the *Spiritual in Art*, he searches for the 'internal', human meaning in movement: 'In appearance, the movements of the monkey are the same as those of man: the monkey sits down, holds a book under his nose, leafs through it with a grave look. But this mimicry is devoid of all meaning.' Kandinsky's conclusion is that man's emotions have a much greater range of nuance, and that his aim must be to render states of mind, which may have been disguised, into natural forms.

As far as the spiritual life of art is concerned, Kandinsky represents it in terms of movement. 'The spiritual life to which art belongs, and of which it is one of the most powerful agents, can be transcribed by means of a forward and upward movement, complex but firm, and capable of being reduced to a simple element. This is the very movement of the act of knowledge. Whatever form it adopts, it keeps the same profound meaning and the same goal.' Kandinsky compares the situation of humanity to that of a carriage occupied by human beings who must be drawn forwards and upwards, and he develops this 'kinetic' image at length, ending up with a schema which he calls the 'spiritual triangle'. 'A large triangle divided into unequal parts, the smallest and the most acute being at the apex, is quite a good schematization of the life of the spirit. The further one goes in the direction of the base, the greater, the larger, the more spacious and the higher these parts are. The whole triangle, with hardly perceptible movement, advances and rises slowly, and the part which is closest to the apex will arrive "tomorrow" at the spot where the door was "today". In other words, what is merely an incomprehensible jumble today, and only means something for the extreme point of the triangle, will become charged with emotion tomorrow for the part which is nearest to it, and filled with new meaning.'

Finally, there is Kandinsky's interest in the link between music and painting, which relates closely to what has just been said. 'For the artist-creator, who is anxious to express and must express his "interior universe", the imitation of the objects of nature, even if successful, cannot be an end in itself. And he envies the ease and facility with which the most immaterial art – music – achieves its goal. It is understandable that he should turn towards this art and attempt to discover similar procedures in his own. This is why we now have, in painting, research into rhythm, abstract and geometrical construction, and why such value is attached to the repetition of coloured tones and the dynamism of colour.'

Kandinsky developed this idea into a very exact theory of correspondence between the 'internal sound' or 'internal resonance', on the one hand, and the forms and colours on the other. He believed that it was possible to apply the laws of harmony, musical composition and rhythm to painting. Under the influence of Scriabin and Mme A. Sacharijn-Unkowsky, he drew up a schema of correspondence between musical tones and colours which was included in his book. This was based on the principle of 'internal necessity'. 'The colour is the key,' he wrote, 'the eye the hammer which strikes it, the soul the instrument



29 Wassily Kandinsky
Theatre set for Moussorgsky's *Pictures at an Exhibition* at the Friedrichtheater, Dessau, 1928

with a thousand strings. The artist is the hand which, with the aid of such and such a key, obtains from the soul the vibration which is appropriate. It is therefore evident that the harmony of colours rests solely on the principle of effective contact. The human soul, touched at its most sensitive point, replies. We shall call this principle the *Principle of Internal Necessity*.' For Kandinsky, this is the dynamic element in all forms of artistic creation.

Kandinsky bases his dynamic theory of colour on the results of empirical and psychological contact with nature and natural phenomena, rather than on positive scientific knowledge. Two broad divisions appear from the outset. I. The warmth or coldness of a colour tone; II. The clearness or obscurity of this tone. Each colour can be divided into four principal tones, since it may be 1) clear and warm, 2) clear and cold, 3) dark and warm, 4) dark and cold. In fact Kandinsky's notion of the warmth or coldness can be restated as the tendency of a colour to approach, on the one hand, yellow, and on the other, blue. When the distinction operates on the same surface, each colour keeps its own fundamental tone. But the tones become either more or less material, according to their degree of warmth or coldness. If there is a horizontal movement, the warm tone tends to come closer to the spectator while the cold tone draws away.

Even the colours which provoke this movement in a horizontal direction are affected by it. But at the time they are differentiated one from another in their internal values. The tendency of a colour towards the warm or the cold is therefore offset by the internal value of that particular colour. This is what Kandinsky refers to as the *First Great Contrast*. The *Second Great Contrast* is brought about by the black/white polarity, since these colours are the equivalent of the tendencies towards blue or yellow in the previous category. They represent the ultimate distance between clarity and obscurity. In this case, there is the same type of phenomenon as with the previous example: the clear approaches the spectator and the dark recedes.

Kandinsky sees the movement between yellow and blue, or the *First Great Contrast*, repeating itself in terms of eccentric and concentric movement. If there are two circles, one in yellow and the other in blue, the yellow circle gives the impression of radiation: it takes on an outward movement and almost visibly approaches the spectator. The blue circle, on the contrary, takes on a concentric movement, like a snail retiring into its shell. It draws away from the spectator. These various effects are illustrated by tables in Kandinsky's work.

Kandinsky glimpses the plastic and psychological possibilities in pure movement. 'To obtain that,' he writes, 'form, movement, colour and the objects taken from nature (whether real or unreal) should not be allowed to suggest any external effect, or anything that could take on external form in narrative. The more the movement is lacking in external motivation, the more the effect which it produces is pure, profound and internal. A simple movement, as simple as you can imagine, without any identifiable end, already operates on its own, and takes on a solemn, mysterious importance. This lasts as long as one remains in ignorance of the external and practical goal of the movement. It is therefore operating in the same way as a pure sound. . . Simple movement, which does not appear to be motivated by any external agent, hides an immense treasury of possibilities. You sense it most when you are plunged in abstract thought, which snatches

man away from the utilitarian bustle of everyday life. So it is outside the practical realities of life that these simple movements can be observed. Yet we need only remind ourselves that nothing at all enigmatic can happen in our streets without the interest which we were taking in this movement vanishing completely: its practical significance destroys its abstract significance. This is the principle on which the 'New Dance' both could be and will be created – which will develop *integrally* the internal meaning of movement *in Time and Space*.'

'And here as well,' Kandinsky continues, 'it will be the law of necessary utilization of the internal meaning of movement as principal element in the dance that will determine the evolution of the enterprise and lead it to its goal. Here as well the conventional "beauty" of movement has to be abandoned. . . every chord is beautiful, that is to say useful, when it is dictated by Internal Necessity, just as, in the dance, the internal value of *every* movement will soon be felt. In that case as well, internal beauty will replace external beauty. A power as yet unsuspected, a living force, will emanate from the "non-beautiful" movements.'

Kandinsky places the main emphasis on the musical value of movement of forms, and above all on colours. Scriabin's influence is always well to the fore. When Kandinsky speaks of rhythmic compositions on a ground bass or the science of harmony in painting, he is already thinking of his *Improvisations* (in the style of Böcklin), his *Compositions* and his *Impressions*. But there is an even more direct contact between his musical theories and his work as an artist in the theatrical projects known as *Sounds*. He had already been working on similar projects at Murnau in 1909, and the final result was his spectacle based on Moussorgsky's *Pictures at an exhibition*, which was given at the Dessau municipal theatre in 1928 while he was professor at the Bauhaus. Apparently he also invented a colour organ.

Kandinsky's concern with the possibilities of linking sequential arrangements of colours and forms to subjective movement persisted throughout his career. At the *Blaue Reiter* stage, this was genuinely new. His lyrical abstraction was to have a widespread influence on the next generation. He persisted in this early style, which can be traced back to 1908 and involved an enormous number of experiments in movement, up to 1921, when his work began to take on a more architectural and geometrical character. Even beyond this stage, movement continued to play an important role. After 1934, the period of Kandinsky's full maturity, it was successfully adapted to his changing style.

At this point, however, we are concerned with Kandinsky's theoretical, plastic and pedagogic work in the years before the First World War. In all of these fields, his achievement marked an essential step in the evolution of a new abstract vision in art. He anticipated the mutual isolation of the various plastic elements composing the traditional work of art, and in particular pointed towards the liberation of the element of movement. And, although he realized that all these elements should be presented in their pure evocative power, he succeeded in enriching the whole development with an emotional and spiritual dimension.



30 Paul Klee
Tanzt Entsetzen, c. 1925. Pen drawing

● Klee: itinerant movement

Paul Klee, who was also a member of the *Blaue Reiter*, was kept somewhat in the background during the years 1910–14 by the dynamic personalities of Kandinsky and Franz Marc. His contemplative, yet humorous character scarcely fitted him for active participation in an artistic group. But his taste for music, his tendency towards abstraction and his pedagogic capacity all suggest comparison with Kandinsky. In effect, his development followed an exactly opposite path to the 'abstractionist' trend.

The problem of movement was at the centre of Klee's preoccupations. But it figured there more as a feeling that had to be tamed than as a principle of pure animation or dynamism. Klee was anxious to go beyond the original emotion, in what might be called a new Romanticism in painting. 'Ingres is supposed to have ordained immobility,' he wrote, 'I would wish, beyond pathos, to ordain movement.' This particular concern with movement can be traced to a very early stage in Klee's life. In the course of his first year at the Knirr studio, Munich, which lasted from 1898 to 1899, he noted in his journal that a retired lieutenant had been visiting him to explain the movement of line. When he visited the Michelangelo frescoes during his visit to Rome in 1901, he wrote of them: 'The movement and the uneven musculature are not pure art, but something more than pure art.' He has left an amusing comment on a classical statue in the Palais des Conservateurs: 'a female statue that is mobile and as perfect as nature. The German makes it revolve. His young wife is seated on a bench and admiring her husband...'

Klee gives a detailed account of his intentions in the plastic field, which involve an elaboration of movement and organic growth in the work: he also gives a special place to light. 'Light and natural forms fight one another, light puts them in movement, evening out the curves, "ovalizing" the parallels, making circles turn in the interstices, and animating the interstices themselves.' At the end of 1910, he makes the further comment that 'light is capable of fulfilling a new function, that of colour movement'. In September 1914 he states that the genesis of movement in the forms is the essential feature of the work.

In 1917 Klee reached a definite attitude on the problem of movement, which was based on analogies from polyphonic music – although the conceptual side was not by any means abandoned. An object that was in ordinary terms invisible but figured in a complex and simultaneous process of organic movement was to be the very centre of his procedure as an artist. Klee had learned by experience that every interlocking rhythmic figure that could be seen was at the same time one of nature's vibration formulae, contained somewhere in the human rhythms of walking, breathing and the beating of the pulse, or in the cosmic rhythms of day and night, the years, the moon and the earth. 'His plastic work,' remarks Werner Haftman, 'has its origin in movement, it is itself movement perceived and made precise.' Klee invites us to make acquaintance with the kinetic qualities of water, of lines, circles and spirals, and of arrows.

The sheer quantity of Klee's work makes it impossible to sketch a full picture of the way in which he utilized movement. There are over 10,000 known works by him. But for our purposes the most relevant material is the series of graphic and pictorial works which he completed between 1910 and 1920. After 1920 his

treatment of movement held an important place in the experiments of the new generation of artists, since it lay mid-way between abstraction and surrealism. At all stages, however, he made a distinctive combination between the different forms of movement and the principle of organic development in nature and in the work of art, indicating turn by turn – in the words of Flinker and Lachenal – ‘a taste for the burlesque, precision of psychological observation, above all poetry . . .’

● **Sculpture: Duchamp-Villon, Laurens, Archipenko, Brancusi, Zadkin, Arp**

Sculpture frequently lags behind innovations in the pictorial sphere. In this case, however, there are several sculptors who deserve to be mentioned for their new ways of envisaging movement. Rodin and Medardo Rosso had concentrated attention on the importance of the play of light on the modelled surface. Duchamp-Villon, Archipenko and Brancusi all reacted against this tradition in their various ways, and developed new conceptions of movement in the process. Laurens and Zadkin, who were influenced at the start by Rodin, affiliated themselves to contemporary movements, Laurens to Cubism which he reflected in his reliefs and polychrome sculptures, and Zadkin to Expressionism, which accorded with his dynamic lyricism. Meanwhile Arp began to incorporate ‘moving symbols’ in his sculpture and reliefs.

The quality of movement in the work of Duchamp-Villon, who was also closely associated with Cubism, is ‘objective’ in the sense in which we have been using the word. His *Torse de jeune homme* (1911) has been called an ‘incarnation of the athletic sportsman of the twentieth century . . . the equal of the greatest masterpieces of antique statuary. By collecting the lines of force and essential volumes of the torso of a young man in movement, in a concentrated form which is intended to increase the desired impression of power, the sculptor transcends his subject by introducing the idea of a mimetic relationship between the torso and a tree with its branches amputated.’

Duchamp-Villon’s masterpiece, *Le Cheval* (1913–14), illustrates a form of dynamism that in some ways recalls Futurism. The horse – symbol of speed – was almost his only theme in 1914, the most fruitful year of his career. ‘People and things brush us by rapidly, and displace us,’ he wrote, ‘we have become used to it and are unable to distinguish the specific forces of the former from those of the forces which they control. Hence a conception of life in which it would reveal itself to us quite simply in its highest pitch of dynamism, it is only a step away, and that is quickly passed over.’

In Laurens’s work from the Cubist period, there is evidence of ‘objective’ mobility. Laurens also pursued this path in the series of collages, reliefs, wooden sculptures and polychrome plaster sculptures which he completed between 1911 and 1918. In the case of Archipenko, it is difficult to say which of the various categories of movement is dominant. In 1911 he adopted the procedures of primitive sculpture and was able to suggest movement in this way. In 1912, he treated his bronze *La Danse* in quite a different way: he himself described it as ‘modelling in space’. Then there is his juggler *Medrano I*, also dating from 1912, and its successor *Medrano II* from 1914, both of which recall the Cubist style

as well as possessing elements in real movement which will be described in Chapter 6. The polychrome plaster entitled *Pierrot de Carrousel* (1913) is very close to the research in objective movement which was being undertaken by the other Cubists and relates to the collages which Archipenko was also producing in this year. Archipenko's stylistic eclecticism, and his consequent readiness to use movement in very different ways, is demonstrated by the wide disparity between the works which have just been mentioned and the *Réflexions* or the *Boxeurs* of 1914, which make use of interplay between geometrical elements in a manner that recalls the *Silhouette* of 1910. Archipenko's work becomes even more complicated as his interest in different styles and materials develops. The culminating point is his invention of the 'Archipentura' system which will be discussed in Chapter 6.

Constantin Brancusi's research into movement was entirely on a spiritual plane. His thought was dominated by the notion of circular movement, and he associated geometrical volumes such as the pyramid with the idea of progress which he believed to be illusory. 'The *fateful pyramid* with which Brancusi has characterized the false notion of elevation and progress was present all around. He took a sheet of paper which was lying before him and drew upon it. At the same time, as if to give himself a rest, he looked at the spiral which surrounded the portrait of James Joyce, and I saw it in that moment moving in the cycles of rotation, in the curves of the eternally returning history of humanity that was dear to Vico and to the Irish poet.'

Brancusi's spirals of life and death, which belong to a later stage, recall the preoccupations of Klee. But his dominant theme is always that of flight. 'Throughout my life I have searched only for the essence of flight,' he wrote. 'Flight, what happiness!' At the same time it is important to bear in mind the role of such geometrical elements as the segments of circles and the ovoid in creating the suggestions of movement which were typical of his work. Both are combined, of course, in his many variations on the subject of the bird. From *Maiastra* onwards, the bird held a 'cosmic' significance for Brancusi, and he was able to refer to the 'bird, a project which must be enlarged to fill the vault of the sky'.

In the case of Zadkin, who was born in 1890, the use of movement is 'subjective', as is appropriate to the lyrical and poetic style of this sculptor. Although it is not very much in evidence, Zadkin's subjective movement has a certain interest because of the important influence which he exerted upon the next generation.

Jean Arp, who was born in 1887, has written of the collages and tapestries which he completed in 1915: 'As the disposition of planes, the proportions of these planes and their colouring seemed to depend simply on chance, I declared that these works had been ordered 'according to the law of chance', as it is in the order of nature - chance being for me no more than a restricted part of an unattainable principle of existence, of an order which cannot be grasped in its totality. The Russian and Dutch artists who were producing works apparently quite close to mine at this period were subscribing to entirely different aims. [My works from this period] are in fact an act of homage to modern life, a profession of faith in the machine and in technique. Although their treatment is abstract, they always retain a basis of naturalism and *trompe-l'oeil*.' This can

31 Jean Arp
Drawing 'according to the laws of
chance', c. 1917



be regarded as the first statement of the idea which was later to become famous as 'automatic writing' in the next generation. Arp, a surrealist in advance of his time, stands at the head of this development.

● Ballet, theatre, cinema – Reflections on movement

Reference has already been made to the relationship between the theatre and the plastic arts at the beginning of the twentieth century. As far as movement and the idea of mobility are concerned, the most spectacular theatrical events of this generation were those connected with the Russian Ballet of Diaghilev, the stage-sets of Leon Bakst which involved 'painted' actors, the art of Nijinsky and the Swedish Ballet of Rolf de Maré. A remarkable pioneer in this field was Edward Gordon Craig, who had planned the operation of his 'art of movement' or 'art of revelation' as early as 1907, and eventually put it into effect in *Scene* (1923). Craig's aim is to present movement of objects in its pure state by means of light. His experiments, together with those of Appia, will be dealt with under the heading of real movement.

Another synthesis between dramatic and plastic art, in which movement plays an integral part, is that which was being developed in Russia, where Tairov, Alexandra Exter and Yakulov were trying to find a 'system' for integrating decor, costume, acting and mime in a 'dynamic whole'. The *Sturm* group in Germany were concerned with similar objectives. Later Schlemmer, Moholy-Nagy and Farkas Molnar took up the same path of investigation at the Bauhaus. Gropius' 'total theatre' of 1926, which existed in plans and models, was to influence the use of movement in dramatic and architectural circles, while at the same time holding out the hope of collaboration between these professions and plastic artists with a strong sense of the aesthetic principles of movement.

It is probable that the cinema exercised a major influence on the plastic arts around the years 1910–20. It was around 1920 that plastic artists with abstract tendencies first began to take part in cinematographic projects. In Fernand Léger's *Ballet mécanique* of 1924, the movement of the camera and the techniques of film montage were the only methods employed. From this work, there is a long line of 'kinetic' experiments of this kind leading from Henri Chomette, Moholy-Nagy and Len Lye to Fischinger, McLaren, Valensi and the artists of the present day.

Literary works from the beginning of the century which contain important passages on movement may have had a reciprocal influence on the plastic arts. Bergson's books seem to have had a reasonably rapid effect on the generation of artists who began to produce important work around 1910. Both James Joyce and Marcel Proust tackled the problem of movement. Joyce wrote in his *Journal* of movement in sculpture: 'Sculpture is associated with movement in as much as it is rhythmic; for a work of sculptural art must be surveyed according to its rhythm and this surveying is an imaginary movement in space. It is not false to say that sculpture is an art of repose in that a work of sculptural art cannot be presented as itself moving in space and remain a work of sculptural art.' Proust wrote in one of his letters: 'And then, like a town which, while the train follows its twisting track, appears to us at one stage on our right, at another on our left,

the different aspects that the same character will have assumed, to the point of being like a succession of different characters, will demonstrate – but only in this respect – the sensation of the passage of time. Some characters will reveal themselves at a later stage to be different from what they are at first, different from what one will believe them to be as it happens very often in life.’





4 Movement in the age of surrealism and geometrical abstraction

- 32 **Josef Albers** (top)
Plate from the album *Homage to the square*, 1966
- 33 **Olle Baertling** (right)
Og. Plate from the album *Triangles*, 1961
- 34 **Auguste Herbin**
Clarté, 1961

Between the two World Wars, there were very few important developments in the use of movement in art. A large proportion of the artists of this period simply continued, or took up once again, the sequence of experiments which had begun before the widespread dislocation of their activity which took place in 1914. There were, however, two opposing currents – geometrical abstraction and surrealism – which evolved in direct relation to contemporary discoveries in the field of psychology. From this relationship, which involved psychophysiology in the first case and psycho-analysis in the second, two new ways of envisaging movement gradually arose. Of course, the surrealist use of movement was on a thematic plane, while the movement that related to geometrical abstraction was strictly plastic.

The greater number of the artists who belonged to the *Cercle et Carré* grouping – founded by Michel Seuphor and Torres-Garcia in 1930 – were attempting to bring simple geometrical elements like the square and the circle into close connection or juxtaposition, in order to create a sensation of movement. Such artists as Arp, Sophie Täuber-Arp, Van Doesburg, Robert and Sonia Delaunay had already made similar attempts, as had the members of the Bauhaus to a lesser degree. But the so-called ‘geometrical’ abstract painters concentrated upon the new problem of taking into account a kind of spatial feeling which they had no wish to represent in conventional terms. ‘The Futurists,’ Marcel Brion has explained, ‘nourished the ambition of carrying out in terms of movement the kind of deployment of form which the Cubists had fixed in a static geometrical structure, by bringing the individual moment to the point where it was the addition of all the possible moments. Yet the weakness of Futurism, apart from its excessive reliance upon theory, lay in the fact that they erroneously believed a synthesis to be no more than the result of the addition of different analyses.’ It was precisely the new awareness of psycho-physiological methods of enlivening the canvas, from a basis of simple elements, that helped to relegate the Futurist conceptions to the background.

The innovators of the generation born around 1910 were therefore eager to abandon the *theme* of movement, and to take up the methodical investigation of plastic possibilities which had already been foreshadowed in Impressionism. This transition from a type of objective movement that was still dominated by impressions of nature to a type of movement which held unequivocal indications of the phenomena of perception was initiated by the artists of the previous

generation – Magnelli, Freundlich, Herbin, Baumeister, Schwitters, Albers and the former teachers of the Bauhaus. Freundlich, for instance, devised a method of associating planes of colour in painting in the same way as volumes were associated in sculpture. His aim was to go beyond the traditional framework of the arts, and to use abstraction to give a new sense of movement.

● Herbin – Schwitters – The Bauhaus – Cercle et Carré – Abstraction-Création



35 Kurt Schwitters
Interior of the *Merzbau*, c. 1925,
Hanover (destroyed)

Herbin began by using the abstract motif of undulating lines, but later managed to develop an alphabet of geometrical elements upon which he based his theory and practice of colour juxtaposition. ‘Time and space are limited by movement,’ he wrote. ‘Everything is complete. Everything is destined to be complete. Electricity and microbes existed before they were discovered. The earth turned before it was understood to turn. The realities of tomorrow are contained in the realities of today. Movement embraces everything, envelops everything, dominates everything and penetrates everything. Nothing is isolated from the whole, nothing is independent of the whole, in volume, in line, in plane or in colour.’

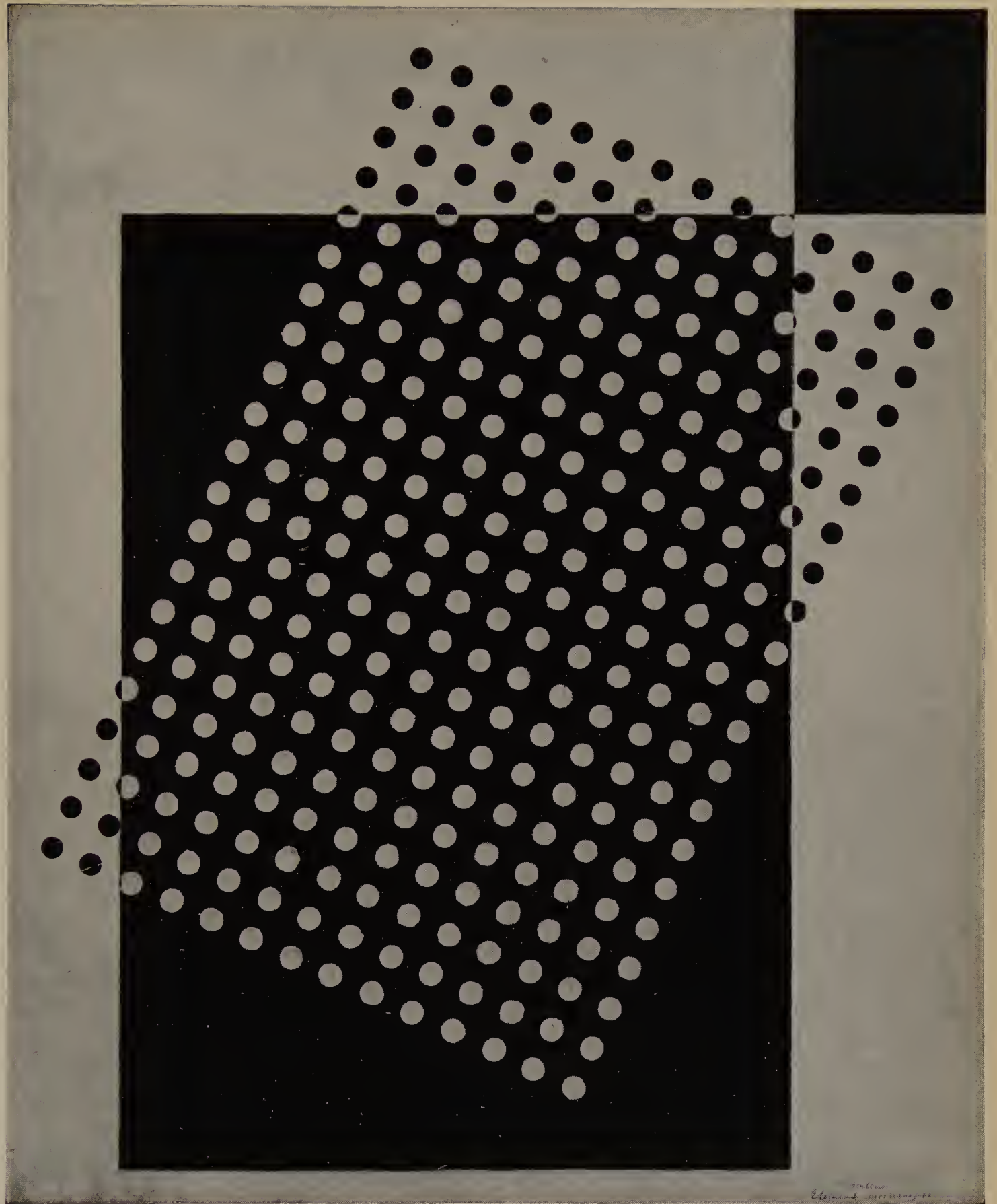
Herbin continues: ‘Since colour is the means of painting, painting will have to be conceived in terms of two-dimensional form to obtain a unity of expression. Painting has no need of the third dimension, either in reality or in any artificial way, since colour expressed broadly in two dimensions possesses in itself a spatial power. Some colours express space in depth (blue), and others space that projects forward (red). Some colours express radiation from within to the outside (yellow) and others from the outside to the inside (blue). Some colours express mobility (red, yellow, blue) and others immobility (white, black, green): others mobility and immobility according to their proportions (pink and violet). All these findings are liable to be modified yet again by the relationships of colours between themselves.’

The aim of the poet and artist Kurt Schwitters was to ‘construct a new world from the debris’. He carried out this plan by means of a purely abstract technique of expression. His subtlety and humour make him one of the pioneers of intellectual movement in this generation of Dadaist and surrealist manifestations.

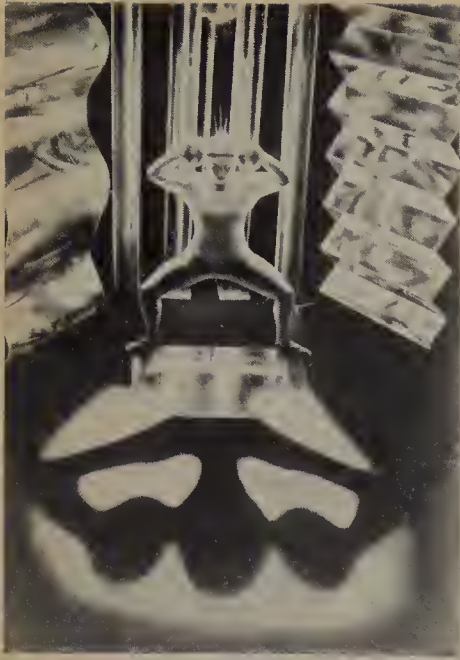
Reference has already been made to the importance of linear movement in the teaching of Klee and Kandinsky at the Bauhaus. The preparatory courses which were introduced at the Bauhaus and given first by Itten and later by Albers and Moholy-Nagy, introduced a more generalized study of movement. This *Vorlehre* (or *Vorkurs*) was intended to serve as preparation for the study of construction and the theatre, and it involved demonstrations of displacement on plane surfaces as well as studies of movement in relation to various different materials. There can be little doubt that Itten’s statements on colour contrast and its applications to architecture, and Albers’ work on the kinetic utilization of colour have both exerted considerable influence on present-day research into colour.

Finally, Moholy-Nagy made some important theoretical statements on photography, the cinema and three-dimensional constructions, which have encouraged the development of an art of movement. These were summed up in the manifesto which he published with Kemeny.

36 Henryk Berlewi
Mécano-facture black on white,
Berlin, 1923. It was around 1922–3 that
Berlewi invented the principle of
‘mechano-facture’ – or superimposition
of repetitive geometrical elements with
the aim of setting up surface vibrations



1965
L. S. M. 1965/1966



37 Oskar Schlemmer
Metallic dance, c. 1928.
 Performed by Karla Grosch at the
 Bauhaus theatre

Oskar Schlemmer, who gave courses on man in art, and, of particular interest in this connection, the art of choreography, placed considerable emphasis on the ways in which man's movements could be related to aesthetic movement (on a plastic, choreographic and dramatic level). He did in fact use the word 'Kinetik' in his teaching programme.

Another member of the Bauhaus, Lothar Schreyer, was writing in 1919: 'The rhythm of the work of art is a movement, a movement which is both compelling and necessary. This movement is compelling because the eye of the artist is forced to submit to it. Movement is an artistic necessity, since only a precise movement, conceived creatively, can give his vision structure.'

The main programme of teaching at the Bauhaus was instrumental in spreading kinetic ideas on both the sculptural and the pictorial level, which belonged to categories outside the traditional division between art and craftsmanship. One of the main points of this teaching was to exploit the new dimensions, such as that of movement, through the use of new materials: 'constructivist' works in relief and sculptural or architectural constructions which have been pared down to the most elementary forms demonstrate this new departure to the full.

The artists of the generation which was born around 1900 were therefore heirs to a new type of plastic movement. This became characteristic of the large and loose groupings to which they belonged – *Cercle et Carré* and, in particular, *Abstraction-Création*. Vordemberge-Gildewart was expressing a general feeling when he wrote in 1933: 'For me, the object only plays an entirely secondary role. For, in the last resort, it does not exist at all because of its static character. My art is anti-static.'

This particular 'Nordic' current of abstraction is well represented by the slowly and carefully developed styles of Cesar Domela, Ben Nicholson, Baertling, Mortensen, Pasmore and Geer Van Velde. All these artists helped to awaken interest in the perceptual psychology of movement by elaborating linear tensions, juxtaposing planes of colour and making conscious oppositions between positive and negative volumes. Domela, for example, makes frequent use of different metals to create sinuous lines indicating movement. Pasmore proceeds from the purely pictorial expression of geometrical elements in tension or vibration to the juxtaposition of materials as diverse as wood, glass, perspex and other plastics. Baertling's hard-edge paintings and moving sculptures have been described in the following terms by Sartoris: 'In his staggering clear-cut paintings (flashes of colour of an extraordinary purity which seem to tear apart the space and fleshiness of a metallic sky), just as in his mobile, threadlike, rectilinear, ascending, aerial and floating sculptures (which are infinitely extensible without weight, measurement and even physical presence), there is never any conflict between one and another – the incommensurable is never an abstraction of the monumental.'

The *Salon des Réalités Nouvelles* played an important part in determining the evolution of this type of work from 1946 onwards. Leo Breuer, one of the founders of the salon, made use of the juxtaposition of different planes – represented as they actually are in space – to create movement through interference. In his work the psychological effects of movement were often reinforced by a clever use of colours, and also by the introduction of stripes to give vibration.

38 Students from Josef Albers' class at the
 Bauhaus: Study on paper, c. 1928



● Gleizes and the use of rhythm – The School of Paris

It is in the writings and paintings of Gleizes that the transition from Cubism to a psychological awareness of plastic *rhythm* or movement can be followed with the greatest ease. Gleizes stated: 'Human creation implies the total renunciation of external sensation. It forces you to come to terms with the principle of living order, which links the organs simultaneously within the organism. This is the principle which transforms power into action, and makes mobility out of the immobile. When you have understood what movement is, you have the means of creating it in human terms.' At another point Gleizes writes: 'Movement is certainly the thing which most needs clarifying nowadays. Beneath the mirages of speed we believe that we are discerning its character. But this is an error. That movement is merely a perceivable agitation with no direct relationship to the movement which is a spiritual continuity.' 'With having understood the character and the necessity of *rhythm* – the ultimate principle of *space-measurement* and *time-cadence* – and having added it at a later stage to paintings which had been completed without foreseeing this need, I managed to take account of all the potential weaknesses in spatial and temporal organization.'

The point which Gleizes' theory of movement had reached around 1933 is well illustrated by the position which he adopted between movement and stasis. He claimed: 'I have completed pictures by forcing myself to situate clearly, and in their natural places, the expressions of space and time – the latter being no more than a counterpoint or fugue on the former.' The works which Gleizes produced from this period up to 1950 reflect his preoccupation with these themes, which also cover the 'dimensions' of light and movement.

In the same way, the art of Estève, Bazaine, Manessier, displays a subtle animation of the picture surface, while other painters of the Ecole de Paris such as Poliakoff, de Staël, Singier, Vieira da Silva, N. Dumitrescu and Hella Guth use constructed and coloured 'planes' with geometrical associations which betray their preoccupation with mobility. It has been suggested that the work of Poliakoff, 'eminently static, but not exempt from subterranean currents of subdued violence... is of a rare discretion, so enigmatic that a long period of intimacy with his work, a patient period of waiting in front of his pictures, is necessary'. On the other hand, the paintings of Singier 'demand with as much force and in the same way – and for the same reasons – as a Chinese landscape from the Sung dynasty, that *movement towards*, that setting in motion of the whole being, body and soul, of the spectator into the innermost centre of the picture.' This element of participation by the spectator, which takes place through an intimate movement, it particularly up to date. 'A collective movement of the heart and the senses, as long and patient as is necessary for the accomplishment of that kind of fusion of the spectator with the work which is, in the last resort, the goal of contemplation – this movement is penetration, association, and confusion: it lasts up to the point when man has become what he is looking at, through bringing to it the best, most lively and most active part of himself.'

Some of the innovations of Lapicque, a notable theoretician of movement, can be placed within the French tradition of abstraction. For Lapicque, 'pictorial movement is never obligatory'. He makes a distinction between 'subjective movement', which is that of the spectator, and 'objective movement', which is

that of the object. The attempt to conciliate these forms of movement and to compromise between the exigencies of abstraction and representation lie at the heart of his work. It may be added that some artists of the generation born around 1900 continue to use unambiguously figurative forms in their work. Pignon is one example of this class of artists who continue to view the problem of movement from its realistic side.

● Intellectual movement: Surrealism – Max Ernst, Masson

If we go back to the problem of intellectual movement, we can recall that this type of movement originates in an act of the mind, but was successfully assimilated in the Futurist and Vorticist programmes before the 1914–18 war. In a similar way, the Dadaists relied upon making satirical commentaries on a form of movement that was cerebral in origin. Among the Dadaists who were still very active in the 1920s, we can mention Arp, Janco and future adherents of surrealism like Max Ernst, Masson, Joseph Sima, Toyen and Styrsky, all of whom made use of intellectual movement.

The surrealist contribution to the art of movement was made manifest first of all in their very individual use of the semantics of movement, which bordered on the symbolic interpretation of the favourite themes of psychoanalysis, and secondly by their direct application of automatic writing in works of plastic art. In both cases it was more a question of allusions to movement on an unconscious level than of genuine movement.

The painting of Max Ernst has been described by André Breton as a programme of optical research which takes as its point of departure ‘irritability of mind’ and a systematic habit of placing things out of context. Ernst himself has frequently referred to this hypersensitivity, which finds expression in surrealist imagery that is often developed from the basis of childhood experience while making use of an ‘intellectual’ method resembling psychoanalysis. He relates the subjects of his work in particular to the experiences which he underwent at the age of five to seven, as a result of the psychological shock from the dynamic personality of his father. ‘A blind swimmer,’ he writes, ‘I made myself a seer. *I saw.*’ He has in fact made a close comparison between the titles of his pictures and the images of his childhood experience. ‘*Very beautiful women crossed a river screaming. A man, walking on the water, took one girl by the hand and jostled another. People who were rather reassuring to look at – in fact, they had slept too long in the forest – made their savage gestures only for the sake of charm. Someone said: “The motionless father.” It was then that I saw myself, showing my father’s head to a young girl. The earth only quaked mildly. I decided to put up a monument to the birds.*’

The images and symbols, both abstract and concrete, which occur in this text, situate Max Ernst in a personal universe which is both literary and plastic.

On 10 August 1925, Ernst discovered the technique of *frottage*, about which he was to write: ‘This process later disclosed itself to be the genuine equivalent of what was already known by the term *automatic writing*. The author takes part as a spectator – whether indifferent or passionately involved – in the birth of his work and observes the phases of its development.’ In making the conjunction

39 Max Ernst
Monument aux oiseaux, 1927.
 Private collection, Paris. Photo Roche,
 Editions du Seuil.
 © SPADEM, Paris



between chance and the act of 'plunging into the springs of deeper life, in order to bring back the hidden reality,' he enriched pictorial art with an element of novelty. His art shares with psychoanalytic techniques the process of transcendence whereby 'the artist appears in a modern role, that of receiver of waves, rather than creator.'

Max Ernst has incorporated elements of movement both in the thematic and the plastic sense into a large number of his works. He has made particular use of them in his three-dimensional objects, which can be traced back to his Dada period and to works such as the *Objet dad'art* of 1919. At a later stage he was to concentrate on displaying his objects from different angles – a process which brought out an element of 'visual' sexuality, as in the *Belle Allemande* of 1935, and also in the *Objet mobile recommandé aux familles* of 1936, which makes use of real movement with a surrealist intention as do the contemporary constructions of Giacometti.

André Masson, who was born in 1896, combines thematic movement and techniques of automatism with a distinctly personal graphic virtuosity. But what distinguishes him from the line adopted by the Surrealists around 1930 is his concern with a predominantly physiological vitalism, which is translated by a particular quality of movement. Here it is a question of an authentic inward movement, which is often expressed in a calligraphic manner that reveals the existence of a section in time. Masson follows a Chinese aesthician of the fifth century in claiming: 'The sound of the spirit . . . makes movement alive.'

There is a deep affinity between this Surrealist who uses movement in an intellectual way and the Expressionist painters using pure gesture who are tending more and more towards a form of movement that is entirely conditioned by a state of mind (Hartung, Soulages, Tobey).

● Surrealism and thematic movement – Magritte, Brauner, Tanguy, Dali

Poetic irrationalism, and the inward flow of consciousness played an important role in Surrealism from the very start. Aragon wrote in 1924: '*Surrealism*, son of frenzy and shadow. Enter, enter, it is here that the kingdoms of the instantaneous commence . . .' From this point we arrive at the first attempts at automatic writing, which took place after the first surrealist exhibition, held with the work of Arp, Chirico, Klee, Man Ray, Miro, Picasso and Pierre Roy. 'In the immense shadows of the unconscious, 'writes Michel Carrouges, 'there are mental slopes over which stream words, miraculous torrents, shining with all the fires of their imagery.' This is an idea which can also be applied to surrealist painting, which can be seen primarily as a will to metamorphosis and the 'setting in motion of the dialectic by automatism.' This dialectic is resolved by the 'fusion of the deam and the watch into a superior state.'

Among the artists who have most faithfully followed the line of symbolism in the realm of movement, we can place Magritte, Delvaux, Victor Brauner, Salvador Dali and, in a more precise sense, Yves Tanguy. Magritte, who was born in 1898, puts the accent on the symbolic and poetic significance of pictorial themes. Movement thus appears at the same time in a poetic and a popular light in a painting like his *Aube à Cayenne* (1926). It takes place within a symbolic

perspective while at the same time indicating something beyond. 'The real problem,' suggests Pierre Demarne, 'is today no longer one of representing anything other than the movements of self-awareness, and of stimulating them in the spectator. In that case, Magritte's pictures are far more dynamic than those of the majority of the great illustrators of the century. Only the movement takes place on the inside, as people say of stage productions that they take place within the auditorium.' Demarne holds that Magritte's images 'create movement, but not the movement which displaces lines in space – rather the movement which effaces them. So a new world is born . . .' – the world of poetry and the dream.

Tanguy, who was at one time a sailor, has built up a universe which is dominated by maritime movements. The majority of his works feature the fantastic remains of flotsam, which the salt water has purged of all its associations. 'The things seem to float and swim like algae of tadpoles but they appear to do so in the air, for they have the solidity of objects and cast shadows.' Besides the movement of the sea, Tanguy's work also refers to the movement of clouds and of the Milky Way – his individual sky.

Victor Brauner, who was born in 1903, incorporates a form of movement in his work which is mental in its construction although it subsequently lends itself to 'a world of projection of objective chance'. Other surrealist artists, who were at work in the years before the Second World War, convey a movement that is subconscious in origin, but under intellectual control. Several of Dali's pictures have been conceived through the method of 'paranoiac-criticism' which was defined by André Breton in the following terms: 'A spontaneous method of irrational knowledge based on the critical and systematic objectivization of delirious associations and interpretations.'

● Automatic signs and paintings: Dominguez – Miró, Michaux

Oscar Dominguez, who, in his development of automatic painting, renewed for the last time the expression of intellectual movement, painted his *Decalcomanies – sans-objet* in 1935. These works are like rocky landscapes, and they give place in 1939 or thereabouts to 'cosmic' paintings, which represent the last phase of the surrealist research into movement on a traditional intellectual basis.

Two painters whose work is surrealist or very close to Surrealism succeeded in making drawings and signs the vehicle of expression for a new form of movement based on a new type of attitude. The world of Miro, with its coloured signs and its miraculous naivety, stands at the other pole from the style of Max Ernst and his divinatory intelligence. This new spirit, which is associated with an entire lack of artificial constraint, is often conveyed by a type of draughtsmanship that is full of movement and has no master other than the imagination. In the years after 1927, Miro himself passed through a period of 'anti-painting' which resulted in collages and paintings 'of a wild frenzy'. The element of movement was still playing an important role at this stage, and it continued to do so in the next phase of Miro's work, which began in 1935.

Movement which is employed and controlled in a surrealist manner is a feature of the draughtsmanship of the poet Henri Michaux. But in his case it is used 'more violently, more electrically, more fantastically'. Michaux' aim as a plastic

artist is not to put into use a particular vocabulary of signs, but to convey the processes of life itself. He has written: 'Instead of a vision which excluded all others, I would have been content to draw the moments which, put end to end, make up life, to bring into evidence the internal sentence, the sentence without words, a cord which unrolls its sinuous coils without ceasing and is the intimate accompaniment to all that presents itself from the outside as well as from the inside. I wanted to draw the self-awareness of existence and the passage of time. Like taking the pulse. Or again, on a smaller scale, what appears when the evening has come and there is a performance (in a shortened and muted form) of the exposed film which has been open to the day. A cinematic drawing.'

When he proceeds to a larger scale, Michaux makes the following discovery. 'To my extreme surprise . . . something that had always been closed opened up within me . . . through this breach a whole quantity of movements were to pass.' Thus 'the amplitude of the gesture . . . had transformed the spirit of the drawing' in Michaux's works and the signs had become 'élan, participation, involvement'. Through this amplitude he was henceforth able to communicate with his own capacity for speed. 'And so there pressed into vision a whole number of movements, of which I had been full – indeed overflowing – for many years. In my childhood dreams, if I remember rightly, I was never a prince, and not very often a conqueror, but I was remarkable in my movements. A real prodigy in movements. A Proteus in movements. These were movements which, in effect, left no trace in my attitudes and could not possibly have been suspected by others, except by a certain air of absence which I possessed and a certain ability to abstract myself from what was going on.'

In order to arrive at a violent extreme of movement – a 'terrible' degree of speed – Michaux experimented with mescaline and lysergic acid. He attempted to convey the internal sensation produced by these drugs in the following passage. 'This carpet of vibration, which had points in common with the wide-spreading sparks of electrical discharges, and also with the spectrum of magnetism, this indefinable trembling, burning, teeming thing, like spasms which have become nerves, this tree with fine branches, which could just as well be bursting out at the side, this fluid which is tempestuous, liable to contraction and shaking movements, vibrant as Champagne but held in elastically and prevented from overflowing by a sort of tension at the surface, this nervous projection screen, even more enigmatic than the visions which came to rest there – I do not know, I shall never know how to speak of it in suitable terms.'

The act of translating this state into poetic or graphic images is the expression of one of the subsidiary phenomena which relate to this complex situation. All the graphic and pictorial work of Michaux – all his 'Phantomism' or 'Psychologism' – is therefore produced without a conscious act of will. It can be placed on the borderline between intellect and sensation, and the ensuing movement between that which is an object of thought and that which is an object of sensation. 'A portrait,' claims Michaux, 'is a compromise between the lines of force in the head of the draughtsman and those in the head of the sitter. The definitive path is the result of this struggle. Some paths are reinforced, others annulled, a few turned aside . . . I would like to be able to draw the effluvia between the two people . . .' At another point he draws attention to the role of movement in

his work: 'The ship responds to the hundreds of waves which strike its keel by an ample pitching movement. Under the blows, you tend to recover a measure of unity. Lean on them. Derive support from them. The waves which create dislocation can also be viewed as radiating.'

● **Subjective movement: German and American Expressionism – The gestural painting of Hartung, Schneider, Soulages, Mathieu, Lapoujade**

The expressionist type of abstraction, which we have already mentioned in connection with the *Sturm* group and in particular Lothar Schreyer, represented a relatively original use of movement in the context of the early 1920s. 'Expressionism is the expression of the spiritual by the form,' wrote Oswald Herzog. 'Form is movement-rhythm. On the material level, form in the Fine Arts consists of lines, planes and light (colour). . . Objects are in themselves ensembles derived from the phenomena of expression and movement.'

American Abstract Expressionism was to have at least as large an effect as German Expressionism on the artists practising gestural movement in the 1940s. Artists such as Thomas Benton (the master of Jackson Pollock), Andrew Dasburg, and Marsden Hartley (in his pictures entitled *Movements*) may be insufficiently known in Europe, but their influence was strong in the United States from 1915–16 onwards.

Some originality in the use of movement can be found in the violent brushstrokes of a number of painters of the *Ecole de Paris*, from 1930 onwards. Hartung and Schneider were the first to take up this line of 'gestural' experiment, followed a little later by Soulages and Mathieu. Hartung's work is essentially graphic, but has very little in common with the automatic writing of the Surrealists. In his case, movement is expressed through the medium of a vocabulary of signs. 'It happens in his work that the arabesque becomes the trace of a journey through the infinite, carried out by a force in motion that writes in a space not vacant but electrified a figure which, if interpreted correctly, would be one of the clues to the world order.' 'An art of anguish, his painting reassumes, beyond its tragic appearance, a strange quality of serenity, at the very moment when this surmounted tragedy becomes transformed into an image of Nature in its original stage, not perceived as a geometrical entity, fixed and immobilised by eternity – but on the contrary seen as a material in the process of fusion, whose movement is that of the storm and the volcano.'

Gerard Schneider, who was born in 1896, is perhaps the best representative of the generation of painters born around 1900 for whom gesture is, at first sight, the essential element in their art. In more accurate terms, this movement of the hand must be seen in relation to the problem of expressing an internal state which is itself eminently mobile. The work of these painters can therefore be placed in the tradition of 'subjective' movement – as we have called it. This is the sense which we must attribute to the following remark by Schneider: 'The work is thus above all an improvisation on an internal state which is there to be formulated in terms of a final solution which realizes the necessities of expression, plastic and technical means.' By temperament, Schneider is a man of strong

passions, with a tendency to violence. It is therefore understandable that the use of movement in his works, an element already present in his *Nature morte* of 1926 but particularly evident from 1944 onwards in his numbered *Compositions* and *Peintures*, should be full of vitality and psychological force.

This type of gestural painting which conveys a psychological movement was reflected during the 1950s in France in the work of such painters as Soulages, Tal Coat and Mathieu. 'In the work of Soulages,' writes Hubert Juin, 'the spectator is not invited to *see* or agree upon the element of dynamism. On the contrary, he is solicited by the dynamism: he *tests* it.' In the case of Tal Coat, the brush-mark is just as evidently an expression of the psychological intentions of the painter, which were to be seen in his half-figurative pictures from 1947-8 onwards. Finally Mathieu betrays the same fundamental intention by his professed attempt to leave 'the embryology of signs' behind, and to concentrate on what he refers to as 'the aesthetic of speed.' 'In introducing the notion of speed into the aesthetics of the West, I was only responding to the internal necessity in the methods of painting which are determined by its inexorable evolution.' After he had exhausted the possibilities of ultra-rapid gestural painting, Mathieu later turned towards what he calls an 'aesthetic of risk.' Gestural movement in the painting of the Ecole de Paris had by this stage arrived at a final degree of paroxysm.

Some of the processes which have just been described were a feature of the work of Fautrier, Lansky and Lapoujade. But Fautrier often showed himself to be a protagonist of what we have called 'objective movement.' 'Reality not only exists,' he maintained, 'but must not in any circumstances be purely and simply rejected. The gesture of painting is not simply the need to spread paint on a canvas, and it must be admitted that the desire for self-expression arises, in origin, from the observed object.' Nevertheless, it seems fair to conclude that, from the time of the *Les Otages* series (1942-44), gestural movement in the work of Fautrier was a matter of psychological expression. The same can be said of Lansky, who can be associated with this tendency towards subjective movement in spite of his meticulous composition.

Lapoujade, who was a man of the cinema and a theoretician of movement as well as a painter, very frequently used the term 'subjective movement.' In his view, 'in painting, movement only exists as a function of our sensations as spectators. Every one of the elements of the picture is motionless.' In contradiction to Claudel, who holds that 'all that is movement is time', Lapoujade affirms: 'All that is time is movement and serves to indicate movement.' In other words, time is the notion which we have of real movement. 'But from our birth to our death, we are no more than movement.' 'Movement, which does not really exist in the painting, therefore becomes a subjective effect, which is caused by the time which we are.' 'I thought it interesting to demonstrate this capture of time and energy by the painting - a radiating block before which we station ourselves 'in the process of becoming'.'

The Venetian painter Vedova, who is the only member of the recent generation in Italy to have assimilated the lessons of the Futurists, can be identified with this tendency towards subjective movement. In the words of one critic, he 'is attempting an active organization of black and violent signs'.

● Nordic Expressionism

Nordic Expressionism survived into the 1930s as a result of the work of a number of painters who practised a graphic style that was directly at variance with the formal colouring and organization of the canvas associated with geometrical abstraction. Movement was not the avowed aim of these Flemish Expressionists, but it is of course an integral part of any aesthetic which seeks to remain faithful to reality. It may be noted that this particular style was formed above all in Holland. From 1914 onwards De Smet and Van den Berghe were in contact with a very lively group in Amsterdam, among whom Le Fauconnier was regarded as having a more genuine claim to be considered the author of cubism than Picasso and Braque. Le Fauconnier's 'physical cubism' – as Apollinaire termed it – was characterized by an element of dynamism somewhat reminiscent of Futurism, which was particularly apparent in *Le Chasseur* (Salon des Indépendants, 1912). This type of dynamism can be found in a rather less acute form and with obvious debts to analytical cubism in the pictures by Sluyters which were inspired by Spakenberg. Both of these artists were trying to adapt the lessons of modernism to a particular type of landscape.

The most significant development from our point of view in the course of Flemish Expressionism was that of Permeke. When this artist returned to Ostend after the First World War, he became familiar with Cubism, which was being featured around this time in exhibitions at Antwerp and Brussels, and consequently began to abandon the rather heavy and static style which still clung to the pictures which he had completed in England. What Permeke took from Cubism was essentially a method of opening up form and giving it dynamism, paying special attention to the points where the planes passed from one to another, and using a technique that was much lighter than that of the original Cubists. A picture like *Le Pain noir* (1923) possesses this experimental character.

It is only insofar as it is a natural phenomenon that movement plays a part in the concerns of Permeke. *L'Homme au panier* (1925) appears in this light as a kind of snapshot of an Ostend fisherman, whose position represents a kind of equilibrium between two areas of oscillation. Besides the two types of movement which have already been implied – that which is the result of an aesthetic experience and that which is the accidental modification of a static situation – Permeke's work also involves a third, which is akin to the one which has just been mentioned. This is movement as a transcription of the interplay of elements in a physical feature such as sea or landscape. Here it is no longer a question of an intellectual operation, but of the dynamism of execution – a principle which can be related, with all the necessary reservations, to the freedom of gesture eventually claimed by the *action painters*, and, in their wake, by a significant fraction of modern painters.

This use of gestural movement, which persisted for a long time among Dutch, Belgian and Danish painters, was strongly affected by the personality of Picasso in his more expressionistic and surrealist phases. An example of this influence can be seen in the career of Jan Wiegers, who was born in 1893, and Bran Van Velde, who was born in 1895. In a sense it also exists in the work of Hendrik Werkman (1882–1945), an expressionist using sober forms who developed

towards the end of his life a technique which he called 'impressions'. This was a process which involved printer's ink on a paper background, and lent itself particularly to the expression of movement – as in his *Porte tournante* of 1941.

Charley Toorop, the daughter of Jan Toorop, combined the lessons of the Jugendstil and strongly emotional, 'felt' painting in a style which opened the way for a renewal of the art of the brush-mark. Another Dutch painter, Ouborg, took particular interest in the problem of expressive movement and had a considerable influence on the Cobra group, which was formed in 1948. This group, which was also influenced by Danish painters such as Jacobsen, Pedersen, Heerop and Bille and the Dutch painters associated with the magazine *Reflex*, took its title from the initial letters of the three capitals Copenhagen, Brussels and Amsterdam. Among its most notable members were the Dutchmen Jorn, Constant, Corneille, Benner and Appel and the Belgian Alechinsky. The main doctrines of the group could be summed up in the following terms. Creation is an experiment into the unknown, which has freedom, courage and revolution as its main objectives. Art is a rough, rather than a refined, pleasure. The freedom of the imagination is the ultimate value. The painters in this group were aiming for 'direct concentration of sensibility and emotion on to the canvas, by the spontaneous movement of their 'writing' and the direct effect of colour. . . Their efforts were therefore more or less similar to those of the Expressionists.'

● The action painting of Jackson Pollock – Tobey, Kline etc.

The most spectacular development in the use of subjective and gestural movement by the painters who reached maturity in the 1930s took place in the United States. The unchallenged leader of the American 'action painters' was Jackson Pollock, who was born in 1912 and died in 1956.

Pollock's art can best be understood as an attempt to animate the very act of painting. As he remarked in 1947, 'painting has its own life'. He aimed to participate in this act with his whole being, stating on several occasions: 'I am *in* my painting.' He held that this method corresponded to his need for a 'natural growth'. As he remarked in a film commentary which was made in 1951, his aim was 'to express my feelings rather than to illustrate them.'

Pollock began his use of gestural movement with the traditional paint-brush, but he later began to work with sticks, trowels and knives. Finally he reached the point where everything was left to the free movement of the fluid material – his famous 'drip' technique. Obviously this particular technique was firmly anchored in the world of the emotions.

It seems to have been in reaction to the teaching of his master Benton that Pollock first began to develop his distinctive style. At a later stage he was influenced, or at least impressed, by the work of Picasso and Miro. There was therefore a surrealist streak in his Expressionism, and a leaning towards the exploration of the unconscious which was to be reflected in his characteristic expression of movement. The 'golden age' of this style – referred to both as abstract expressionism and as action painting was to come between 1943 and 1948. Pollock's aim was to bring out the potentiality of a kind of cursive writing which was entirely divorced from the image, a continual stream of arabesques

40 Jackson Pollock working in his studio at East Hampton, Long Island, c. 1945



which gave the appearance of having been generated automatically. In the last analysis, he was concerned with an entirely pure plastic notation.

After this initial phase, Pollock introduced new techniques both in 1947 and 1949, while retaining the dominant idea of the picture surface as a field of conflict and struggle. In 1947 he painted his first work on aluminium, which was entitled *Cathedral*, and in 1949 he went on to his first 'splashes' in an attempt to destroy the unity of the material itself and to liberate its internal forces. Some of Pollock's works – such as *Autumn rhythm* – can be seen as a result of delirium or ecstasy, but it is important to remember that his most colossal pictures spring directly from the need to inscribe the record of 'felt' movement in a limitless space. Pollock's art is therefore one of 'internal necessity' in the same sense as that of Kandinsky.

There can be little doubt that Pollock's violent revolt was the cause of the renewal of creative activity in America after the Second World War, and that he has made an important contribution to the liberation of movement as a plastic element – while retaining all the time certain vestiges of emotional content. This is the typically American component of the history of movement in the plastic arts. It can be traced back through Pollock's career to his figurative period of 1933–34, when he completed *Landscape with Rider* and *Seascape*. But the most significant dates are 1945, when his abstract works were exhibited for the first time, and 1947, when those involving free use of the liquid material were first shown.

The vocabulary of signs used by Mark Tobey gives an effect of greater intimacy than those of the majority of American painters. Tobey is attempting to achieve a contemplative interiority that is almost oriental. As Alvard remarks, he 'is concerned with being and not with appearance. Signs, shapes and strokes melt into a larger multitude that vibrates intensely. He has discovered the meaning of phenomena without limit, of pictures without beginnings, and of perfections without end.' The very titles of Tobey's work are a worthy illustration of the way in which he has slowly and carefully worked at the development of this calligraphic approach to plastic art which is at the same time an extension of the thematic variety of movement.

Leon Kochnitzky has written that 'in the oppressive atmosphere of the American metropolis . . . the individual can only save himself by embracing in thought the frenetic mass of the city'. Franz Kline, who was born in 1910, belongs to this tradition. But with his broad and incisive treatment of black pigment he is nevertheless outside the calligraphic tradition. 'In Kline's paintings,' it has been suggested, 'the whites are not negative or positive spaces. They have the same significance as the blacks. There is in this interplay of values an equivalence of forces which recalls the equivalence of rectilinear elements in Mondrian. His pictures have no connection with oriental calligraphy.'

Of the other American painters who may be mentioned in this connection, Brooks replied to a questionnaire prepared by the Whitney Museum, New York, in 1957: 'It is probable that the movements of forms in my paintings are borrowed from human gestures rather than from dumb nature.' Gottlieb replied at the same time: 'The problem which concerns me most consists in projecting intangible and fugitive images which appear to me to have significance in terms of

sensibility.' A similar concern with gestural and 'subjective' movement is a feature of the work of other American painters such as Baziotes, Guston, even Arshile Gorky – and in particular Barnett Newman with his 'unique, vertical and obsessive' line.

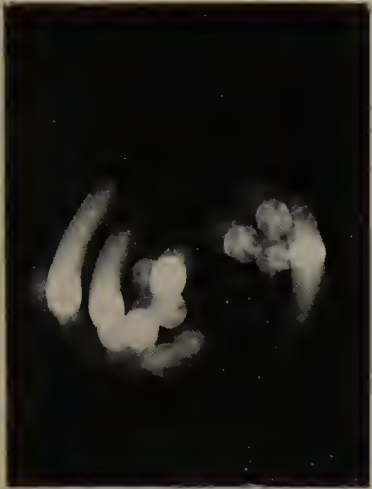
● Sculpture – Pevsner, Gabo, Vantongerloo, Max Bill

In the case of sculpture, the break with the traditional scheme of references to movement comes with the inter-war period, as a result of the achievements of Moholy-Nagy and Calder. Real movement already occupies an interesting place in the work of the sculptors in the generation born around 1900 – as will be seen at a later stage in the book. If we restrict the present enquiry to those sculptors who were content to use the traditional resources of movement – in other words, figurative representation, the play of light on surfaces and the spectator's classic itinerary around the object – it becomes clear that some paid particular importance to the element of movement and in this way contributed towards its establishment as an independent aesthetic factor.

This contribution by the traditional sculptors is connected with a new treatment of space and a willingness to employ a wide variety of new materials. Moholy-Nagy saw the evolution of sculpture in the following terms: from the block, of which the pyramids provided an obvious example, there was a transition to modelled sculpture (in positive and negative volumes), and finally the process came to an end at kinetic sculpture, having passed through the stages of perforation and suspension. In his opinion the constructivist sculptures of Pevsner and Gabo remained at the stage of modelling, with the exception of the few which made use of real movement. But it must surely be argued in contradiction to this view that the innovations in the treatment of space which were made at this stage in the field of static sculpture were still extremely important in the history of objective movement. Carola Giedion-Welcker is right to emphasize that the constructivist manifestoes and exhibitions proclaimed the 'supreme value of movement.' Material solidity was being decomposed through the aid of light and movement was in consequence becoming a plastic element. Pevsner's works can in many cases be regarded as 'free symbols of the movement of the universe', expressing 'space and energy' even if their original source is 'the depths of human emotion.'

G. Vantongerloo deserves to be placed among the modern artists who have contributed most to the development of new aesthetic possibilities. His passionate interest in the problems of space and movement led him, as early as 1918, to attempt a new form of distribution of elements in space, which was based upon mathematical coordinates. This was, in effect, a demonstration of Euclidian geometry by means of the absurd. Vantongerloo's subsequent research persuaded him that it was impossible to 'fix' an object by the use of points: this could only be done by bringing out the energy or inner tension of the object. The way in which he developed this idea – in a number of works that suggest comparison with mathematical formulae – was to be of permanent value to all artists who were attempting to use three-dimensional, conventional, virtual or real movement.

Max Bill, a sculptor and theoretician who has been closely concerned with



41 Georges Vantongerloo
Chrysalis, 1950.
Transformation by rotation

42 Max Bill
Construction with suspended cube
1935–6



43 Sonia Delaunay
Plate from the album *Poésie de mots,
poésie de couleurs* (Soupault), 1962

the problem of movement in space, began his career as a student at the Bauhaus. 'From the very beginning,' it has been suggested, 'his plan of research tended to place the plastic work in space, to deprive it of its frontal, static appearance in favour of a visible mobility.' Like Vantongerloo, Max Bill has often had recourse to mathematical formulae in the course of his career, with the ultimate purpose of providing a firm, constructive base for his work and of enabling the element of movement to 'extend beyond the established forms.' In most cases, it has been a question of objective movement, expressed in materials such as bronze and marble when the work is on a large scale, and brass and copper when it is somewhat smaller. In his *Endless ribbons*, which date from between 1935 and 1953, and his *Rhythms in space*, which were constructed in 1947-48, Bill has managed to achieve an impression of symmetry when the work is seen from the front, which breaks up into 'endless' interlacing the moment the spectator changes his point of view. His *Construction with suspended cube*, which is made of brass and iron and dates from 1935-36, is a mobile involving real movement.

● Bloc, Jacobsen, Zadkin, Moore, Hepworth, Gonzalez, Smith

André Bloc succeeded in developing a way of using space in a dynamic manner, which was equally applicable to sculpture and architecture. 'We continue to use the word sculpture,' writes Michel Seuphor, 'to describe the widely differing achievements of abstract artists. In order that the necessary comparisons should be made, it would be better to use a new expression, such as 'the art of occupying space'. This art extends from townscape to the individual work, since the problems are often analogous in these fields, even though the scale and the material conditions are transformed.' The work which Bloc completed according to these principles is reflected in that of Robert Jacobsen, who was born in 1912. Jacobsen, however, used more specifically kinetic effects.

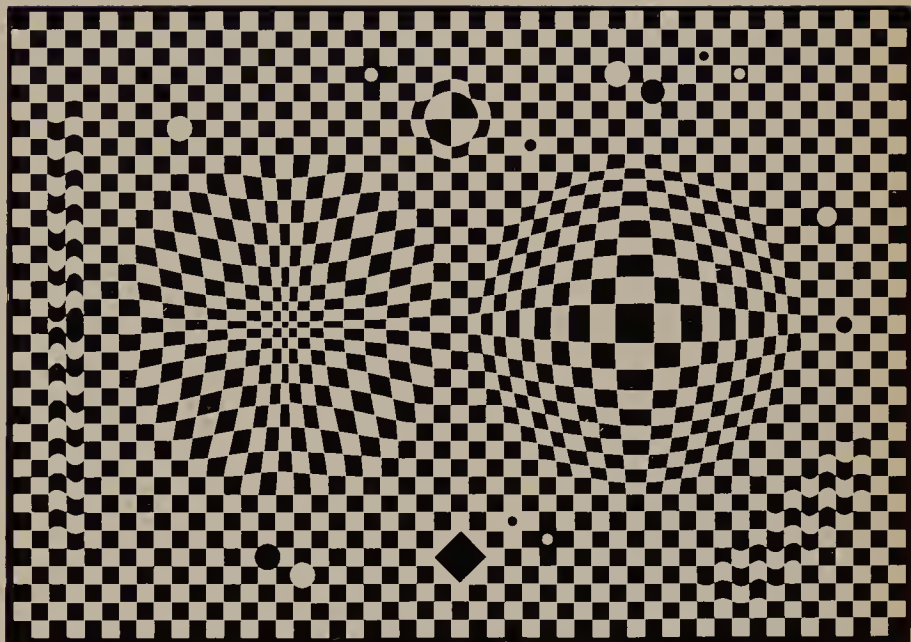
Lipchitz, who was born in 1891, made use of positive-negative volumes in order to obtain a half thematic and half plastic type of movement. Gargallo, who lived from 1881 to 1934, had already exploited the interplay of concave and convex volumes in a series of works which began in 1924. Zadkin, who began his development with a form of expression which tended 'simply to set up a plastic rhythm,' was impelled by his poetic nature to attempt more complex groupings, more varied combinations of form and more expansive arrangements of movement as his career proceeded.

If we follow Moholy-Nagy's argument, we arrive at the principle of perforation which is also one of earliest characteristics of the English sculptor Henry Moore, who was born in 1898. Moore has written that: 'A work of art must have a vitality of its own... not... a reflection of the vitality of life, of movement, physical action... dancing figures and so on, but... a work can have in it a pent-up energy, and intense life of its own, independent of the object it may represent. When a work has this powerful vitality, we do not connect the word beauty with it. Beauty, in the later Greek or Renaissance sense, is not the aim of my sculpture.'

Moore is in fact calling for a metamorphosis, based on the notion that nature is itself filled with energy. He has pursued this idea in his investigation of a wide

44 Victor Vasarely
Plate from *Kinetic album no. III*, 1959

45 Richard Mortensen
Plate from the album *Le Ve Chant*, on a
theme from the *Odyssey*, 1960



variety of materials. Barbara Hepworth, who was born in 1903, has followed a similar path in the development of her art, opening up sculptural mass by piercing and hollowing it. Her aim is to liberate the external form, as she has explained in the following passage. 'I was the human being in the landscape. The colour of the concavities (of my sculptures) plunged me into the depths of waters, caves, shadows, more profoundly than those concavities themselves. The threads, that was the tension that I felt between myself and the sea, the wind, the hills.'

Moholy-Nagy, whose work in real movement will be discussed at length in a subsequent chapter, made some investigations into objective movement at this period with the use of numerous different materials, of which perspex is the most important.

The counterpart to intellectual or surrealist movement in the sculptural field was a branch of activity which derived its individuality from the use of new flexible materials, in particular wire. Julio Gonzalez, who was born in 1876, played an important role as an innovator from 1927 onwards, and was responsible for the reintroduction of iron as a sculptural material. As far as the expressive and surrealist possibilities of movement were concerned, he was the interpreter of Picasso in terms of sculpture. His influence was widely felt in Europe and America, especially on the generation of sculptors who were born around 1900.

Iron and wire have also been the favourite materials of several English sculptors, such as Chadwick, Armitage and Reg Butler. Since the dynamic and rhythmic qualities of their works spring from an essentially linear view of sculpture, the element of movement is often prevalent. But this is essentially an intellectual movement, which reflects surrealist inspiration. Movement also occurs in their works as a result of the juxtaposition of materials – 'lines' of iron, blocks of stone and fragments of glass.

Among the American sculptors who have been strongly influenced by the spirit and technique of Gonzalez and Picasso, David Smith occupies a prominent place. Smith, who was born in 1906, began his career as a Cubist and later became a Surrealist. He sculpted his first polychrome wood constructions in 1931, and began to work with soldered iron in 1933. He has written of this technique, which he pioneered in the United States: 'Metal by itself has no history in art. What it possesses is the power of evoking the essential features of our age: power, structure, movement, progress, destruction and brutality.' At a later stage, David Smith showed a preference for steel as a material, since it allowed at least some suggestion of movement in the working of the surface.

● Hans Arp – Giacometti – Lardera – The climate of thought around 1930

The surrealist use of movement is also a feature of the sculptures of Hans Arp and Giacometti, two artists who belong to the generation which was born around 1900. Mention has already been made of the work of Arp, who exercised a persistent influence during the 1920s and 1930s with his remarkable reliefs, which went beyond the open sensuality of their contours. The unusual work of the self-taught artist Jean Peyrissac, who was born in 1895, recalls the path which Arp followed. Peyrissac started to use iron, cord and pieces of wood after he had

46 Alberto Giacometti
Homme qui marche I, Bronze



left the Bauhaus, and succeeded in creating sculptures like *Engins plastiques* and *Constructions dans l'espace* which were full of vitality and movement. And yet he stated in 1960: 'Although sculpture suggests movement, its static rigour is really its essential quality.'

The sculpture of Alberto Giacometti, who was born in 1901, bordered upon the researches of the Surrealists around 1930. But as far as movement is concerned, it should be placed in the category of 'felt' movement. 'In any case,' Giacometti has remarked, 'it is the type of sculpture in which I can sense a continual violence that touches me most.'

A student of Bourdelle, Giacometti has displayed a new quality of vision in his desire to 'seize the wholeness of a figure'. 'The form goes to pieces, there is no longer anything but a movement – as if of seeds – on a deep black emptiness.' He makes use of elements from the unconscious, from his own memory and from his dreams. Objects like his *Boule suspendue*, and *L'Heure des traces*, both of which date from 1930, and *L'Objet désagréable* from 1932 employ a combination of real movement and magical or divinatory movement as a means of expression. 'These sculptures,' wrote Auguste Herbin, 'either form themselves into small groups or stand alone in a remarkable emptiness which they themselves seem to create.'

Between 1935 and 1945 the art of Giacometti passed through a stage of crisis. At this point his study of the model and his interior vision did not seem to agree any more. It was only through a long series of experiments that he managed to find a new and appropriate way of expressing the problems which faced him. 'The problem of movement claims his attention. And it is the image of walking which appears – the gesture of an arm or a stretched-out hand.' 'The attitude, the gesture creates a disturbance in space, cuts it up and sculpts it, while the eye registers its very slightest alterations. Sculpting a man on the move is also, in one sense, a matter of representing space in a state of agitation, modified by the passage of the walker.' 'A motionless figure surrounds itself with closed space. A figure in motion opens up space and attracts other figures, without encountering them in the process: in an open space, solitude is plural.'

It is perhaps a rash undertaking to look in the work of Lardera for indications of research into subjective movement. At first sight, the work of this sculptor, who was born in 1911, seems to belong to the region of the most rigid Constructivism, with its various elements in copper and iron. But in one sense movement plays an important part. As Michel Seuphor has remarked, 'these large black metal sheets, cut out in lines of force, make you think of brush-strokes thrown into space'. And Lardera has himself pointed out the influence of the pioneers of movement and of new materials on the artists of the younger generation: 'It was necessary to reach the same point as the researches of Gonzalez, Calder and several sculptors of the younger generations in order to find new solutions to the problems of the plastic arts, in which the quality of emptiness would take on expressive values in an absolute sense.' Lardera's iron sculptures are essentially based upon this kind of rhythmic relationship between emptiness, space and movement. He moves from plane geometry to spatial geometry, and by intercutting two or more different contours manages to give the whole work a dynamic feeling. Despite its rigorous calculation and its cold metallic exterior,

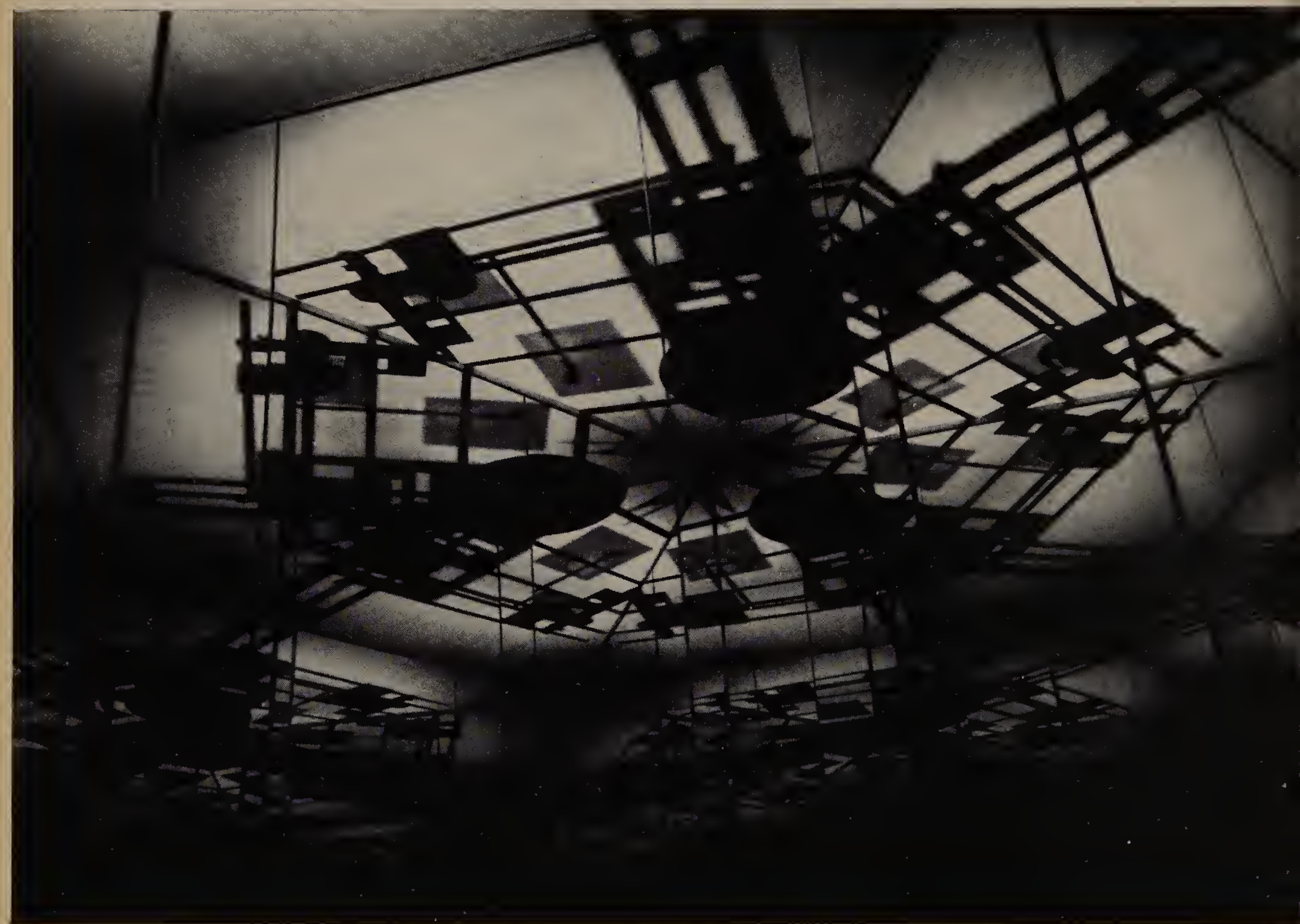
his sculpture springs from strong conviction and genuine sentiment.

Other members of the younger generation who have made use of 'felt' movement – with the aid of new materials applied to half-figurative and half-abstract forms – include Maria (Martin), a surrealist sculptress from South America whose work is particularly fertile, the American Mary Callery, who derives her sculptures from gestures and movements which 'universalize themselves into attitudes which themselves tend to be abstracted into signs,' Carmelo Cappello, the Italian sculptor, and Harold Cousins, whose 'linear sculptures' of metal rods and stalks combined with iron, bronze and nickel elements make up perforated masses that 'carry this way and that antennae which vibrate with the slightest breath.'

The very persistence of the traditional themes and procedures connected with movement in the work of Italian sculptors like Mario Marini, who was born in 1901, and Pericle Fazzini, who was born in 1913, helps to explain the revolution in the expression of movement which took place in the 1930s. Marini's work, including the *Horses and Riders* which conjure up a vision of 'antiquity freshened by an authentic naiveté and a completely independent turn of mind,' and that of Fazzini, which is 'surprisingly rhythmic but always graceful', both aroused a violent reaction and helped to provoke the introduction of real movement into avant-garde sculpture.

The three-dimensional movement which has just been reviewed involves no more than the suggestion of movement in the work. In the next chapter a more intense degree of movement will be discussed – that of the 'virtual' movement which compels the attention of the spectator. Finally the degree of real movement will be taken into account. We shall attempt to relate this process to the development of painting. But, at least as far as kinetic art is concerned, it is difficult to maintain the distinction between painting and sculpture in any useful way. The art of movement emerges as a more or less separate phenomenon, as the works of Husserl, Heidegger, Bachelard, Freud and the general developments in experimental psychology and the natural sciences might have led us to expect. The researches of these various scientists, philosophers and thinkers have tended to establish a new and realistic conception of movement, principally through interchange between applied science and technology. Striking examples of this development are to be seen in the fields of astronautics and cybernetics – the new science established by N. Wiener in 1948. At the present day, all this activity in the application of scientific thought to the problems of movement has strong repercussions in the plastic arts.

Part 2





5 The origins of kinetic art: virtual movement

47 Nicolas Schöffer
Lux II, 1957–65. With multiple prism

The element of movement has now assumed an important place in the research of contemporary artists. At this point we must turn to what has been called kinetic art, or, in the vocabulary of some critics, the kinetic arts.

In the table at the end of this book, I have made an attempt to classify the various types of work which involve movement, and to define the boundaries of the field. I have classed works which employ 'virtual' or apparent movement within kinetic art, but joined them by a dotted line to static art – that is to say, work whose motion or tempo only becomes appreciable after an effort of concentration. In a sense virtual movement occupies a half-way ground between the mobile and the static. The reason for including it here lies in the fact that it is the artist's avowed intention to create a sensation of movement through transparency, arrangements of line and colour etc. A work of this kind only realizes its aesthetic value when the spectator has responded in accordance with this intention.

The methods used in the past to indicate movement – which have already been described here – survive to this day. But they are associated with styles that are quite different from kinetic art. *Action-painting* and the various styles involving expressive marks are cases in point. Artists of our generation are still interested in animating the image by juxtaposition of elements, as can be seen in Pop art and 'Neo-Dada' or 'Neo-realist' movements.

If we turn to the remote sources of kinetic art – inspiration from nature, from art itself, and indeed from psychological states of mind – the variety is immense. Artists have derived inspiration from – or at least determined their choice of method in response to – intellectual and imaginative tendencies such as the dynamic philosophy of *vitalism*, the mathematical calculus of movement and other theories of the relationship between time and movement, also from the notion of progression as a factor of movement. They have considered both ancient and modern theories relating to order, repetition, combination and permutation. A particular example would be information theory, with its notions of entropy and redundancy. And here we must not forget the theories of artist-engineers, who derive a genuine aesthetic of dynamism from the field of science and transpose it into the use of movement in thematic or purely plastic terms.

Of a more permanent nature are the natural manifestations of movement which have influenced the kinetic artist. Phenomena connected with light – especially the cycle of night and day – with wind and air, gravitation and weightlessness,

belong in the first rank. But other common phenomena such as the movement of water – from the smallest drop to the scale of the ocean – fire and smoke, atoms on the microcosmic and stars on the macrocosmic scale, have inspired artists of our time. Particular mention should be made of biological movement, from that of the smallest organism seen under the microscope to the immensely varied movements of man and the animals.

There is also a group of relatively distant sources belonging to the technological sphere. The most striking and the most permanent of these are technical inventions such as the wheel – and motor-car – boats, clocks and cameras. But there is also the less tangible effect of theories of the relationship between art and science, and theories of the repercussions of technological progress in the realm of art. Here we are close to a field that is partly artistic, partly natural and partly technological, that of firework displays, water and smoke fountains, automata and robots. The artists themselves often quote these sources and their works confirm the influence.

Next we come to the domain of the arts, where there are two opposing theories that must be taken into account. On the one hand, art is tending more and more towards the dynamic. On the other, movement only plays an important part in the history of art at certain periods – of course the second theory does not rule out the possibility that our own period is one of these. Both these points of view have had an effect on the attitudes of contemporary artists. And perhaps the most significant factor in the realm of art theory is the suggestion that the element of movement has now become autonomous, resulting in the birth of a new art form – kinetic art. This notion, which is of course the basis of the present book, can be taken both as a point of historical fact and as a working hypothesis which the artist can adopt at a purely practical level.

More specific parallels can be made between kinetic art and the characteristic forms of movement which are to be found in the other arts. Music, in particular, has played an important role in the development of a plastic art in motion. It has always represented the ideal to be attained, and musical terminology – though it can only be adapted with difficulty to other fields of activity – has often been carried over into the statements of kinetic artists, in such words as rhythm, rubato, tempo, rallentando and accelerando. Another influence from a neighbouring art which must be taken into account is that of choreography and the drama. And the relationship between the plastic art of motion and cinematography is of particular importance in coming to terms with a certain class of works.

Finally there is the influence from the plastic arts themselves, which is the strongest and the most direct. Here, in the full range of forms of movement indicated, suggested and represented from prehistoric times to the present day, we may expect to discover the true guiding lines for our chronological and analytic survey.

But first of all let us take a look at the origin of the word 'kinetic' and the term 'kinetic art'. As far as can be determined, the two words were not used together in ancient literature and philosophy. Our starting point must therefore be the revival of the Greek root as a scientific term at the beginning of the nineteenth century. The word 'kinetic' (French: cinétique) was universally employed around 1860 to describe phenomena connected with movement in physics and chemistry.

In particular, it was applied to the field of 'gas kinetics'. In mechanics it held a different sense from the words 'cinematic' and 'dynamic'.

Around 1890 these terms acquired an added range of meaning. The research of Muybridge and Marey, which had resulted in the invention of an apparatus capable of taking up to sixteen photographs per second, led to Edison's *kinetoscope* of 1892. Edison's invention made possible a rapid succession of photographs, which gave an illusion of movement when seen together. And finally, in 1895, the brothers Lumière put on view their 'cinematographic' apparatus, which enabled whole audiences to take part in the display of projections. It is to this technique, which developed into a new art form, that we owe the association of the word 'kinein' with the vocabulary of aesthetics. The Germans, however, had adopted the term 'kinetic arts' for the arts of gesture.

It was in 1920 that the word 'kinetic' was first used in connection with the plastic arts. Gabo and Pevsner spoke of 'kinetic rhythms' in their *Realist manifesto* which dates from this year. But the term soon became associated with precise physical phenomena. Gabo himself exhibited a steel strip, set in motion by an electric motor, under the title 'kinetic sculpture' that same year. In effect, the word 'dynamic' was still used most frequently to denote movement in the plastic arts. Even Moholy-Nagy, who, with Gabo, was to make the most coherent use of the terms 'kinetic' and 'cinematic', used the alternative word for the majority of the phenomena involving movement mentioned in the manifesto which he signed with Kemeny in 1922. Fernand Léger, Schlemmer and Kiesler all made use of the words 'kinetic' and 'cinematic'. The Czech artist Zdenek Pesánek referred to his works as kinetic, and even published a book called *Kinetismus* in 1941. Yet a term for a type of work involving movement which acquired much more general currency between the wars was that of 'mobile' – probably introduced by Duchamp in 1932 to describe work by Calder.

It was only around 1954 that the word 'kinetic' finally became an accepted part of critical terminology. The *Yellow manifesto*, published on the occasion of the first 'Movement' exhibition at the Galerie Denise René, Paris, in 1955, contained references to the 'kinetic arts' by Vasarely – artist and theoretician – and Hulten – art historian. In this case, the word was being used partly for purely visual research which compelled the spectator to respond to certain stimuli. When Agam had adopted the term 'kinetic art' for his own work begun around 1952–3, it was also being applied to works whose temporal structure only became apparent if the spectator himself moved. And later it spread to cover works which derived from the colour-organs, or involved light projections and moving forms, in the tradition of Scriabin, Wilfred, Baranoff-Rossiné and the members of the Bauhaus. Wolfgang Ramsbott drew the dimensions of this wider field when he published his elaborate chronology of kinetic art in 1960. From this date we might say that kinetic art belongs to art history.

For the purposes of this study, kinetic art covers all two or three-dimensional works in actual movement, including machines, mobiles and projections, whether controlled or uncontrolled: it also covers works in virtual movement, that is to say, in which the spectator's eye responds quite clearly to the physical stimuli. Within the last category we must obviously place the work of such artists as the members of the Nouvelle Tendance, who allow optical phenomena to play a predominant

role. Finally, we are bound to admit those works which require active participation by the spectator, either through his own movements or by virtue of the part which he plays in composing or recomposing the elements of the work.

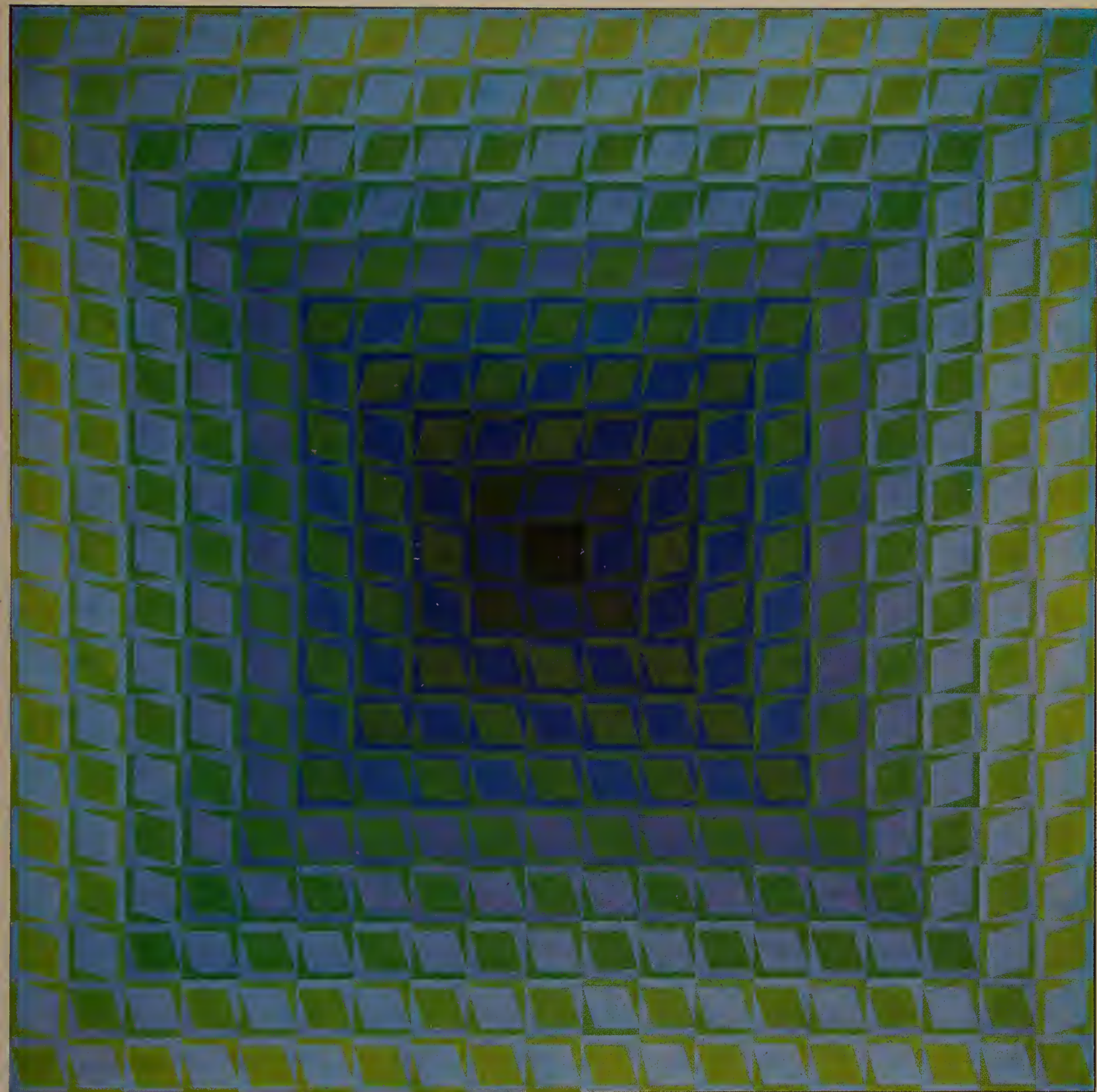
The fact that the term 'kinetic art' can be applied to this wide range of works must not be taken to imply that the aesthetic experience of movement is identical in all cases. In fact, this experience seems to vary in direct relationship to the existence of the three basic groups: those which are stable but stimulate physiological reactions in the spectator, those which challenge the spectator to physical action, and finally those which are themselves in movement. Of these three groups, it is the one which is concerned with virtual movement that poses the most difficult problems of classification. This is not because the artists derive their inspiration from a great number of different sources – a problem which recurs in all branches of the arts – but because there is no decisive frontier between traditional images of movement, whether semantic or plastic, and the new vision which leads to the liberation of the element of movement. Nonetheless, it is possible to cite the names of a few artists who are generally regarded as pioneers in this area, since they succeeded in bringing the issue of virtual movement into prominence by their treatment of colour, line and volume. These are: Delaunay, Kandinsky, Malevich, Mondrian, Herbin, Albers, Sophie Täuber-Arp, El Lissitzky, Berlewi, Klee and several other members of the Bauhaus.

● Vasarely

Victor Vasarely, who was born in 1908 at Pecs in Hungary, spent some time as a professional draughtsman. But it would be wrong to speak in his case of a transition from purely technical to artistic expression. In his studies at the Műhely (Hungarian Bauhaus) under Alexander Bortnyk, he had entered into the spirit of the new educational method which made no distinction between the artisan and the artist. It was from his continual attention to drawing, and the problems of space and movement, that he gradually evolved his 'plastique cinématique' – or 'cinétique' as he later described it. His work comes within our classification under the category of linear virtual movement.

Vasarely views his own contribution as a synthesis of what went before. He writes that 'the vestiges of recent figurative art linger on in the first abstract works. One stroke calls to mind the old horizon, while another suggests the Italian conventions of perspective. One background is still atmosphere, and not a purely plastic element, another is chiaroscuro . . . All this had to be left behind'. Vasarely's own research has led finally to the vision of 'a new city – geometrical, sunny and full of colours' in which art is to be 'kinetic, multi-dimensional and communal. Abstract, of course, and closer to the sciences.'

For Vasarely the notion of movement is inseparably linked with that of spatial illusion. It is from the union of these two elements that the plastic word develops. 'By virtue of the opposing perspectives these positive and negative elements alternately arouse and dispel a 'sense of space', an illusion of movement and duration.' Again he writes: 'We should not assume from the term 'plastique cinétique' that it is a question of making the pictures and objects move at all costs. What is being expressed is a generous concept of plasticity, in which



movement is the vehicle.'

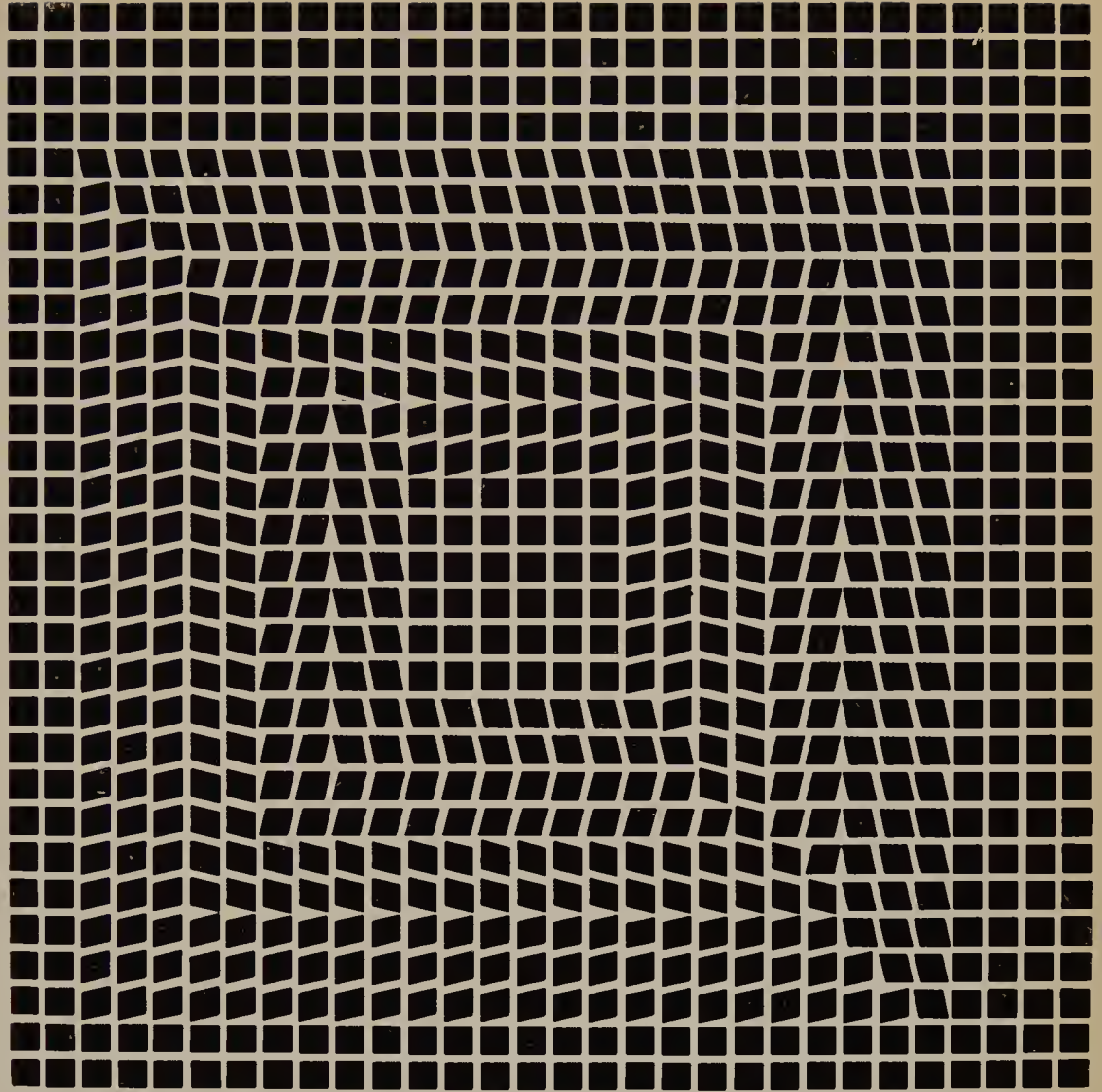
Vasarely's sense of space and movement does in fact remain close to the sense which is aroused by cinematographic works and techniques. The art of the cinema, involving as it does modern techniques of enlarging the work by projection and diffusion, has for a long time been foremost in his thoughts. He has spoken of 'the quantitative augmentation of the image' and suggests that he views the original work as 'no more than a potential'. And his predilection for the cinema is amply demonstrated by this remark – printed in capitals in the *Yellow Manifesto*: 'THE SCREEN IS A PLANE SURFACE; YET ALLOWS MOVEMENT; IT IS ALSO SPACE.' The two words 'mouvante et émouvante' (in the sense of 'motion' and 'emotion') which he used to identify the beauty of the future at the end of this manifesto, were taken up in the title of the first large exhibition of works in movement at the Stedelijk Museum, Amsterdam, in 1961. This was called 'Mouvement émouvant'.

But Vasarely was not to be content with a purely graphic expression of movement. By 1955 he was already considering a further development of his 'plastique cinétique'. He wrote that: 'Pure composition is a matter of colour/forms, or units involving contradictory perspectives which cancel one another out.' And, on the theoretical side, he predicted the abolition of traditional divisions in art. 'Painting and sculpture are becoming anachronistic terms. It is more appropriate to speak of a plasticity which exists in two, three or many dimensions. We are no longer concerned with distinct manifestations of the creative sensibility, but with the development of an unique plastic sensibility in a variety of spatial situations.'

Work from the earlier stages of Vasarely's career anticipated many of his more recent concerns, as can be seen from the comparisons which were made in the catalogue of his one-man exhibition at the Galerie Denise René, 1955. A detail from a publicity hand-out of 1930 – beautifully drawn – is reproduced beside a painting from 1955. A zebra from 1939, which illustrates the creation of form by deviation from the straight line, is placed beside the 'photographismes' of 1951. Another study of two overlapping zebras helps to explain the principle of elaborating the form through a positive/negative disparity, and puts into effect Vasarely's favourite formula: $1 = 2, 2 = 1$. So there is a link between this study and the final discovery of the 'Colour/Form unit', which he sees as 'the basis of a new plastic language'.

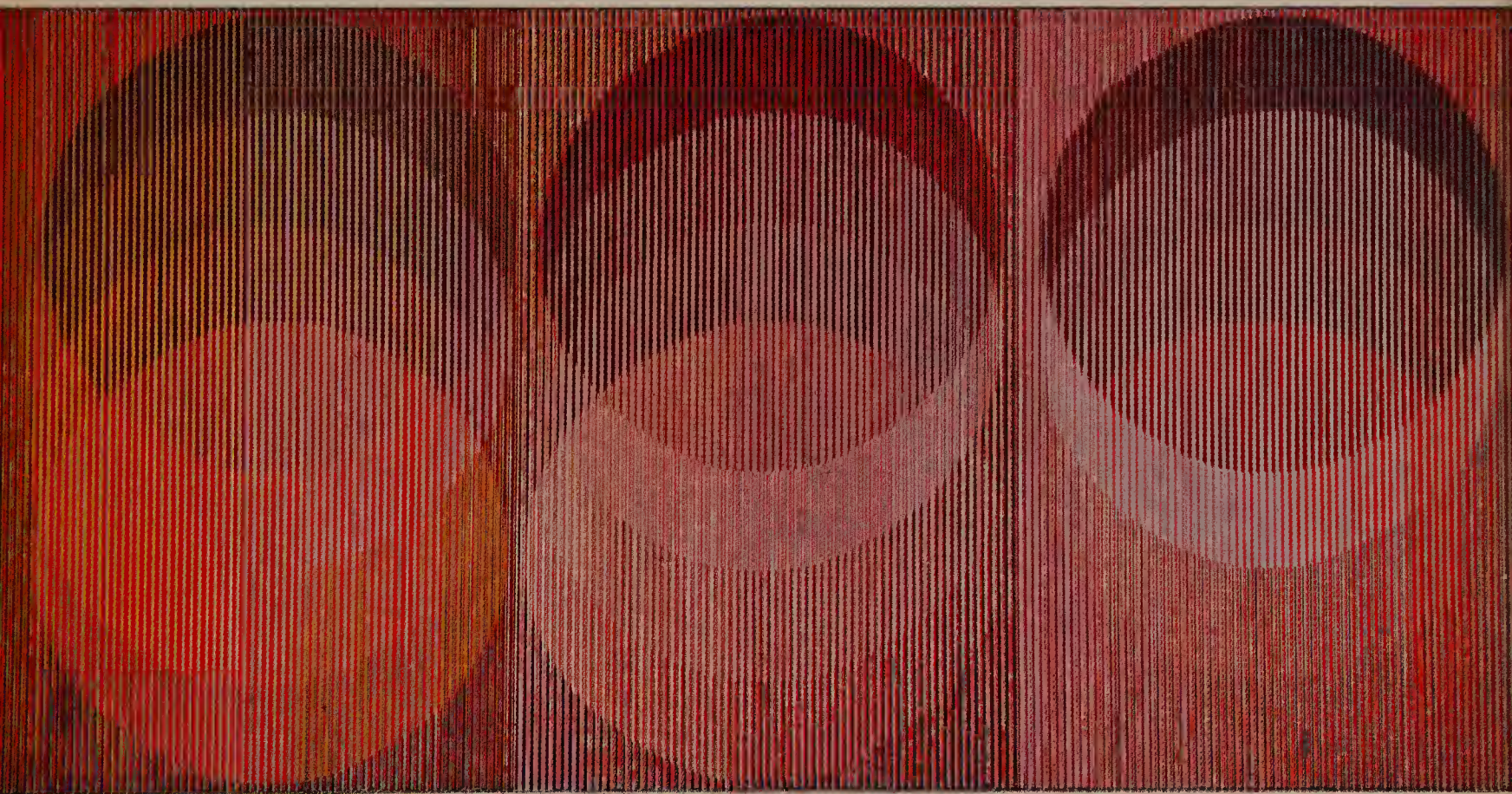
The study of the two zebras is placed next to a more geometrical painting, *Decalée* (1952), and finally a study of chessboards with their pieces is juxtaposed with the *Hommage à Malévitch* (1948–55), where Vasarely turns the artist's famous square into a third dimension by 'dynamizing' it – and so marks his progress towards the kinetic ideal.

There remains one further point of comparison, which is of the greatest importance in tracing Vasarely's steps towards this ideal. The *Notes noires sur feuille translucide s'estompant par superposition* (1935), the 'trompe-l'oeil' study of superimposed *Mouvements sur écrans* (1938) and the composition on five superimposed transparent sheets (1946) – all of these invite comparison with a work from 1954, the kinetic study on transparent screens arranged in depth, which brings into play the kinetic potentiality of transparent materials and superimposed drawn or coloured surfaces – as well as enabling the spectator to animate the work by his own movement.



In many of the works since 1964, the eye of the spectator is guided along a precise itinerary. If he follows this for a certain time, strong sensations of movement are aroused. Here we are in the uncertain territory which lies between the traditional suggestion of movement in the visual arts and the 'virtual' movement which forces itself upon the spectator. Although it is clear that Vasarely tends, both in theory and practice, to direct his research towards 'cinétisme', this element of ambiguity remains. It is partly due to the fact that he has pursued two principal types of work in which the element of movement has been important. First of all, there are those works which utilise graphic and chromatic elements in two dimensions, in the tradition of Delaunay and Albers, and confine themselves to no more than a strong suggestion of movement. Secondly, there is the path of research in which Vasarely discovered a new significance for the element of movement. He has written:

'From 1948, the year in which I discovered the PLASTIC UNITY (L'UNITÉ PLASTI-



QUE), I have recognized that there is a polarity, in plastic terms, between the 'corpuscular' and the 'undulatory'. My time was divided between these two areas of activity. . . . During these crucial years, I devoured numerous works on Relativity, Wave Mechanics, Cybernetics and Astrophysics. . . .'

If Vasarely's juxtaposition of blacks and whites reflects this preoccupation with wave vibrations, his transposition into colour of the black and white framework comes closer to his interest in corpuscular theories. And it is this last area of research which lends itself to Vasarely's ideal of the 'polychrome city', where the plastic works are perfectly integrated into the architectural scheme.

We must return to another branch of Vasarely's activity – that of the works in three dimensions which invite the spectator to change position. Since he was dissatisfied with the research into three dimensions which he undertook particularly in 1954–5, he reverted to the plane surface – as in the 'photogrammes' – and superimposed compositions on cellophane or perspex which he had previously placed at a distance from one another. As a result the plane surface held together compositions that were subtly out of phase. Vasarely had embarked upon an illusionistic kinetic method which he believed to have richer and more durable qualities than the 'spectacular' effects of real movement or movement resulting from the spectator's change of position. But it must still be borne in mind that his research into transparent materials and superimpositions takes its place among the achievements of other pioneers such as Agam, Soto and Bury in that stage in the development of movement in art which hinged upon the active participation of the spectator. Nor should it be imagined that Vasarely made no practical use of this relationship between the work and the spectator. His various architectural projects, such as the work for the University of Caracas and for the University Theatre at St-Louis (completed by 1954), demonstrated the wide range of possibilities which lay in the 'kinetic' animation of outside walls and façades.

Vasarely's work has led many artists of the younger generation to undertake a purely optical study of movement, both in Europe itself – among the members of the *Nouvelle Tendance* for example – and in America, where the teaching of Albers has also been an important contributory factor. In reality, Vasarely's ideas are far from being confined to the context of optical experiment. He has suggested that the kinetic work, which can be 'recreated at will', epitomizes 'the indestructibility of a thought-art (*pensée-art*) – that is, the everlasting quality of the object which remains perpetually young in its original form – and the vast prospect of art becoming a common treasure, distributed on the very widest scale'. He has also suggested that: 'The kinetic idea in the plastic arts gives rise to a philosophy of art which involves at the same time aesthetic, ethical, sociological and economic aspects. Taking into account the perpetual outdistancing of the self in a world on the move, favouring transformation in the techniques, functions and ideas of art, this notion assumes as its own the idea of the identity of the physical and the psychical in the unending cycle of evolution.' Finally he has revealed that he sees the future of 'movement' – on the plastic and on the intellectual level – in the transformation of the 'kinetic discovery' into a genuine presence which human beings can appreciate in the context of everyday life. He believes that in this future there is the prospect of a 'humanistic enrichment', eventually leading to what he calls a 'planetary language'.

● **The Nouvelle Tendance – Its theoretician Mestrovic**

Vasarely's ideas were taken up and developed in particular by the generation of artists who were born around 1930. These artists tended to form small groups, like the Groupe de Recherche d'Art Visuel of Paris, and it was a combination of these groups – French, Spanish, Italian, German, Dutch – that came together to form the Nouvelle Tendance. However vague the rules and objectives of this association may have been, there was at least some measure of agreement in the attitude which the members adopted towards the use of movement in their work. The majority of them seized upon the element of spectator-participation and placed it at the centre of their programmes. They were attempting to bring into evidence the psychological and physiological aspects of movement.

When the Nouvelle Tendance exhibited at the Musée des Arts Décoratifs, Paris, in April 1964, Karl Gerstner wrote in the introduction to the catalogue that here was an art which was based upon the idea of reciprocity between the artist and his partner, the spectator. The work at the same time provided visual sensations for the spectator and tested his talent for action or reaction. Finally, this type of art clearly lent itself to multiple production on an industrial basis. The visual statement was to be conceived subjectively but brought to completion in an anonymous, objective fashion.

Matko Mestrovic, who organized the first exhibition of the Nouvelle Tendance at Zagreb in 1961, has summed up the aims of the movement in greater detail. 'The work is designed to operate upon the psycho-physical mechanisms of perception and not upon the psychological or cultural background of the spectator. The spectator is not invited to contemplation or passive consideration of the work, but should take an active part in its enactment, which is a matter of constant variation either as a result of his own movements or because of the intrinsic mechanism which keeps it in a state of continual movement and change. A complex visual-kinetic process develops in response to the activity of the spectator.' Even at this early stage, the combination of light and movement played an important part in the programme of the Nouvelle Tendance. Since their aim was to deprive form of its material qualities, the use of light – both as an immaterial substance and as a completely self-sufficient phenomenon – became one of their principal methods of 'formation'. Mestrovic himself chose to employ this word 'formation' because he considered that there were no longer any 'forms' in this type of work. He looked forward to the utilization of indeterminism, entropy, and information theory in providing more advanced solutions to the problems of aesthetics – what he called 'productive action'. However he maintained his view of the particular significance of the relationship between the movement and the act of visual perception, claiming that 'in the Nouvelle Tendance the objective factors which correspond to visualisation are more closely associated with movement' than in the case of traditional art.

● **The Groupe de Recherche d'Art Visuel of Paris – Le Parc Programmed art – Munari, Eco, Mari**

We find the same theories and the same ultimate objectives in the work of the Groupe de Recherche d'Art Visuel of Paris. The written material which they have

produced ranges from the polemical to the esoteric. But it is nonetheless particularly revealing.

The group give pride of place to the phenomenon of movement. The manifesto 'Propositions sur le mouvement', published under their collective authority in 1961, began by underlining the importance of a constant relationship between the human eye and the plastic object and went on to make a classification of different types of movement. The first two of these – movement on the surface and movement in static reliefs – correspond to the area which we have identified under the title 'virtual movement'. The other four types must be left to a later chapter.

While this programmatic development of different possibilities of movement was central to the intentions of the group, their ultimate objective was the development of what they referred to as a 'new visual situation'. They were looking for a constant relationship between image, movement and time, which would only make itself manifest, in their opinion, within 'the field of vision'. Their interest lay exclusively in the object/eye relationship, rather than in the object considered for its intrinsic plastic properties. And this emphasis led them inevitably to a doctrine of formal anonymity in their concern with surfaces and static reliefs. This anonymity of form, combined with an overall homogeneity of surface, resulted in the creation of unstable structures that could be perceived only in the field of peripheral vision. Thus the spectator was no longer able to maintain the distant relationship with the work which had previously been the rule. A virtual movement had been set up.

We must not forget the significance of the word 'recherche' (research) in the group's title. Each member intended his own work to be part of the common programme of research which had been instituted at this early stage. But it is, of course, permissible to look more closely at the individual careers of these artists. The Argentinian Le Parc began his own line of research in isolation with the investigation of what he referred to as 'surface-sequences'. Beginning with a chess-board pattern, he obtained effects of progression and juxtaposition by decreasing the diameter of successive black and white circles, by using similar sequences with a range of twelve (later fourteen) colours, and by gradually inclining the position of a line in a clockwise or anti-clockwise direction. When traced by the eye of the spectator, these surface-sequences gave rise to impressions of new and surprising structures, a form of movement which we might call consecutive. Each small modification of the sequences in fact brought into evidence a different structure – one that was, so to speak, hidden within the framework of the progression. In this way Le Parc laid the foundation for a new type of plastic and perceptual research in which the subjective element was virtually eliminated. It is possible to hold that this already represented a different line of development from the subjective optical works of Vasarely. In fact, Le Parc and some of his friends, later to be members of the group, had visited Vasarely several times on their arrival from Argentina in 1958. They had also met Denise René who was already showing interest in this type of work and was to mount several of their subsequent exhibitions. Their very first studies suggest an attempt to come to terms with the plastic vocabulary of surface patterns which they derived from the work of Vasarely. But their rigorous concern for the elimination of pictorial composition – that is to say, the animation of such and such

a part of the surface by the arbitrary modification of certain elements – led Le Parc and his friends to surface patterns in which one or two parameters were modified according to a regular plan. These surface-sequences lent themselves to repetition and multiplication. And, as has been noted above, they made possible the appearance of new unstable structures, perceptible only in the periphery of vision, without the slightest degree of intervention by the artist.

The artists and aestheticians of Italy have also provided an interesting response to the problems of movement. In the course of their writings on ‘programmed’ art, Bruno Munari and Umberto Eco defined kinetic art in these terms: ‘A genre of plastic art in which the movement of forms, colours and planes is used to procure a totality in the process of change. The aim of kinetic art is therefore not to secure a definitive and fixed composition.’ To meet the problems of classification imposed by contemporary research in the plastic arts, Eco also brings in the concepts of the ‘open work’ and – perhaps in collaboration with the Swiss artist Spoerri – the ‘multipliable work’. The open work is a ‘genre which involves a whole constellation of elements, with the result that the observer can detect different possibilities of combination – and so different possibilities of distinct configurations – by the way in which he interprets the work. In the extreme case, the observer actually intervenes by modifying the relative positions of the elements.’ The multipliable work, on the other hand, is devised by the author with a view to production in several examples, through the use of industrial techniques. Thus there is no question of an approximate reproduction of a unique original piece, as is normally the case in art reproduction.’ Finally there is the possibility of ‘programmed art’. ‘From precise programming a multitude of similar forms can be obtained.’

Enzo Mari, Italian coordinator of the Nouvelle Tendance, believes that, in response to the new aesthetic conditions in architecture, industrial design and the plastic arts, researchers should experiment with methods of programming prefabricated modular elements. There should therefore be a number of canons or programmes within which they can compose with a great degree of latitude. Mari holds that this programming is a necessary conclusion from the fact that the spectator goes from element to element in the completed scheme without ever gaining an overall view of the work. Hence traditional concepts are called into question and the goal of research must be to provide new solutions to the problem. Through a programming that takes the spectator into account, the relationship between the work and its creator acquires a profound social significance.

● Psycho-physiological phenomena

Works in virtual movement which are dependent on optical phenomena can be composed with the aid of graphic or chromatic elements, reliefs or volumes. Or they can be related in particular to tonal values, composition, transparency and texture. In the group of works at present under consideration, the graphic element has gained particular importance. This is partly because a good number of young artists have secondary occupations as graphic designers in industry. They therefore reflect in practice the experience of Vasarely and the ideals of the Bauhaus.

But before we discuss the work of these artists it is important to devote some

space to the scientific classification of the phenomena which they use. Mention has already been made of Purkinje's discovery of consecutive movement, or the 'after-image', in 1925. This is the illusion produced by first of all observing the continuous movement of waterfalls, marching troops, rotating striped cylinders, spirals etc. – and then turning to fixed objects, which take on an appearance of movement in a contrary direction. This effect is particularly noticeable in the field which borders on the area of actual movement – whatever this may be. However, to the extent that the movement arouses in the eyes a kind of variable oscillation, known as nystagmus, the illusion extends to the whole field of vision. This is because perceptual factors intervene to suggest a plausible type of movement – displacement or deformation of the whole object or simply its surface. The whole effect depends, of course, upon the conditions under which observation takes place.

Wertheimer's phi phenomenon and its numerous subsidiary varieties have been used by a great number of artists. This is the name for the illusion of movement produced by two fixed objects or shapes of similar form when one of the two appears shortly after the other has disappeared – but in another place. If conditions are right, we see a single object passing swiftly from one place to another. Although this phenomenon has been studied principally in relation to vision, it can also be found in touch and hearing.

Three varieties of the phi phenomenon known as alpha movement, beta movement and gamma movement are linked with the name of the physiologist Kenkel. Alpha movement can be observed when the successively presented shapes appear to alter in dimensions while remaining in the same place. The spectator registers a shape in the process of transformation. Beta movement is very similar. But in this case the two successive stimuli do in fact differ in their respective positions or dimensions – or in both. The spectator sees the shape move while undergoing transformation. Gamma movement, which Kenkel discovered in 1913, is the illusion of expansion or contraction produced by an isolated shape appearing for a relatively short time. The illusion takes place at the moment when the shape appears or disappears without warning, or when the light is suddenly increased or diminished.

Further instances of the phi phenomenon, discovered by Korte and Linke respectively, have been classed under the names of delta and epsilon. Delta movement is a more complex manifestation of the phi phenomenon. The observer notes that the second stimulus is quite wrong in relation to the first. The movement which appears to take place in the interval between the two stimuli is initially directed towards the first, but reverses direction and finally ends up at the second. Epsilon movement, or positive/negative movement, is the name given to the effect which involves a white line on a black ground. This is transformed into a black line on a white ground in response to a change in position.

Among other kindred phenomena are gamma-pi movement, discovered by Kanisza in 1951, which arises from the illusion of partial expansion, adopting a particular direction in accordance with the structure of the field of vision. The theta effect, discovered by Thorne in 1935, results from the illusion of relative movement. A point of light is observed through a prism with one eye and through a piece of red glass with the other. If the prism is revolved, it is the red light

which appears to turn around a fixed white point. Finally, there is Saucer's omega perception, discovered in 1953. This is also a matter of apparent movement, but movement of a rough and ready kind, such as might occur with a primitive nervous mechanism, or a vision impaired by scotoma (an obscuration of part of the visual field).

It is quite clear that the principal psycho-physiological illusions can be related to fundamental elements in aesthetics. Phenomena involving line interference, such as the moiré effect used by Soto, Malina, Cruz-Diez, Asis, Yvaral, and Oster – the effect of dazzle and the play of conflicting interpretations in black and white which we find in Vasarely, Bridget Riley, Steele, Nusberg and others – all bear witness to the kinship. And the reversible perspective of Schröder, apparent in some of Albers' work, has been mentioned in connection with the *Trames* of Morellet, which are built up from a rigorous pattern of straight lines and yet suggest a rosette traced with the aid of the compass. Although we are quite aware that the picture is made up of straight lines, the impression of curves persists. Of course the parallels between psycho-physical phenomena and the realm of art are not all contemporary. Poggendorf's illusion, which involves the distortion of a straight line cutting obliquely through two parallels (that mask it to a certain extent), appears to have been used by the painters and sculptors of the Renaissance – e.g. by Donatello in the *Cantoria*, which is in the museum of the Cathedral of Florence. The same effect has been applied in many different ways in virtual kinetic art.

As regards the use of colour, psycho-physiological illusions resulting from successive contrasts, consecutive movement (the Purkinje effect), and chromatic vibration have all been put to use. Agam, Cruz-Diez and Tomasello have all achieved effects of an unusual intensity by careful control of the chromatic elements in their reliefs. And, of course, there are an immense number of optical illusions relating to volume, which depend upon the exploitation of different angles of viewing, the superimposition of elements in real space and many other factors. The Groupe de Recherche d'Art Visuel and Roy Ascott should be mentioned in this connection.

● Soto – The moiré effect

The Venezuelan Jésus-Raphaël Soto, who was born in 1923 at Ciudad Bolívar, began around 1951 to exhibit pictures like *Répétition optique (Damier)* and *Tableau optique (Rrr)* which involved an element of vibration through the repetition of formal elements. Soto used repetition as a means of getting rid of traditional concepts of form and composition, which were still, in his view, at the stage of figurative art. He had formed the conclusion that true abstraction in the plastic arts could only be achieved by a sort of transfiguration which movement alone could perform. And yet he did not, for the most part, go beyond the stage of 'optical' and virtual movement. In *Répétition optique* he was already making use of a technique of relief which lent his work a status between painting and sculpture. But it was only in 1952, with his picture *Synthèse*, that he finally came to terms with the complex graphic problems involved in this attempt. The next phase in his work was concerned with the superimposition and systematic

51 J-R. Soto
Vibration (La boîte), 1962.
60 cm. x 40 cm.



distribution of coloured dots over the whole surface. At this stage he worked from the basis of the three primary colours, the three secondary colours, black and white. But later he continued this line of research with the regular superimposition of simple geometrical elements. Through his 'punctualized' surface he managed to acquire a thorough knowledge of optical and virtual movement, without being obliged to resort to the devices of composition.

The next stage in Soto's work came in 1953, when he began to investigate the possibility of enriching his style by a more daring use of optical movement. For the first time he made use of kinetic ground patterns – striped surfaces which were suitable for causing the moiré effect. He took as his subjects various stock themes. But his interest was never concentrated upon the form or the subject – any more than it is now – but on what he has called 'relations'. By this term he means to cover relationships between different formal elements, between different types of movement.

In the same year, Soto carried his interest in the superimposition of plastic elements and the effect of progression on transparent surfaces to a further stage, in what he referred to as 'Structures cinétiques'. These were spirals traced on perspex and superimposed in depth, which gave rise to optical movement in direct relation to the interval of space between the plane surfaces. Soto had chosen to explore the problems of progression and rotation, and the result was what he called a 'vision of movement', created without any mechanical aid.

The next important stage in Soto's development opened in 1958, when he began his 'superimpositions' of wire and other metallic elements on striped backgrounds, and backgrounds of various materials. As in the previous phases, it involved a kinetic element, since the spectator was impelled to alter his position in relation to the work and so to experience sensations of optical movement. One of

the earliest of these works was also of considerable proportions. This was the *Grille de fer* which was on show at the Brussels Universal Exhibition of 1958 and measured 7×5 metres. Even in a work of this size Soto continued to work in a pictorial manner, considering himself as a painter rather than 'an architect's model-maker'. And since this time he has continued to make progress on a strictly pictorial level. He has made increasing use of striped backgrounds to induce an effect of optical dazzle, using them as a foil to different elements suspended or fixed in front. He sees his work as a series of steps towards the complete transformation of matter – a progress in which light is more and more effectively made to serve his purposes and the immateriality of the work makes an increasingly acute impression.

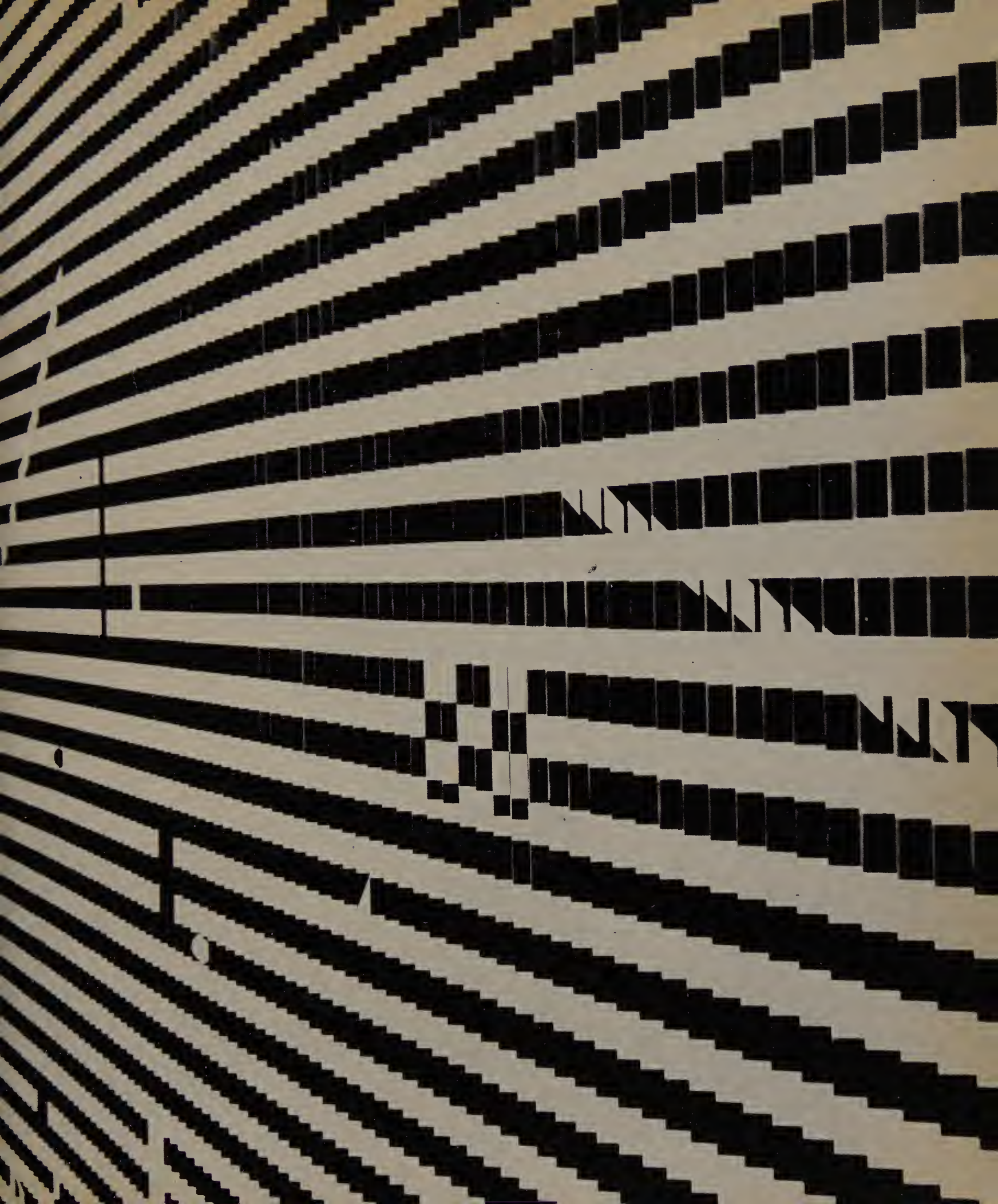
It is perhaps important to stress the strict continuity in Soto's development. The line of research which he began in 1951 was based from the very first upon the visual representation of movement, and it was also quite clearly characterised by the utilisation of light. In a work like the *Première boîte transparente*, the light seemed to change position in time with the spectator. Soto has finally reached a stage where he is able to make use of a range of kinetic devices – movement in the fixed object, the spectator's movement in front of the work and the separate movements of free elements incorporated in the work, as well as any combination of these three. But since movement remains in his view 'a *relation*, and not an object changing position', we can say that his fundamental aims have not changed. Since he is concerned above all with the impression made upon the spectator, and not with the technical details of the work, it would be fair to state that his method is still that of optical movement.

Soto looks at his development purely from an artistic point of view, and refuses to admit any influence from the natural world. The artists who he admires are Cézanne, the Cubists, Klee, Mondrian and Calder. But we very often get the impression when looking at his work that optical movement has a secret link with music, not merely because of its poetic qualities but because it is also based upon a kind of abstract algebraic code.

● Agam – transformable, polyphonic and tactile works

Like Soto, Agam has constructed works which only reveal their structures when the spectator moves in front of them. Both artists believe with reason that works of this kind should be placed in a different category from those which only involve movement upon a plane surface. And like Soto once again, the musical analogy immediately comes to mind. Agam has in fact used musical terminology in the naming of his works. The words 'contrapuntal' and 'polyphonic' are used again and again in the titles of these remarkable pictures, which undergo a complete metamorphosis as the spectator passes in front of them.

It should, however, be emphasized that Agam is trying to reach beyond the time-scale which is implicit in traditional music. He regards mere duration as infinitely less rich than the quality of time which is involved in his transformable paintings – a time that is dynamic, irreversible and unforeseen. He believes that the whole question of incorporating kinetic effects into painting is inevitably bound up with the notion of time. But his own notion centres upon the concepts



of irreversibility and the simultaneity of acts and events in nature. This is where he sees the true unity – a key-word that testifies to his profound knowledge of Hebrew spirituality. ‘Time is the unforeseen,’ he writes, ‘duration is the foreseen.’ With this principle in mind, he sets out to create an art which exists solely in the realm of the possible – the virtual. And for this reason he might be said to be making use of ‘virtual’ movement in every sense of the word.

Agam has stated in the preface to an album of his work:

‘Indeed, nothing is fixed in nature nor in the cosmos, and the painting that attempts to attain the truth through

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| congealed fixed | representations falls far short |
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of touching this truth of nature. Everything in

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| nature reality creation | can be transformed |
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with endless variety, while preserving a particular and definite character.’ The superimposed words signify what Agam calls a ‘word-accord’ (mot-accord), and they are typical of his attempt even on the verbal level to achieve new types of unity – and hence a new vision of reality. In the artistic field this impulse is translated into a desire to pass beyond the isolated plastic statement, beyond the forms and images which, for him, can only be a partial representation of reality. And his first practical step towards the attainment of this aim lies in the destruction of the form by movement, which alone can make visible the unfolding of a structure in time.

Although we have already noted the musical analogy which exists in Agam’s work, at least on the level of terminology, we should remember that music does not provide the inspiration for his kinetic creations. It was only when he had reached an advanced stage in their development that he began to see the correspondences between music and the plastic arts. What must be borne in mind above all is that Agam was the son of a rabbi, and that he has attempted throughout his life to dissociate spirit from physical matter. He is quick to mention that he was brought up on the study of the Kabbala and in that way ‘learned the necessity of the quest for inner truth’.

The crucial date in the development of Agam’s work was 1952. Since that date all his efforts have been directed to the expression of structural movement, and to the task of engaging the spectator to participate actively in this movement. He has written of the first group of works, the ‘Tableaux transformables’:

‘By transformable paintings I mean more precisely paintings based principally on the modification of their pictorial structures, either by means of a pivoting element, or by means of elements which can really be moved within predetermined limits into holes distributed at regular or irregular intervals, or finally

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| by with | elements which can be moved freely over the whole surface of the painting.’ |
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The spectator is thus able to modify the position of the forms which Agam has provided. He enters into a kind of game, and thereby achieves the liberty of action which Agam is anxious to grant him.

In a second group of works, which carry musical titles, the element of spectator

participation is transformed into actual physical movement in front of the work. These 'contrapuntal' pictures unfold their structures in a simple, rudimentary fashion, being based upon the fusion of two or three themes in the same way as Bach's musical exercises. The attentive spectator can pick out the various themes as he moves in front of the picture. The works which Agam calls 'polyphonic' have a far greater harmonic richness, and are composed of at least five different plastic themes. Agam has written of them:

'The surfaces of these paintings are composed of parallel triangles in relief, which set up a rhythmic measure over which the different themes are painted. I can paint up to eight distinct themes in one work: these appear to be integrated with one another if one stands straight in front of the picture, but they separate and recombine in turns when one moves to the right or the left. I began by painting two different themes on the two different parallel surfaces. If the painting is viewed from the side, only one composition on one of the parallel surfaces can be seen. But as the spectator moves towards the centre, he perceives both this composition and a fraction of the composition painted on the other face, which gradually incorporates itself into the first in counterpoint. From the front, he sees the totality of the compositions in one comprehensive pictorial orchestration. The values and relationships of these compositions are modified and transformed by the diminishing of one motif and the growth of another, as the spectator moves in front of the work.'

Agam reserves the term 'metapolyphonic' for pictures in which there is a modification of the basic elements (circles, squares etc.) as well a polyphony of form. In these works line is transformed into structure, and form dissolves in order to take on essentially different characteristics. The kinetic – and indeed the dialectical – element is more firmly underlined. Agam has compared the polyphonic paintings to a book which one reads in comparative calmness, while the metapolyphonic works suggest an animated discussion between several people.

A further extension of Agam's artistic and philosophical premises has been the creation of works 'liberated from the earth's force of attraction' and 'independent of the wall'. He has drawn inspiration from the Venetian Mannerists, for example C. M. Mitelli (1634–1718), in the composition of pictures which have no 'right side up' but can be turned through 360 degrees. And he has also designed works which are 'in their essence... liberated from and even opposed to integration with a wall'. Yet both of these types of work retain their essentially pictorial character, in spite of the addition of the third dimension. In effect, they are the direct consequence of Agam's previous innovations – as he has admitted in the following passage:

'After works hung by an invisible nylon thread in the actual space of the frame, creating an illusion of complete independence from frame and wall, only one step was necessary to arrive at pictures completely liberated from the wall.'

Agam's recent research has led him to yet another interpretation of movement and of spectator participation. His paintings 'with vibratory movement', constructed since 1960, lend themselves to virtual movement through their metal springs. Agam writes:

'These are paintings with elements attached by means of springs, which begin

to vibrate at the slightest contact, and thereby transform the initial data forms, creating new immaterial forms that vary according to the frequency rhythm speed of the movement.'

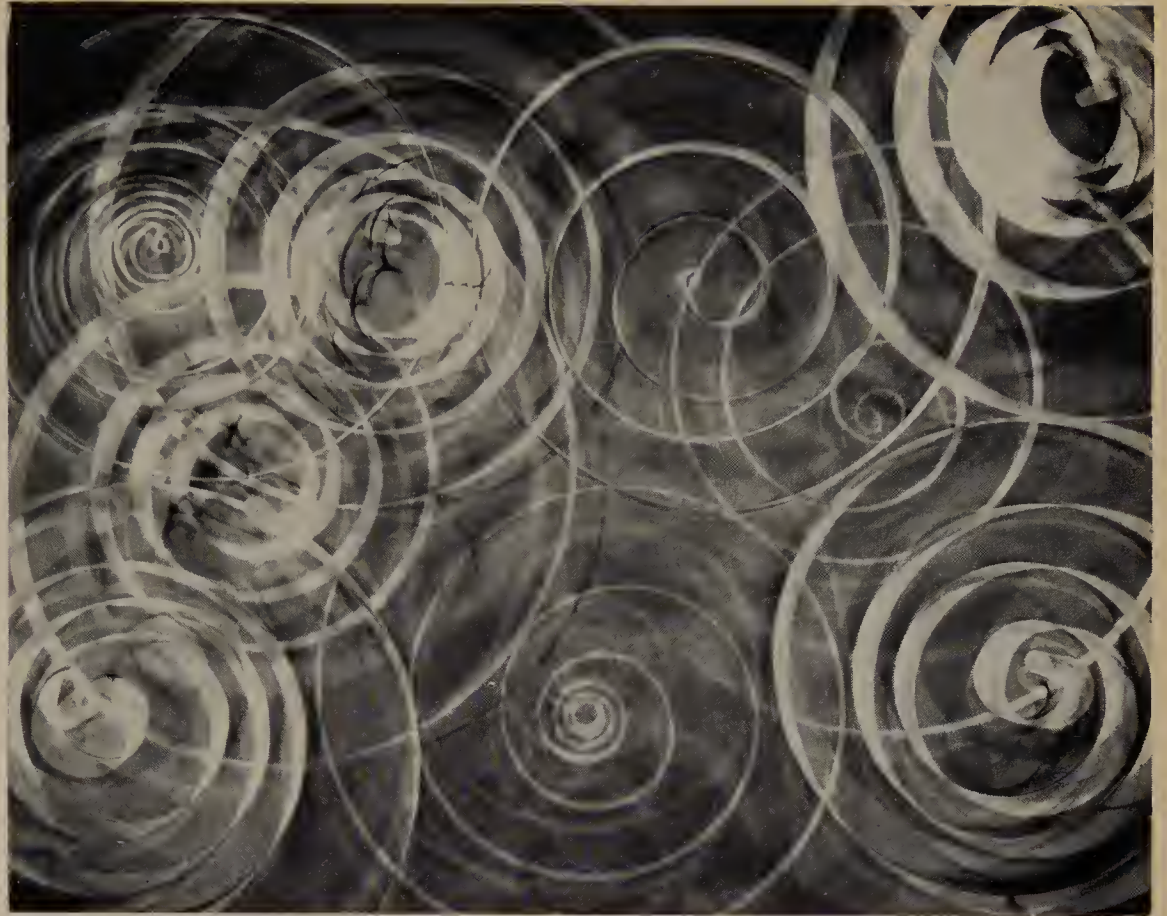
These vibratory pictures are the culmination of Agam's work, in the sense that they carry to one extreme the lines of research that he began in 1953. Here are many of the hallmarks of his style – a concern with the infinite elaboration of relationships between colour and form, an attachment to the creation of movement in circulating planes, and above all the desire to make the spectator participate in a game which is full of surprises. For Agam, this has its human side. It is the expression of a new type of liberty. On the artistic level, it represents the disappearance of the form and the manifestation of movement itself. The implications of this radical programme are even more boldly demonstrated in the two remarkable works which Agam exhibited at the *Lumière et Mouvement* exhibition (Musée d'Art Moderne de la Ville de Paris) in the summer of 1967. In one of them, a picture turning at many thousand revolutions per minute is lit periodically by stroboscopic rays, thus creating an occasional illusion of immobility. In the other, a light source within a bare white dome is activated by the human voice. Man recreates the divine prescription 'Let there be light'. And in so doing, Agam proclaims, he fulfils 'his most intimate and secret ambition'.

It will be obvious that in works such as these we must dispense with the traditional opposition between subjective and objective movement. In fact, this is a case in which the traditional divisions of the plastic arts cease to have any immediate application. Agam is aiming not for the development of any particular genre, but for the achievement of a 'total visual synthesis'.

● Bridget Riley – The Moiré effect – Cruz-Diez

We have already established that virtual movement, while dependent upon the effective participation of the spectator, is bound up with the operation of various plastic elements – such as line, colour, relief and volume. The kinetic possibilities of line have engaged the attention of three pioneers whose work has already been discussed – Vasarely, Soto and Agam. More recently, the same subject has occupied the English artist Bridget Riley, who uses graphic elements to concentrate the spectator's attention upon fluctuating movements which appear to emanate directly from the object of perception. Her aim is to 'construct a plastic situation which leads to the enactment of an autonomous event.' Anton Ehrenzweig has written of the way in which she achieves a minute balance between geometrical elements, in such a way that they cancel each other out. This gives rise to a precarious kind of equilibrium, as if we were dealing with an organism in motion which is nonetheless stable.

A particular type of linear organization which produces strong sensations of movement is the so-called 'moiré' effect, which can be obtained by using a striped background (as in the case of Soto) or by placing a grille in front of the composition. Malina produced a series of works of this kind before proceeding to investigate the field of light and movement. The same technique, whose



theoretical basis was clarified by Oster in 1963, has also been exploited by Asis, Cruxent and Wilding – but with widely differing results. For example, Asis supplements his use of grilles and moiré patterns with the introduction of vibrating metal spirals, while Cruxent uses them in conjunction with backgrounds of coloured light.

We have noted the use of black and white elements to create virtual movement in the cases of Vasarely and Soto. This is an area which has also occupied most of the attentions of Yvaral, Leblanc and Dadamaino. An equally large number of artists are investigating the type of virtual movement which is produced by chromatic effects, often by means of the transformation of geometrical forms. Garcia Miranda, Lily Greenham, H. Sommerrock and Cruz-Diez come to mind in this connection.

Cruz-Diez has been working since 1955 on what he calls 'vibrations'. Originally he drew his inspiration from the natural world – from plant life and especially from the seasonal changes in European vegetation that had not been the rule with the evergreens of his native Venezuela. At this stage he attempted to transform these impressions from nature into a series of 'vegetable signs' which, when juxtaposed, aroused in the spectator sensations of visual and optical tension. From 1956 until the end of 1959, he concentrated upon the problems of consecutive movement or 'persistence of vision'. Appreciating that the physical

phenomena which he had observed could be given an aesthetic function, he completed several works utilizing juxtapositions of trapezoidal forms, which created shifting rhomboidal structures upon the retina.

Cruz-Diez then set himself the task of using the radiation of colour – a phenomenon which is still the subject of scientific controversy – to enliven the areas immediately next to the painted surfaces. He soon discovered that the same colour was liable to cause two different types of radiation, sometimes colouring the neutral zones which lay nearest to the painted surfaces and sometimes communicating directly and much more intensely to the eye of the spectator.

The next stage in Cruz-Diez' research was to come in 1959, with his discovery of Dr Land's work on polarized light and colour change. In an article for *Newsweek*, Land had spoken of the filtering of red and green, suggesting that by the mere addition or subtraction of these colours it was possible to produce the full range of the chromatic spectrum. Although Land's aim was primarily to improve techniques of photographic reproduction, Cruz-Diez saw how the principle could be applied to his own work. He decided to substitute a new notion of painting space through light for the traditional one of colouring surfaces with paint. He hoped that it would be possible to obtain a full range of colours simply by exploiting the properties of the colours red and green.

First of all he made experiments to find the optimum distance between the strips of card that were to carry the actual colour. His conclusion was that each strip of 1mm thickness should be 3mm from its neighbours. Acting on this principle, he constructed the first group of works which derived their colour from the radiation of these card strips placed at right angles to the picture plane. Next he began another series of experiments to see if colour could be projected over varying distances. The result was his first 'Physichromie', also dated 1959, which took the theory of additive colours to a more advanced stage. In effect he was combining his new technique of regularly spaced card strips with his earlier discoveries about colour. He retained his previous basic colours – red and green – but added white, the most intense form of light, and black, the very opposite of this. Now he was able to achieve a subtle interaction between the very intense reflections from the surfaces turned towards the spectator and the effects of expanding colour recorded upon the surfaces adjacent to the pigment. These two types of radiation did not remain distinct, but combined to create a unified impression upon the retina. And yet the colour which was perceived bore no relation to the actual colours of the separate pigments applied to the surfaces of the picture.

This distinctive plastic effect which Cruz-Diez had discovered could be varied in countless ways by the use of different materials and by adjusting the size of the strips of card. From 1962 his work succeeded in giving some impression of this range, through a register that extended from a fairly aggressive use of colour to a restful softness of tone. Cruz-Diez' most recent variation on this basic pattern, already anticipated in 1960, came in 1963 when he began to make superimpositions of mobile elements. These particular works created intense effects of colour interference, fixing the spectator's attention upon an atmosphere permeated with rich chromatic light.

● Virtual movement and the use of different materials

Another aspect of research into virtual movement is concerned with the reflection of light upon metallic surfaces or through transparent materials: in the second case a whole range of types of glass and plastic lends itself for the purpose. This sort of technique was invented and developed by the Constructivists Gabo, Pevsner and Moholy-Nagy. Members of the Nouvelle Tendance such as Alviani, Christen and Gerstner have continued in the same line.

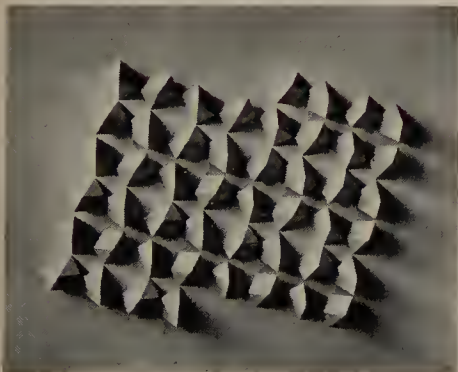
Getulio Alviani is primarily concerned with aluminium surfaces, which he covers with 'equal curved signs, identical in their basis, but of differing heights and relative positions.' An element of spectator participation comes in here, for the surfaces give back in reflection 'lines of light which vary according to the spectator's angle of view.'

The Swiss painter and draughtsman Andreas Christen tends to use surfaces of white polyester, which reveal plastic elements such as points and lines in particular light conditions. 'In my objects,' Christen has written, 'there is a process of development which comes into play at the instant in which we pass from the second to the third dimension. Points and lines occur on the surface, which is itself given form, so to speak, by points and lines. Light is used as a kind of aesthetic message.' Another artist who shows a similar interest in light effects and the third dimension is the German Uli Pohl. He has chosen to work with the synthetic material Acryl, which he values for its complete lack of subjective associations.

A large number of artists of this generation use the techniques of relief to obtain the effects of virtual movement. These differ considerably according to the materials employed. The Venezuelan artist Debourg creates reliefs in wood, which he refers to as 'surfaces animated by a series of elements in relief with a view to a visual statement.' These reliefs, with their diagonal planes, interact with the light in a way that is determined by the geometrical organisation. Camargo, on the other hand, paints his wooden reliefs white, obtaining the impression of radiation and organic growth as a result of the vibrations of light across the surface. Another artist who works with wood is Tomasello, who makes use of the reflection of elements in relief upon a white surface. Since the facets of these elements which are turned away from us are painted in primary colours, chromatic shadows are formed upon the adjacent surfaces, moving according to the angle of natural or artificial light as well as in response to the movement of the spectator.

Enzo Mari is concerned with aluminium structures, either painted black or retaining their natural metallic colour; he uses them to create a kind of honeycomb, in which each internal space is treated successively as full or empty. He is in fact pursuing a line of research which enables him to discover new possibilities in the organisation of space in three dimensions. He is concerned both with the problems of optics and dynamics and with the technological implications of a programmed composition made from prefabricated parts. Thus he has exhibited a work which brings to the foreground the optical and dynamic distortion of a cube within a sphere, covered with dots in series. The surface of the sphere, like a kind of intervening lens, distorts the image of the inserted cube. This work by Mari has been produced in an edition of fifty.

54 Luis Tomasello
Réflexion n° 50 (Atmosphère chromo-
plastique), 1960, 121 cm. x 151 cm.



The English artist Anthony Hill makes use of a wide range of natural and synthetic materials, such as aluminium, perspex, P.V.C., copper and formica. His skill in combining elements of these various materials allows him to create relief constructions which challenge the spectator to a thorough exploration by tactile or by visual means.

● Virtual movement in three dimensions

Let us take in the first instance the Yugoslavian artist Picelj and the Germans Klaus Staudt and Ücker. The former constructs surfaces in relief, while the latter two cover materials of various different kinds with white paint. Although the works within this category cannot be firmly distinguished from those in the preceding section, it is possible to suggest one distinctive feature. With these three artists, unlike Mari or Tomasello, the changing effects of light are strong enough to transform the whole atmosphere of the work, and to create the illusion of immateriality. Ücker has in fact worked since 1957 with the aid of numerous – even mechanical – methods in the hope of arriving at what he has called a ‘pure integration of light in movement’.

A similar area of research is the investigation of effects of virtual movement obtained by an interplay of volumes. In the case of Vjeceslav Richter this enterprise takes on an architectural character. It is perhaps worthwhile to mention at this stage that attempts have been made to draw a parallel between the experiments of Schwitters and the field of kinetic art. Schwitters certainly intended the spectator to walk around within the first Merzbau, which dates from 1924. But this is not to say that he shared the present-day interest in active participation by the spectator. The way in which the spectator moves acquires a completely new significance in certain works of today. We may instance the objects of transparent or coloured perspex by Sobrino, a member of the Groupe de Recherche d’Art Visuel of Paris. With these works, the movement of the spectator is calculated to result in a ‘transformation of the plane’, an ‘optical acceleration’ or an ‘alteration of the interplay of combinations’.

Hugo Rodolfo Demarco aims to discover colour in its most essential form, by reducing it to pure vibration and by setting it off in a series of different planes. He calls his works *Dynamisations*, *Superpositions spatiales* and *Réflexions changeantes*, and he has written of them: ‘The juxtaposed colours, taken from exactly opposite places in the chromatic circle, take on an element of real movement. A struggle ensues and from this there comes about a continual vibration... Colour as a unique element loses some of its value, to recreate itself once again in a totality by producing changes of colouring and luminosity in a continual visual movement.’ In another place, Demarco has given a description of his working methods: ‘Arising from a group of square forms in reflecting metal (polished aluminium), situated at opposite angles on a plane surface, there develops an uninterrupted reflecting space. I add to this space a transparent surface of perspex with a certain number of geometrical forms marked in transparent colours. The function of the colour is simply to give the forms individuality. These forms adopt different positions and depths in space: saturation of colour, transformations of structure and new intensities of light and colour offer them-



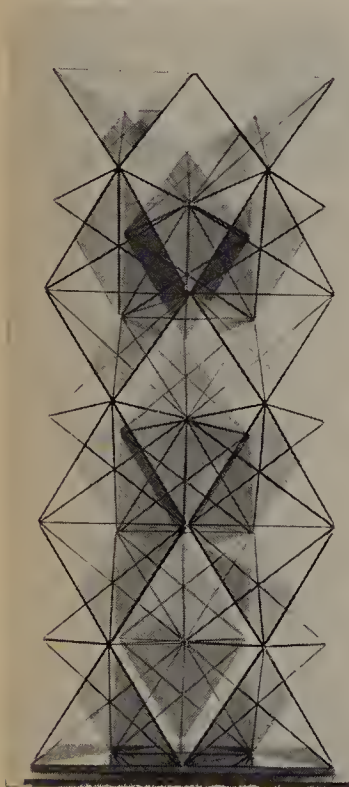
selves to the vision. From the basis of this experience, real movement is integrated with the elements or reflecting bodies which are provided as a mechanical basis, and possibilities of combinations of movement, interrelation of speeds and directions come to the fore.' Demarco adds that an additional factor is contributed by the spectator's movement in front of the work, which 'transforms the image and creates active participation on the part of the spectator'.

Several other artists have experimented with illusory volumes. Costa, who is a member of the Group N of Padua, has constructed a *Structure optique-dynamique* in polyethylene and wood, which dates from 1961. This gives the illusion of a parallelogram splitting into separate units and multiplying as the spectator moves. Marc Adrian, an Austrian artist, has constructed a number of works in his aim to achieve 'the highest degree of integration of the spectator in the genesis of the work of art.' He realizes this aim through displacing the spectator's field of action – the work is made up of 'sixteen fields on four bases of industrial glass', which are placed before a ground painted in relief so as to allow four different modes of apprehending the movement.



56 Joël Stein
Trièdre, 1963–65. Four cells

57 Francisco Sobrino
Transformation instable (interference structure), 1963



Finally there is the work of the German artist Karl Reinhartz, which is executed in wood, aluminium, perspex and added colour. Lighting is from behind, a feature which lends the character of a relief. Reinhartz' works are all made by simple and schematic methods. But the interplay of light rays and the movements of the spectator give rise to a complex reaction on the part of the senses.

● Manipulation by the spectator

Yet another class of works requires the active participation of the spectator expressed in the manipulation of their basic elements. In a sense these works could be said to exist in optical terms before the spectator has been able to intervene. And since the actual movement which is prescribed for the great majority of these works is only intermittent, we might class them in the category of virtual movement. Clearly this poses a fundamental problem in the relationship between the creator, the aesthetic object, the perception and the participation of the spectator. Works of this type are particularly hard to disentangle in terms of their effect. We can, however, make a summary analysis of the works themselves.

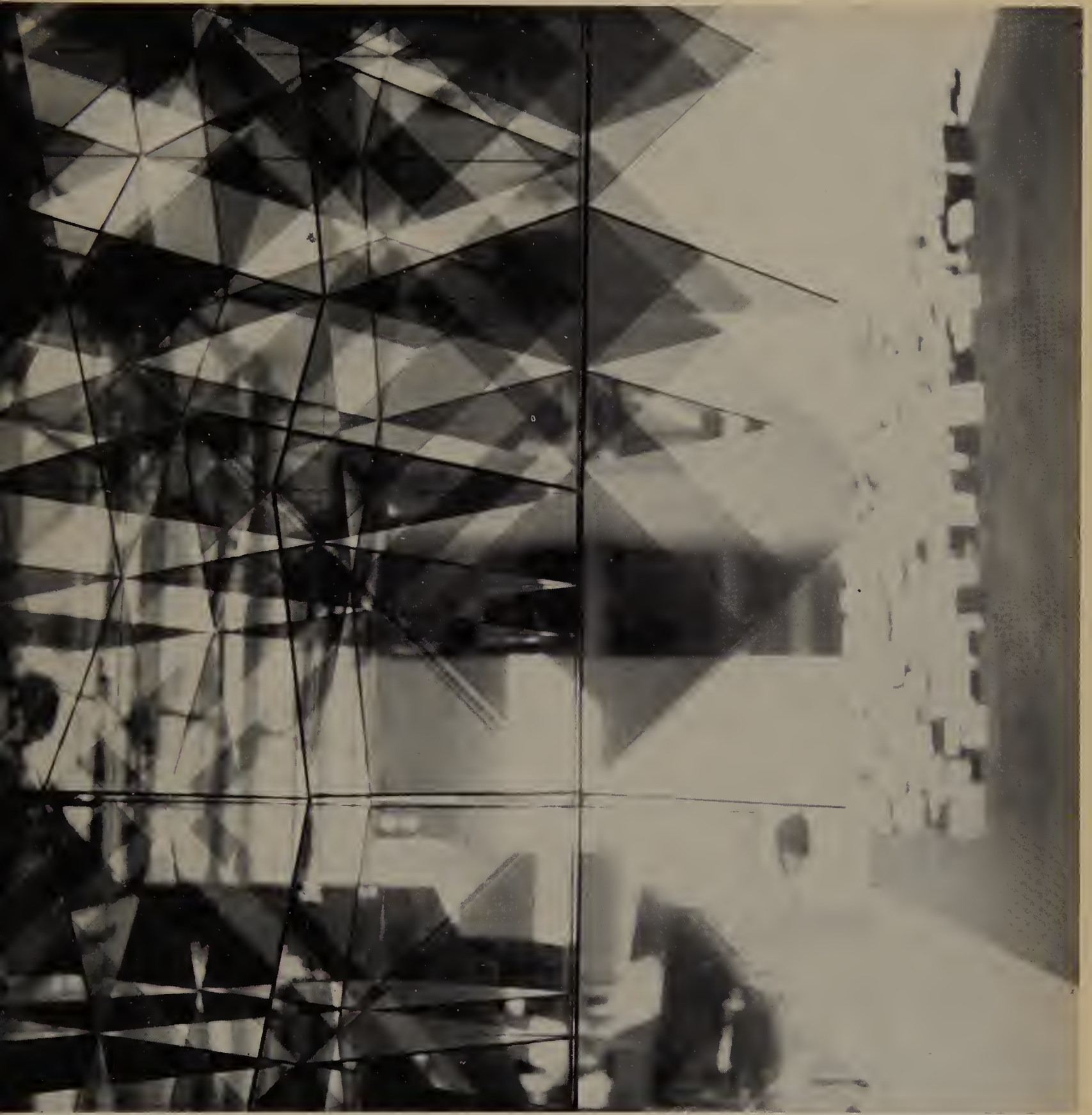
Works such as the reflecting polyhedrons, with mobile and manipulable elements, which are characteristic of Joël Stein of the Groupe de Recherche d'Art Visuel of Paris, must be placed between the category of works in virtual movement that can be manipulated and the three-dimensional works in real movement that we call mobiles. This also applies to numerous other products of Stein's group, and to work by the Italian groups T and N.

For the most part, the manipulable works in virtual movement can be related to the aesthetic of the game. We have already met works of this kind in the case of Agam. Diter Rot's works from 1960 are another case in point. They carry Agam's title of 'transformable paintings'.

These works which suggest the aesthetic of the game have a number of clear antecedents. As early as 1945, Hugo Weber was working in Basle on transformable reliefs composed from balls of wood. And Karl Gerstner, who also came from Basle, was exhibiting transformable metallic compositions in 1956. Yet another Swiss artist, Paul Talman, was also concerned with this type of work. He devised objects in perspex that incorporated coloured balls which could be moved by a mere flick of the hand. Each new initiative by the spectator therefore led to a variation in colour effects, and a change in the composition. Talman held that this distribution of movable balls on a large or small surface brought out in the most direct manner the 'tension' between order and chance.

This is in effect one of the most obvious characteristics of the transformable work, and it applies to a wide variety of artists. Bruno Munari, one of the most productive pioneers in the field of kinetic art, exploited a similar effect in his *Strutture continue* – works which could be assembled or taken to pieces according to the principles of a relatively strict code. Sobrino followed rules of this kind in his *Structures interférentes* of coloured perspex, while the Yugoslavian artist, Vlado Kristl, has introduced subtle possibilities of variation into a series of works which are constructed from wire and paper on a wooden base.

Mortensen made an important innovation at the 'Mouvement' exhibition held



58 Groupe de Recherche d'Art Visuel
Works by Sobrino (on the left), Le Parc
(on the right), at the 1963 Paris Biennale;
under the direction of the architect
Pierre Faucheux

at the Galerie Denise René in 1955, when he introduced the principle of the grooved work which could be manipulated by the spectator. His achievement had interesting repercussions in England, where Roy Ascott has devised a series of statements belonging to very precise fields. In general he exploits the effect of 'familiar objects in an unusual context', inviting the spectator or pupil to alter the relationships of the various elements. It is up to the spectator to find out the latent possibilities contained in each work. Ascott has also worked on the development of an elementary course in art education. It might in fact be said that the primary concern of all his artistic enterprises, whether they go under the name of 'change-paintings' or 'kinetic constructions', is with the education and bearing of the spectator. This ties in with the way in which he defines his works as structures which are subject to the same human pressures and the same likelihood of transformation as our purely intellectual notions. Ascott goes on from this point to consider the future of art as a 'cybernetic' activity or discipline.

Finally we must record the unusual technique of Olson, who obtains an astonishing interplay of colours by making use of the effect of polarisation. He works with metallised crystals and filters placed between two layers of glass, which are only effective when the spectator changes his position in relation to the work.



6 Three-dimensional works in movement

We now arrive at the class of works which involve real movement. This particular chapter is concerned with those whose movement takes place in space, as opposed to those which utilize the effects of moving light on a plane surface. The very fact that these works involve real modifications in space sets them apart from those which merely indicate the presence of space in a symbolic or illusionistic way.

The main division within this category is between foreseeable and unforeseeable movement. The classification may seem arbitrary, but from the point of view of the spectator it is most important. Does the spectator experience a *sensation* of predictability in his contemplation of the work in movement, or does he not? This is the main point, and it dispenses us from approaching the vexed problem of the mathematical predictability of mechanical or cyclical movement. Of course, the actual cause of the movement is relevant in this connection. The majority of works which move mechanically, either by direct human propulsion or through the intermediary of a man-made machine, fall within the predictable category. The reverse is true in the case of works which are set in motion by natural forces, with no human intervention. Into this last category would come the large class of mobiles which respond to wind, heat and other forces beyond our direct control.

● Machines – Ancestors of real movement

Reference has already been made to the wide range of models, dating from classical antiquity to the present day, which can be regarded as precise antecedents of such and such a type of modern work. In connection with kinetic machines, we should first of all mention 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 AD. 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 seems to have been 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



59 Jacquet-Droz automaton
Mechanism of the *Draughtsman*, 1774.
Musée de la ville de Neuchâtel

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 make allusion to the existence of mechanical fountains. The examples given by Salomon de Caus are particularly interesting in this connection. Mechanical toys and marionnettes have a long history, particularly in the Far East. And sixteenth-century Europe pioneered the transformable painting, with a composition on a moveable 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.

In the seventeenth century we see the development of a new phenomenon, the human or animal automaton which imitates lifelike appearances. The celebrated duck of Jacques de Vaucanson (1709–1786) is now thought to be inauthentic. But the same inventor has left some remarkable androids, such as his Flute and Tambourine Players. Friedrich von Knaus (1724–1789) constructed in 1760 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 in the Conservatoire des Arts et Métiers at Paris, was built by Kinzing, while the Writer-draughtsman in the Franklin Institute, Philadelphia, was begun by the Jacquet-Droz family and finished by H. Maillardet in London.

During the eighteenth century, the taste for the mechanical toys, marionnettes 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 depended 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.

● The machine aesthetic and real movement – Archipenko, Duchamp, Man Ray, Tatlin

We have already considered the question of the artist's reaction to the coming

60 Marcel Duchamp
Rotative demi-sphère, 1925



of modern machinery, and the development around 1910 of what has been called 'the machine aesthetic'. Foremost in this 'modernolatria', 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 a number of artists who actually experimented with the incorporation of real movement into their works. Around the year 1912, Larionov, 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 vogue among young Russian artists of the time for the introduction of objects or natural phenomena in their pictures. For this reason the fact that Larionov and David Burliujk 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 explains that his research into the possibilities of real movement began in 1912 at 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 involved still left him dissatisfied. He was to take the idea up once again at Berlin in 1922. Finally, at New York in 1924, he crowned a period of intensive technical research with the invention of his *Archipentura*, an actual machine which was intended to create an illusion of movement in a pictorial subject through methods analogous to those of the cinema. This invention, which he finally designed, patented and constructed in the United States in 1928, consisted of a box roughly 7 x 3 ft in dimensions. On each side there were a number of narrow metal bands superimposed as in the case of Venetian blinds. An electric motor drove these round. 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 of view, as can be seen from his commentary on the four views of his *Revolving figure* (1956).

Marchel Duchamp approaches his kinetic experiments in three dimensions from a very different point of view. The first ready-made, which dates from 1913, was the *Bicycle Wheel* mounted on a stool. From this use of movement pure and simple, in an attempt to demystify art and to strip it of its material qualities, Duchamp began around 1920 to investigate the possibility of producing spatial



61 Alexandre Archipenko
Archipentura, 1924



illusions with the use of actual spatial constructions. 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-Sphères* of 1925 and the *Disques visuels* 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-Sphère* is similar in construction, with a hemispherical spiral turning at the centre. The *Disques visuels* or *Rotoreliefs* are abstract compositions which appear to be three-dimensional when placed upon 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 – from Giacometti, who created in 1919 'a mobile work which was like a square cloud with a pendulum made of blue smoke', to Calder in 1932 and finally to Tinguely, Kramer and Bury in our own period.

Man Ray began his Dada experiments with a series of mobiles incorporating real movement. These will be examined at a later stage in the chapter. 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'. Tatlin also began his kinetic work with a number of mobiles, but his project for a *Monument of the Third International*, which was realized in wood and metal in 1919–20, 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 announceragitator, further on the latest news, decrees, decisions, the latest inventions will be announced... creation, only creation.' In this connection, we should perhaps mention the comparable case of El Lissitzky's remarkable 'Electrical-Mechanical Spectacle', developed in Moscow 1920–21.

● **Gabo and Pevsner – The Realist manifesto: the manifesto of Moholy-Nagy and Kemeny**

The first work which answers all the criteria of this category, 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 Pevsner summed up in the same year in their *Realist manifesto*:

'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

62 Vladimir Tatlin
Maquette for the monument of the Third
Internationale, 1919–20



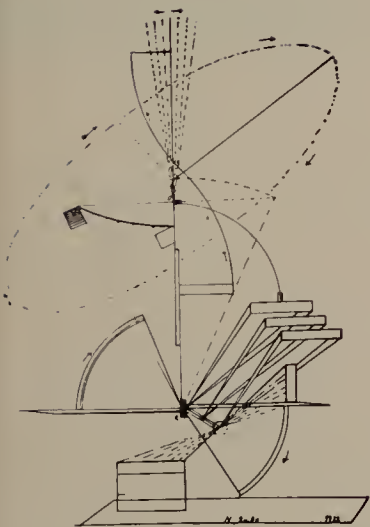
techniques we are today capable of bringing to light the hidden forces of nature and realizing psychic events.'

Gabo's *Virtual kinetic volume* has also been referred to as *Kinetic sculpture* or *Kinetic model*. It consisted of a strip of steel attached to 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'. It was purely for technical reasons, he insisted, that he made no further investigations into real movement. We must remember, however, 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 predecessor. 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 a monument destined for the Institute of Physics and Mathematics.

Gabo's theories on kinetic sculpture were taken up and developed in another direction by Laszlo Moholy-Nagy, who wrote 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 tensions 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 based on the relationship of forces and 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 apparatuses which would test the relationships 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 Bâtiment* 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



63 Naum Gabo
Drawing for a kinetic construction, 1922



64 Laszlo Moholy-Nagy
Lichtrequisit, 1923–30. Harvard
University Museum, Cambridge, Mass.

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.

● Works driven by the hand or powered by electricity – Munari, Bury

The class of works which depends on continuous human force, particularly that of the hand as 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 about 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 is 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 utilize this particular technique. We might say 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 humorous 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 with 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'. In the same year he himself created a 'machine which produces 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 file past. His most recent kinetic creation of this type, the *Tetracono*, is made up of four cones which occupy the total cubic capacity available. Each cone is coloured in two equal parts of red and green, which results in an optical vibration when the power of the four motors is applied. The same basic programme can be observed in the *Tetrafono* of P. Grossi, which is particularly concerned with sound effects.

Harriet Heiner constructed her *Kinetic sculpture* in 1941, making reference to both the Dada and the constructivist aesthetics. This work was a sculpture in rotation made of wire. It incorporated ping-pong balls which gave differing degrees of movement and different directions of movement when inserted in the work. The result was a combination of unpredictable and predictable movement.

There is some similarity between the preceding work and the *Pictorial composition* of Richard Mortensen, which was completed at Copenhagen in 1944 but has since been lost. Mortensen's work hovered between imagination and reflexion, between the Surrealism which he was practising before the war and the Expressionism which he developed after 1939. It was a large picture, measuring 4 x 12 metres, which consisted of geometrical elements quite freely distributed over the surface. Five of these were in slow movement. In addition, there were four cages containing white mice, which introduced an element of unpredictable movement, and an electric motor which set the entire picture into motion. A film of this extraordinary spectacle was taken by Metz and Jorgen Roos.

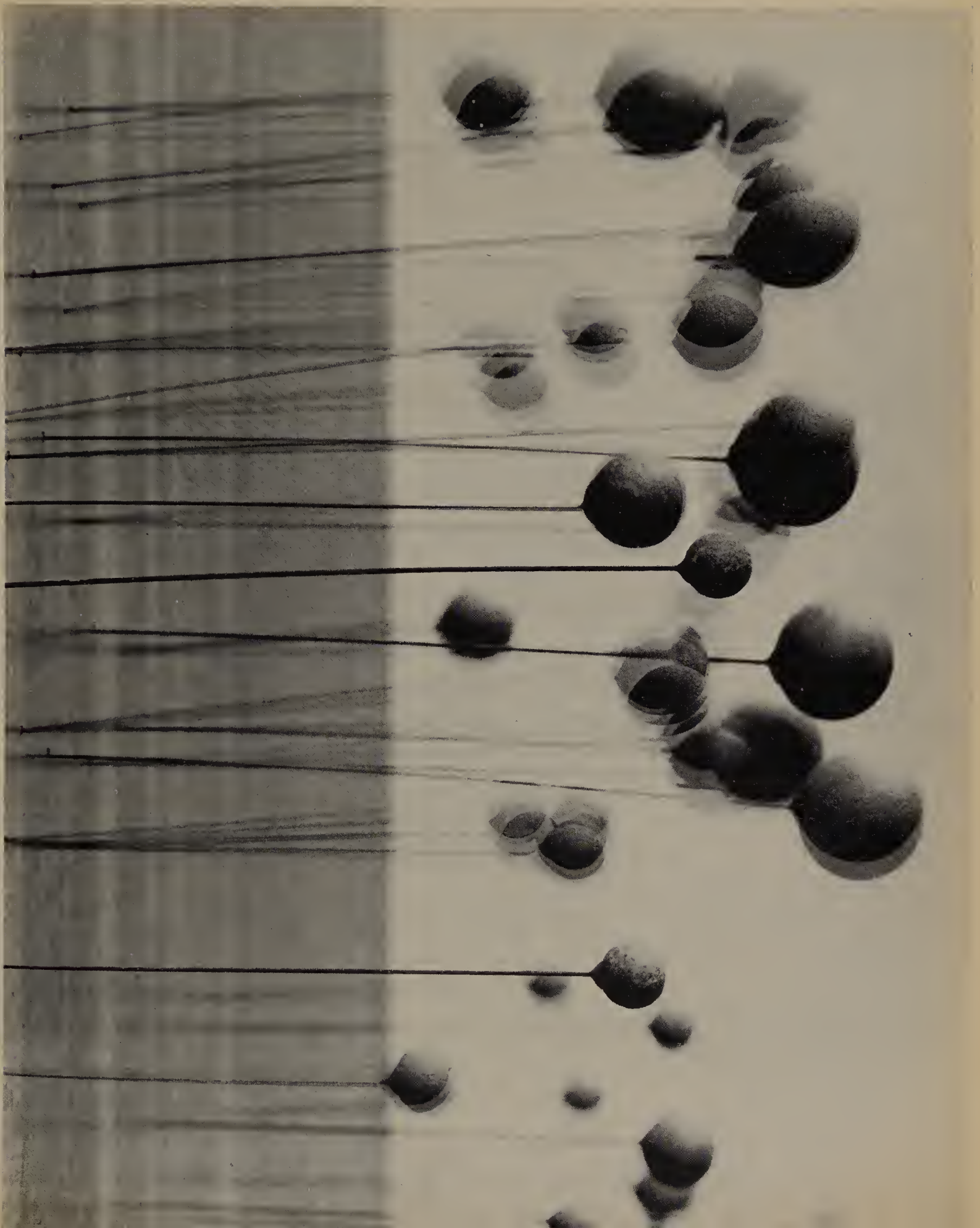
One of the first artists to undertake a series of works which depended upon the use of electric motors was the Belgian Pol Bury. Impressed by an exhibition of Calder's work, Bury began his research with the construction of what he called 'mobile planes' in masonite. These were sometimes black and white 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 to 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.'

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 Bury had in fact 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



65 Richard Mortensen
Sequel to *Ominanda IV*, 1964. Galerie
Denise René. This relief becomes kinetic
through the movement of the spectator

66 Pol Bury
...*Boules en mouvements*, 1963



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 pneumatiques*, 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 was still sufficiently loose to be sensitive to the slightest touch. Each of them was fitted with small stalks of rubber, at once 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 work 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 or interstellar space in the appearance and disappearance of white spots. But Bury is aware of the completely random character of these impressions and considers them to be extrinsic to the work.

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 superseded now that movement has come into use. He explains: 'Just as the painter benefits from knowing some of the elementary theories of the laws of colour, I have felt myself obliged to take certain mechanical principles into account. Since the micro-motors which I use have a limited power, I have been 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.'

● The Dadaist tradition – Tinguely, Kramer

These 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 uses movement at once to stress the properties of the machine and to transcend them. He is 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 accepts 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 is 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 recordings were played simultaneously. The first involved Tinguely himself attempting to explain his theory of stability in modern machine movements. He did so in an 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 *Cyclograveur* challenged the spectator to mount a bicycle seat and produce paintings or engravings through the 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 French woman moved around in the audience.

From Tinguely's point of view, the machines which he devises 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, a quality particularly apparent in the series of *reliefs métamécaniques* 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 the 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 this series was the giant machine *Euréka*, 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’.

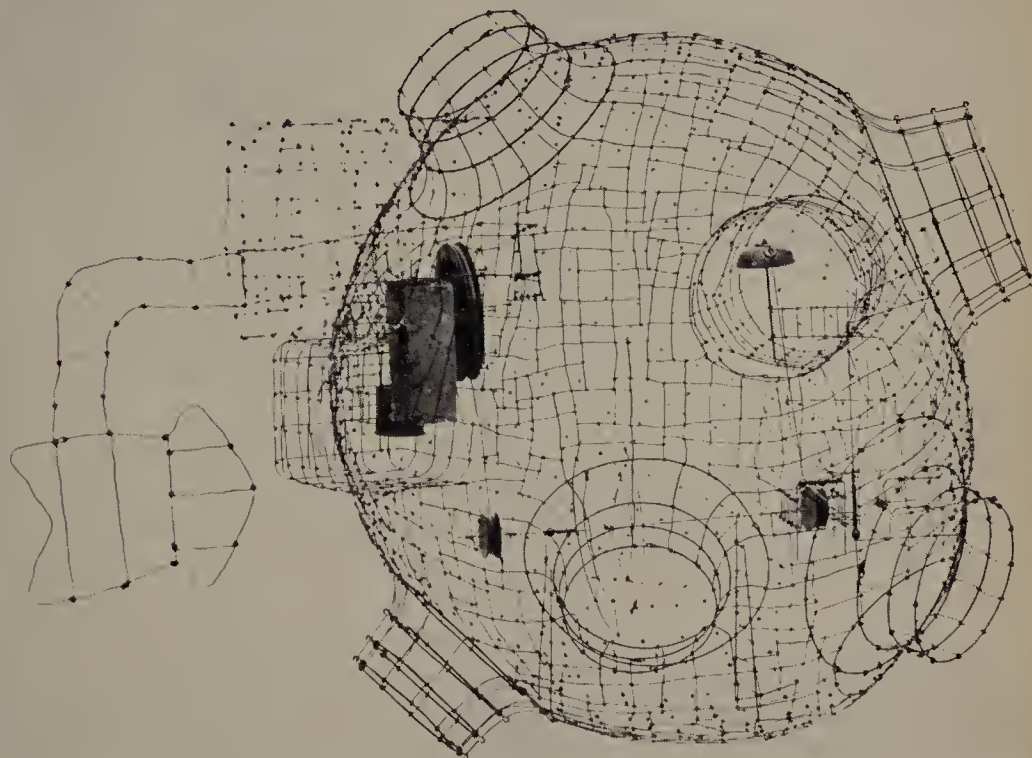
Another aspect of Tinguely’s work has been his exploitation of rapid deterioration in machines. In March 1960, a number of mechanical elements were assembled in the garden of the Museum of Modern Art, New York, for a *Machine Happening* which Tinguely called *Homage to New York*. Here the element of 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.

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 scène*. Since 1961,



68 Jean Tinguely
M. K. III, 1964

67 Jean Tinguely
Animation of small bulbs, 1962



69 Harry Kramer
Ball with opening, 1964.
75 cm. x 120 cm. x 85 cm.

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. Günter Metken has given an excellent description of their curious effect: '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, or the works of Jean-Philippe Hiquily. We are not far from the spirit of Dada in many of these works, even though it must be said that the use of the *ready-made* or the incorporation of industrial waste products is never more than an incidental factor in their aims. An artist who clearly belongs to the surrealist tradition is the Englishman Bruce Lacey, whose androids are composite creations that owe a great deal to popular sources of imagery. There is perhaps an affinity in this case with the work of Foldes, who has incorporated optical lenses in his pictures and collages.

● 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 Pevsner 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 Pevsner: 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 he 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 plastics. This in-

creasingly 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 *Cyssp 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 directly with the dynamic possibilities of time. *Chronos I* was made of nickel steel and plastic, incorporating mirror surfaces and 'multiple peripheral projections'.

Schöffer spoke of this 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 into 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 animation, whilst 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 appears on the facade of the neighbouring Palais des Congrès. The tower is regulated by an electronic brain which is sensitive to such features of the environment as sound, temperature and humidity, and itself produces an appropriate kind of music, based on such material as street sounds and recorded bird-song. The public can 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 our urban landscape. That is to say, he would like

to draw a close connection between town life and the ideas of cybernetics. His spatio-dynamic towers at Biot and St-Cloud, and his cybernetic tower at Liège, are still the only large-scale projects which he has carried out. But he has planned a grandiose scheme involving a central electronic brain which would provide a solution to the problem of 'visual saturation' – as he has called it. The electronic system would be concerned with despatching 'mobile cybernetic sculptures' to different places, where they would stay suspended in the air like helicopters.

The bewildering variety of Schöffer's activities should not lead us to forget that there is a very close connection between the original introduction of real movement and his other guiding notions. From 1960, he has been 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 we remember 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 recent publication entitled *La Rétroaction 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 micro-time 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 to art, through man's intermediacy, a substance which transcends man. Towards the end of this essay, Schöffer draws the threads together in a veritable profession of 'scientistic' 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 emissible, *omni-directional* and aleatory.'

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 writes: '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 works with an infinite range of variations, technique is helping to resolve any problem of saturation and any partial cause of increasing conditioning.' 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 the 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.

The German artist von Graevenitz recalls Schöffer and a number of other artists who have already been mentioned in his concern for the 'open' work, which is not limited or determined by its figuration. This concern has led him to consider the possibility of creating works in editions. Yet he differs from most of the artists whose names occur in this connection in putting the main emphasis on the optical factor, and on the new 'statistical orders' produced in the process of movement. This is the case even when the element of real 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 structure which could be distinguished quite clearly from the constructivist model. In the latter, it was simply a case of controlling the plastic form 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 attention. He has spoken of several 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 realise this objective 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 similarly 'constructivist' tendency has led the sculptor 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 or gyratory elements in their 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 the 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 chiffré 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 the *Persistance de la goutte d'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 the 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 untranslatable 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 and poetic movement, Kosice tends to use the terms 'hydro-poetry', 'hydro-space' and 'alternancy 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 man to the natural movement of the elements is in fact at the centre of Kosice's concerns 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. You must have noticed that the majority of my sculptures were constructed on the basis of a half-curve, or more recently a half-sphere.' '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 still 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

71 Gyula Kosice
Hommage à ma femme Dijí, 1964



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. Recently 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 ninety degrees 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'.

We should not forget 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 Lijn 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.

● Magnetic force – Takis, Boriani

Kosice is fascinated by the natural elements of water, air and light, which offer him an infinite number of possibilities. The Greek artist Takis explores the hardly less wide-ranging possibilities of magnetism. Since 1959 he has been constructing *Telesculptures* which make direct and obvious use of this previously neglected force. He began to use vibratory movement in 1955, the year in which the first of his *Signals* was completed. For a time he concentrated particularly on these fine constructions in iron and steel which relied upon chance currents of air to set them in motion – and gave extremely interesting effects when juxtaposed one against the other. But the possibilities of magnetic force were to stir his imagination much more powerfully. 'If I could only capture the music of the beyond with an instrument similar to radar...' he exclaimed in 1963. 'The thought made me forget all the rules of art. What if the object were capable of capturing sounds and transmitting them, in its process of rotation...'

Takis' principal concern in recent years has been that of making meaningful and perceptible on a human level the 'mechanical and undulatory forces' which dominate the natural world. Obviously he has laid great emphasis on the importance of movement in pursuing this aim. His *Télesculptures*, which generally consist of a magnet and certain parts made of aluminium, iron and steel, and his *Telepaintings*, which also involve a magnet and other metallic objects, have recently been supplemented by a novel use of the kinetic element of light, in this



case diffused by mercury vapour lamps. These blue-coloured lamps flicker all the time, giving out a light that is aggressive but also poetic in character. They are 'cosmic flowers', which register energy as a seismograph does.

Takis is therefore trying to capture the natural forces which lie hidden in metals, and to reveal the energy that is all around us. Some of his most successful works depend on his ability to control and combine two types of movement, as when he allows white balls to hang suspended over upturned magnets, hovering and darting about in response to the conflicting forces of gravity and magnetism. His interpretation of natural forces is radically different from that of an artist like Schöffer. Instead of assuming an ideal unit of perception like Schöffer's 'micro-time', he prefers to rely on the latent energies of magnetism, and his work acquires its unusual tension from this unresolved conflict between magnetism and the universal forces of gravity.

Magnetism has also engaged the attention of the Italian artist Boriani, a member of Group T of Milan. In 1961, Boriani constructed a series of *Magnetic surfaces* which involved magnets fixed behind turning planes: the planes were covered with a thin layer of metal dust which formed extraordinary patterns in response to the alternate attraction and repulsion of the magnets.

● Len Lye

Len Lye – pioneer of experimental cinema and animation between the wars – is one of the most gifted artists to turn his attention to the problems of movement. In spite of their title, his *Tangible Motion Sculptures*, which are comparatively recent in date, belong to the present category of three-dimensional mechanically operated works. This is because Len Lye is simply referring to the visual impression of tangibility and has no intention of making his works actually dependent on touch.

Len Lye's kinetic experiments date back as far as 1918, if we are to allow the occasion on which he fixed planks within an orange-box in order to support a collection of handles, rollers and pulleys. His subsequent passion for the cinema in all its aspects can be sensed in the vibrating sculptures which he makes today. These are simple constructions, generally made of firm yet elastic steel and mounted on supports that conceal silent motors. The programme of action which takes place once the motor is switched on follows a sequence which has been strictly determined by the artist. Thus much is made clear in an anonymous article entitled 'Forms in Air' which appeared in *Time* magazine. The motor starts up, slowly at first, and then accelerating according to a carefully arranged cycle. In the mean time, the sculpture begins to trace its outline in the surrounding space.

This description may not explain the importance of the cinematographic element in Len Lye's work. But one of his letters establishes the point beyond any doubt. He writes: 'I'll now get back to my studio corner and be sure that I can at least mess around with animating steel and exploiting its springy resonances in terms of controlling energy to compose motion not only of static objects vibrating and quivering *while* in motion. This point is analogous to, say, the film editing device of using short cut scenes as visual screen accents (at the

73 Len Lye
Steel fountain, 1959



splices). Now if, sound is synchronized with the cuts (or splices), that is one 'step by step' unity; but, if there is internal action within the scene with which sound is also used in synchrony, then that's internal motion of something that is externally controlled. – Another analogy might be made by likening the torpedo to an externally set line of motion and a shark with an internally set and directed one.'

Len Lye is primarily interested in the grace and power of movement, rather than the mere fact of its presence. He sees 'motion sculpture' as a distinct category of modern art, and the 'tangible motion sculpture' as a means of displaying an infinite variety of 'fundamental patterns', in such a way as to bring out the beauty of movement as such. With this fundamental aim in view, he has ranged widely in methods and techniques. His *Revolving Harmonic* is operated manually by means of a rheostat which controls the speed at the touch of a button. This control can be replaced by a fully automatic electronic system. Len Lye is interested in the possibilities of programming additional combinations, seeing the artist in this respect as the choreographer of movement. And he allows for the possibility of chance (or aleatory movement) by incorporating a weight into the system. In another work, the *Oscillating steel fountain*, he matches the fluidity of water with the force and flexibility of steel. 120 steel tubes are set into motion by a comparatively slight force applied at their turning base. Yet another, the tangible sculpture *Roundhead I*, consists of four concentric metal rings animated by mechanical means. The result is a combination of clock-wise and anti-clockwise movement, interrupted by points of rest which occur in accordance with an 'audio-visual' programme.

The works mentioned above give some idea of the range of Len Lye's visionary art, which extends from the scale of monumental fountains to that of tiny 'Mixmasters'. In every case, he is concerned with subtle and complex oscillations which owe their character as much to the individual frequencies of the metal components as to the requirements of the programme.

Several similar types of work come to mind in this connection. The American artist, Jose de Rivera, has completed a series of compositions in polished steel, which rotate slowly in response to mechanical force. Charles Eames' *Do-nothing machine*, which dates from 1955, is powered by a motor that derives its energy from the sun.

It can be stated as a general principle that those three-dimensional works in motion which give the impression of predictability are mainly operated by actual mechanical movement. But we must still make a distinction between three distinct methods of utilizing this type of movement. Mention has already been made of the genuine 'machines', in which the mechanical elements are fully exposed to the spectator, whether they arouse him to admiration or suggest an ironic or poetic commentary. In this category we may place many of the works of Moholy-Nagy, Schöffer, Takis, Duchamp and Tinguely. The second main division comprises the class of works in which all mechanical elements are carefully hidden, but can be deduced from the related movement of other three-dimensional elements which are directly accessible to the spectator. This would fit the works of Bury and the 'tangible' sculptures of Len Lye. Finally, we must take into account a third class of animated works which only involve a reflection

of the mechanical operations. 'Mixed' works – such as the sculptures by Schöffer which incorporate semi-transparent screens – belong partly to this category.

In all these types of work, the motive power is furnished or controlled by man rather than by nature. This already introduces an impression of predictability as far as the spectator is concerned. Most of the artists who have been mentioned show readiness to overcome this factor by incorporating elements of indeterminism, chance, unpredictability – or whatever they choose to call it. Some of them have tried other ways of resolving the same problem – Kosice by converting mechanical movement into the natural movement of water, Takis by concentrating our attention on the magnetic force rather than its electrical origin, and Schöffer by introducing an element of 'indifference' to break up the cycles and bring us into contact with 'pure' movement.

There are, of course, a small number of works which cannot very easily be classed as predictable or unpredictable. The Swedish artist Ultvedt, who makes use of a motor to give his wooden constructions a rather haphazard kind of movement, is a case in point. Then there are the mobile machines of Kobachi, whose *Plumbob IV* consists of ceramic balls suspended from nylon cords, and the creations of W. Weber, whose *Espace et Temps* makes use of a single ball that is kept in irregular movement by a blower.

● Mobiles

The precursors – Tatlin, Rodchenko, Man Ray
The inventor and dominant figure – Calder

It is almost impossible to suggest a firm point of origin for the class of three-dimensional works whose movement is unpredictable. Probable antecedents can be found in the 'wind-clocks' and turning lamps of China, in the vast range of marionettes which are to be found in all countries, and in some of the suspended objects which play an important part in theatrical design. Then there is a wide variety of light objects – flags, leaves etc. – which respond to the force of the wind. These appear to have influenced quite a number of artistic exercises in unpredictable movement.

In all events, the chief characteristic of all these works which we class as 'mobiles' is an impression that the force of gravity is being modified. The mobile is at the mercy of atmospheric forces. It responds to the random pressures of air and heat.

The majority of mobiles are constructed of light materials and hang suspended from the ceiling. A few are fixed to stands and go by the name of 'free-standing mobiles'. The spectator need not intervene to create the initial movement. But he has the opportunity to do so. The categories become confused at this point, and it is perhaps necessary to add that a mobile which lends itself to control by the spectator fulfils precisely the same conditions as the sculptures in virtual movement – requiring participation by the spectator – which have already been discussed.

The term 'mobile' as such dates from the year 1932. But it is reasonable to apply it to a tradition of works which began as early as 1914–5. Tatlin was the first artist to create a work which consisted of a series of suspended reliefs



74 Alexander Rodchenko
Suspended construction, 1920

– his *Contre-Reliefs libérés dans l'espace*. Michel Seuphor has explained: 'Tatlin's most original contribution is without any doubt the 'counter-relief' which abandons the stability of the pedestal or even the wall, and stays suspended on wires that are stretched in various ways within the corners of a room. Apparently these so-called 'machines' which were specially designed to counterbalance corners have not been imitated by subsequent artists.'

These particular constructions by Tatlin, which gave the impression of being able to float freely in space, were therefore his most revolutionary achievement. He had invented a completely new type of spatial form, a rhythm of interlocking planes whose movements 'penetrated, cut, embraced, obstructed and pierced space'. But this invention took place within the framework of a much more ambitious scheme of research – a prolonged investigation of the interplay between interior and exterior space which was linked at many points to the exploitation of movement.

Rodchenko, the friend of Tatlin and founder of 'Non-objectivism', continued this particular line of investigation with his work on the juxtaposition of materials and textures. The fruit of this research can already be seen in the interior decoration of the 'Picturesque Cafe' in Moscow, which Yakulov, Tatlin and Rodchenko undertook together in 1917. This consisted in elements of wood, metal and *papier mâché* which were fixed to the wall. Also in 1917 Rodchenko had completed some luminous constructions designed to be hung on walls. Three years later he realised his *Suspended construction*, a most impressive wooden mobile which was to serve as the model for his later research.

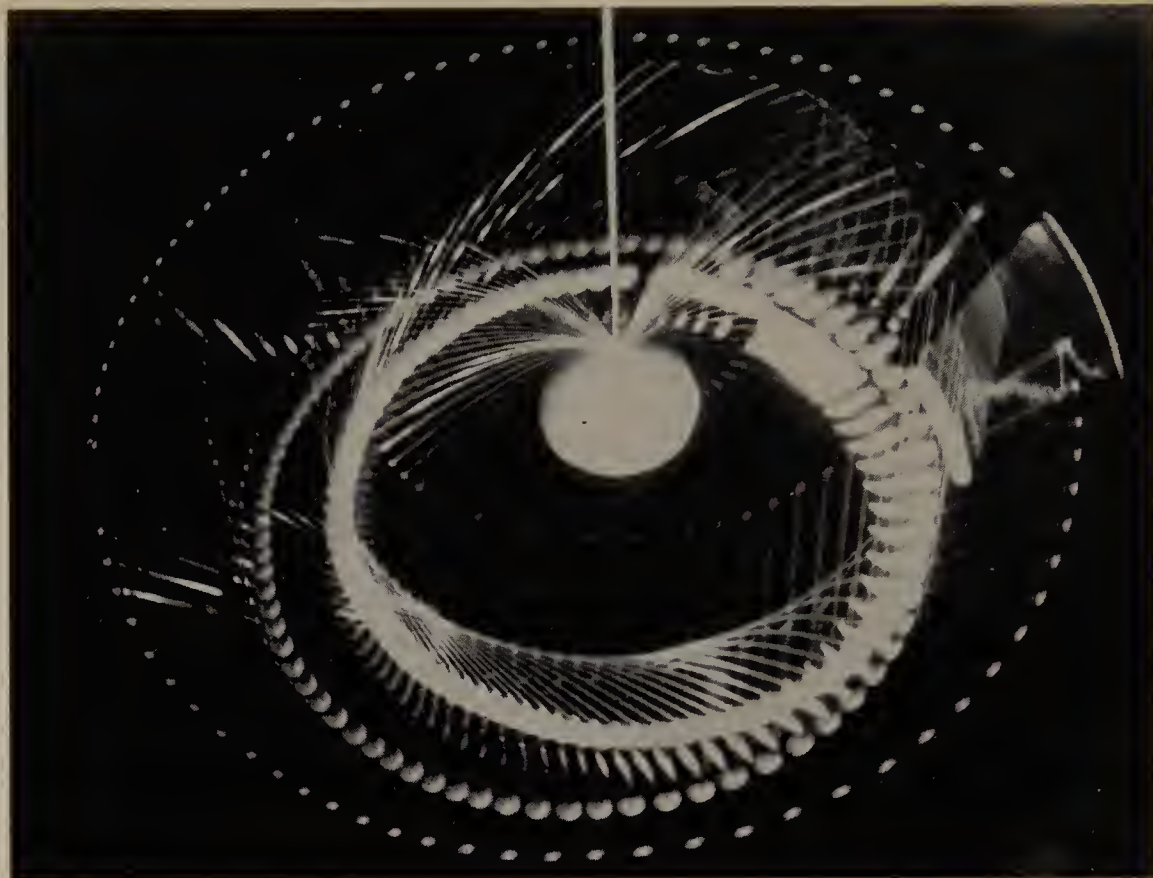
At roughly the same date, but with a completely different attitude of mind, Kurt Schwitters included a mobile element in one of his sculptures, which he entitled *Joy post* (1919). Man Ray was also working in this direction. His *Shade* from 1919 or 1920, is a spiral cut out of paper which hangs from the ceiling and expands and contracts in an unpredictable way as it rotates. This work was used in the preparation of Man Ray's film, *Le retour à la raison*, which dates from 1924. It was recreated in an aluminium version in 1954. Man Ray's *Object of Obstruction* (1920) is also interesting in this connection. It consisted of a series of clothes-hooks suspended in the same way as a mobile. There seems little doubt that these *ready-mades* and mobiles of Man Ray had an influence on Calder and the various other artists who were to explore this field in the 30s.

Apart from the isolated case of Giacometti's *La Boule suspendue* of 1931, which incorporates a kind of sensual movement, we may say that the mobile received its official consecration in 1932. This was the year of two Calder exhibitions – at the Galerie Vignon, Paris, and the Julien Lévy Gallery, New York. Marcel Duchamp seems to have invented the term 'mobile' specifically to describe the moving constructions by Calder which were included in these two exhibitions. The works in question were in fact propelled by small electric motors or tiny handles. But Calder was to construct his first air-propelled works very shortly afterwards. There is still some ambiguity about the term 'mobile', but it seems to be generally agreed that it can only be applied nowadays to the second category, that of constructions which move as a result of natural forces and, in particular, currents of air.

Duchamp compared Calder's first mobiles to trees in the wind. Calder's son-in-



75 Man Ray
Shade, 1920. Mobile



law, Davidson, has cited a literary source, 'Edgar Allan Poe's mobile - King Pest'. There is also J. J. Sweeney's suggestion that Calder may have been influenced by the Chinese windbells which he would have seen during his childhood in San Francisco. Besides these rather diverse points of contact, there is the obvious influence of some contemporary artists - Mondrian in particular, and also Arp and Miro, whose Dada attitudes are reflected in the sheer playfulness of Calder's work.

But there is more to Calder than mere playfulness. His fundamental aim is to express movement in terms of movement itself, and to avoid at all costs the problems of imitation. 'Most of the time,' Sartre writes, 'he is not imitating anything. I know of no art that is less mendacious than his. Sculpture suggests movement, painting suggests depth and light. Calder suggests nothing: he captures real live movements and shapes them for his purposes. His mobiles do not signify anything, or refer to anything, outside themselves. They are - and that is all there is to say. They are absolutes.' Here Sartre is sketching the new musical and natural vocabulary which Calder created through his distinctive interpretation of mobility. 'In a word, although Calder has not made any attempt to imitate - since his only intention is to create scales and accords of movement which are not yet known - his works are at once lyrical inventions, technical - almost mathematical - assemblages, and accessible symbols for Nature, that huge vague Nature which scatters pollen in all directions and abruptly brings about the flight of a thousand butterflies, about whom we never

know if she is a blind succession of causes and effects or the timid, constantly retarded, deranged and impeded development of an Idea.'

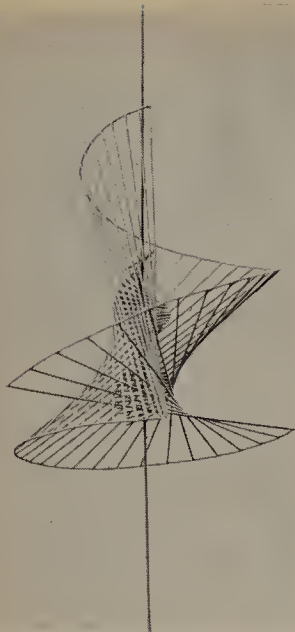
Calder's mobiles fall into two main groups: object-mobiles on supports and suspended mobiles. The first come in all shapes and sizes, from large constructions whose elements zigzag from the end of metal stalks – themselves held in equilibrium on the top of tripods – to small mobiles which hang from long curved strips or stand away from their slight supports like the precious foliage of ornamental plants. The original suspended mobiles were made from bottle-necks, glittering fragments of coloured glass and small wooden objects which hung from flails on the end of long threads. More recent examples are built up from cut-out sheets in black, red and white, which spin round in response to the slightest breath. Horizontal blades spread out next to vertical formations which suggest curtains or fans. Sometimes the dominant impression is of falling, or hanging like bunches of fruit: sometimes the horizontal elements are like branches, which 'scatter through space their twenty-one white leaves'.

Through his happy and playful approach to the use of forms and materials, Calder has – a little in spite of himself – opened the way to kinetic statements of a more scientific kind. He has initiated a line of research which leads in one respect to the opening up of space and the cosmos, and in another way to the development of a new aesthetic which involves the eclipse of the creator and the confrontation of the spectator and the living work of art. Yet we must remember Jean Cassou's remark that Calder's art remains on the level of an extremely individual poetry. Calder's poetry encompasses joyful and playful elements, but does not exclude mechanical ingenuity. And, as Cassou puts it, there is 'seriousness in this joy'.

● **Munari's *Macchine inutili* – Lynn Chadwick, Kenneth Martin**

As early as 1933, Munari was making mobiles which he referred to as 'Useless machines' (*Macchine inutili*). These were compositions of silk thread which could be set in movement by the slightest breath. They were designed to cover a complete circle and rigorously followed the fixed dimensions of the implied sphere. Unlike the works of Calder, they were always modelled on a single base element, which was repeated, though in different proportions, throughout the other elements. Munari's passionate interest in movement has survived up to the present day. But he has abandoned these suspended mobiles, and now concentrates on the use of virtual movement with active spectator participation. He is also investigating the movement of polarized light.

Two English sculptors – Lynn Chadwick and Kenneth Martin – stand out among the artists who have concentrated upon the production of mobiles at some stage in their careers. It was around 1947 that Lynn Chadwick, who had already carried out experiments with different materials on varying scales, constructed a series of wire mobiles which clearly owed something to Calder's supported mobiles as well as to the structures of Gonzalez. Chadwick developed two particular types of mobile, the first being characterized by the fact that they gave no impression of floating or flying. They were held in a strange equilibrium, half supported by the air. Abstract forms, kept stable by the base, set up a



77 Kenneth Martin
Screw mobile, 1956

sinuous, intertwining movement. Chadwick's second group of mobiles were suspended from threads or cords and had far more freedom of movement. Their ceaseless arabesques illustrate the truth of the artist's statement that this art is not derived from sculpture, which rejects space, but from 'the borders of space and the constructions which hedge it in'.

Chadwick's most important mobile works were completed in 1950-1. His *Fish eater*, a construction of iron and copper, has been compared to a vertical torpedo resting on three iron legs and supporting a pivoting iron cage: also to an insect whose antennae are composed of iron grilles, and finally to the 'wishbone' of a gigantic bird's skeleton, with its basic structure coloured bright purple. Besides this central composition, there are delicate mobile discs, stalks, metal threads, wooden balls and cut-out fish forms in copper. Sound effects from the mingling of the various elements often accompany the purely kinetic effects.

Since 1952 Chadwick has begun to feel the limitations of this method of expression. He would hold that the imagination is not just canalized but actually threatened by the inherent restrictions of movement itself. Since that date he has continued his work as a sculptor along more traditional lines, making some use of surrealist imagery but abandoning the techniques of real movement.

Kenneth Martin sees the problem of movement in terms of a search for infinity through calculation. He considers that the evolution of movement and form in the plastic arts is the result of kinetic principles which relate intimately to life and sensation. His chief aim is to provide a definition of space, which has traditionally been expressed through elements appealing to the spectator's emotions, uniquely in terms of the oscillation of objects. These oscillations, which manifest themselves in rhythms that can be defined mathematically, correspond at the same time to the calculable rhythms of life itself. 'Oscillation' and 'spiral' are the two words which lend themselves best to the description of movement in Kenneth Martin's work.

It is clear that Martin's experience in architectural techniques and his research into the juxtaposition of materials have had an important influence on his mobiles and metallic sculptures. He gives his mobiles individuality by the use of fragments of aluminium, tin, iron, sheets of asbestos and other materials which reflect light and colour. These mobiles can be divided into three main groups: reflecting mobiles, ring mobiles and screw mobiles. The first group is characterized by a calm horizontal movement, which enhances the spectator's sense of space, and in particular leads him to consider his position in the room in relation to the plane of the ceiling. Martin often accentuates the circular and elliptical movements of this group of mobiles by careful use of chromatic components. Thus his *Mobile reflection* (1956) is painted black, white, red and cream, although the basic materials are aluminium and steel. Martin's second group, the ring mobiles, consist of oval or figure-of-eight components which describe a horizontal circular movement. Finally there are the screw mobiles, which follow a relatively simple pattern of movement but are enlivened by a complex accompaniment of apparent movements. The combined effect of the changing contours, the encircling lines and the shadows cast on to adjacent walls is to introduce limitless variation into a simple kinetic theme. This is where Kenneth Martin achieves the most satisfactory marriage between the two principles of movement and concen-

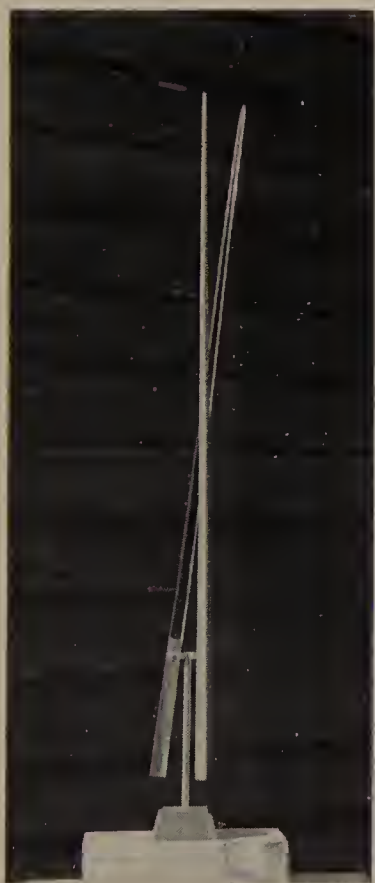
tration which are at the base of his art.

Martin has recently succeeded in combining the principle of the screw form with that of the unpredictable variation of speeds. This achievement required a large degree of precision in the construction of the separate elements, and a mathematical exactitude in the way in which they were assembled. It would be fair to say that his most successful mobiles are almost always derived from mathematical principles which can be sustained on a theoretical level quite apart from their success in practice.

The starting point of Kenneth Martin's kinetic research is the simple form – the cross or the spiral. From this basis he is able to explore the latent possibilities which are brought out by the use of movement. The principle applies to his large projects as well as to the works which have already been discussed. He has completed a fountain at the L.C.C. Day College, Brixton, which required close collaboration with the architect Bernard Lemaire and an engineering consultant. This consists of stainless steel tubes which allow the water to spout in precisely calculated and controlled jets. Martin's own interest in the scheme was, however, directly linked to his other investigations. He accepted the challenge of applying hydrodynamics (and thus a non-linear mechanics) to the exploration of water as a plastic medium, and he succeeded in creating a pure form.

The Brazilian Marie Vieyra, who began to work on mobile sculpture in 1949, has similar preoccupations. After her move to Europe in 1951 she continued to explore the different possibilities of using movement in conjunction with abstract sculptural forms. Mention must also be made in this connection of the Swiss sculptor, Walter Linck, who has made use of vibrating springs in several of his works.

78 George Rickey
Two lines up, 1964



● Rickey, Vardanega, Le Parc, Yvaral, Stein, Morellet

George W. Rickey, the American sculptor and theorist of kinetic art, explores the subtle possibilities of movement prolonged into space. His stainless steel mobiles generally consist of two or more elements pivoting upon common joints. Their titles – *Two lines up*, *Six horizontal lines* etc. – already tell us something about the objectives of Rickey's methodical research into free movement. A visitor to a German exhibition which was dominated by three of these sculptures has described how 'visitors often stopped to watch the scintillating blades performing slow and graceful movements against the deep blue of the sky. The monotonous rumbling – in German – of the opening speeches seemed pedestrian and trivial in comparison with the timeless quality of this tranquil celestial writing.'

Rickey's method of construction is almost scientific. A long period of experimentation precedes the final work of assemblage. He himself emphasizes: 'When you construct an object in movement, you are always surprised by the movement itself: however well worked out the design may be, the movement seems to come from somewhere else.' Rickey does not think it necessary to use a wide variety of types of movement. He is content to make his sculptures pitch and roll like boats. But he concedes that it is possible to establish a theoretical classification which includes, at the most, six or eight types of movement – all of these being

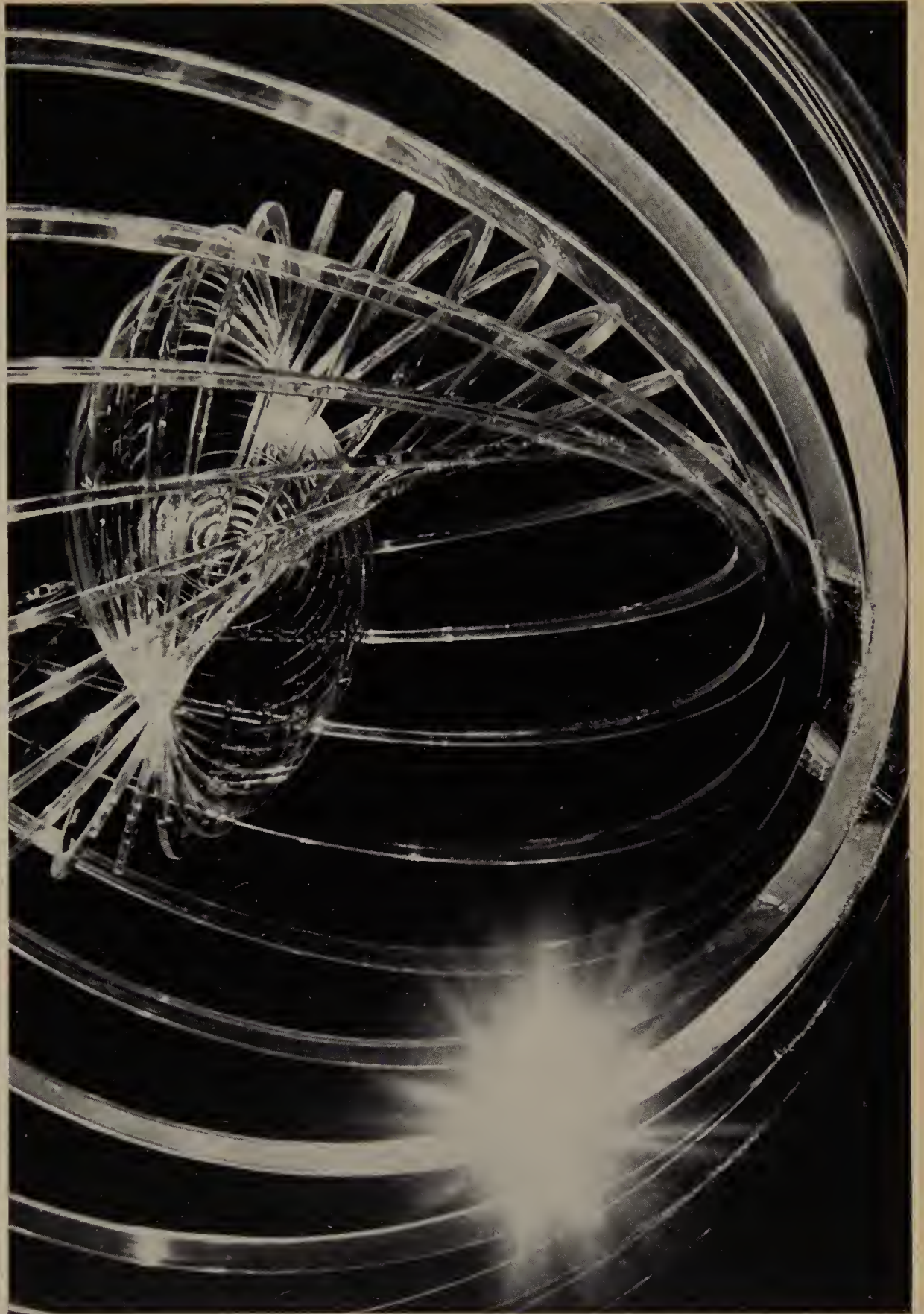
taken from aerial navigation and relating in his view to the concepts of maritime navigation.

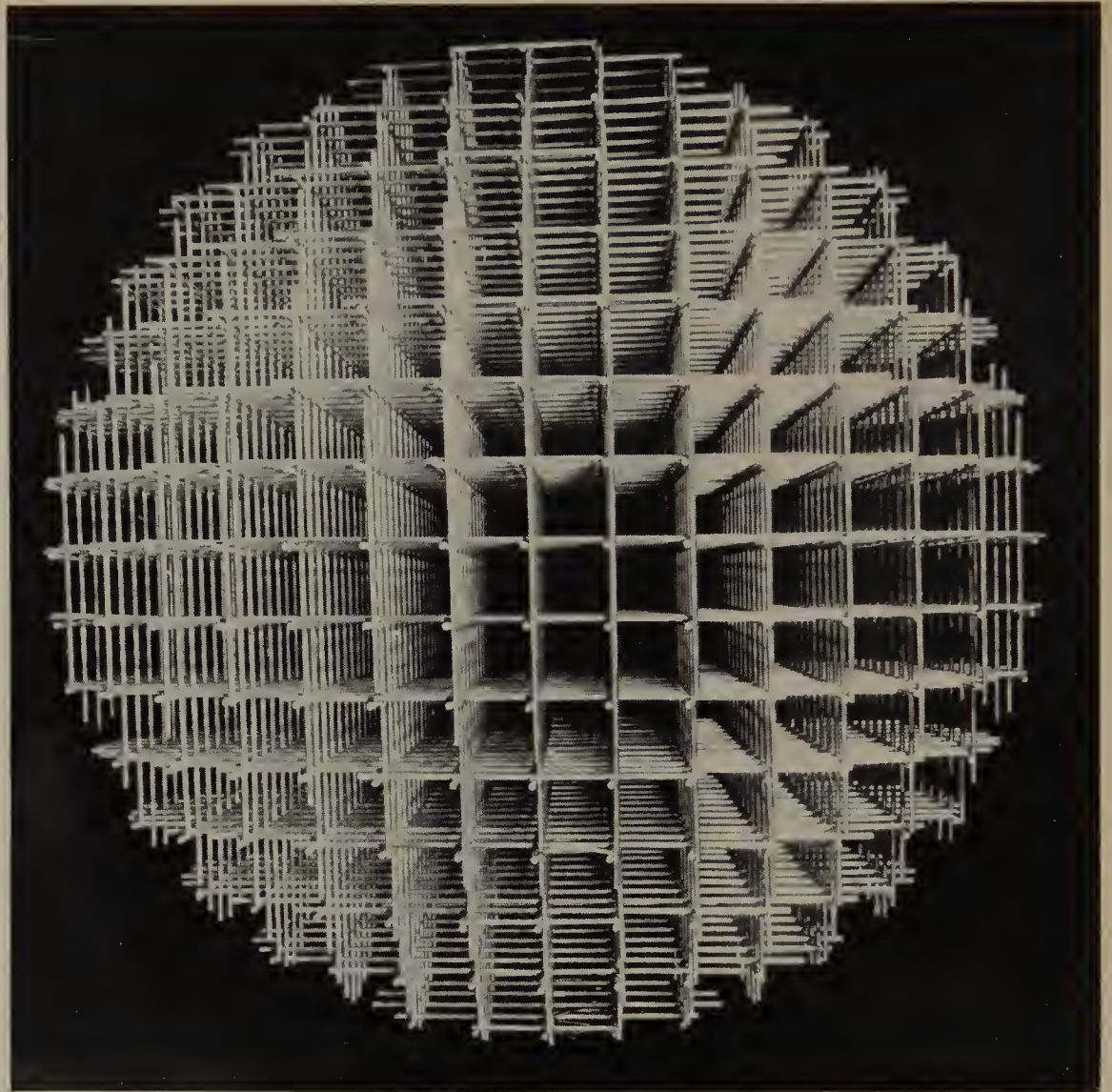
Since Rodchenko, wood has often been used in the construction of suspended mobiles. Transparent Perspex gained equal popularity between the wars with Moholy-Nagy and Vantongerloo, and since 1944 it has acquired almost universal favour among the artists of the South American school. From this date, members of the *Invention*, *Arturo* and *Madi* groups – directed by Arden Quin, Rothfuss and Kosice – began to create perspex constructions with mobile elements, in a style that owed much to Vantongerloo. At a later stage, Gregorio Vardanega, who belongs to this school although his birthplace was Italy, started to combine the indeterminate movement of suspended forms with the inherent movement of the spiral in a series of perspex mobiles. This was a particularly successful combination, which produced an unusual range of light effects.

Vardanega had in fact been working since 1946 on the superimposition of sheets of glass or perspex, and he had completed a series of ‘half-spheres’ and structures of tightened thread. He had tried to come to terms at this early stage with the problems of transparent colour – space-colour and colour-light. By 1956 he had arrived at a fully integrated work which fulfilled many of his criteria. It involved a constant variation of aesthetic effects, brought about by a mechanical arrangement of celluloid ribbons which supplied the motion. In the same year Vardanega also constructed a *Univers électronique*, which allowed for the spectator to intervene and change the colour of the interior space. Four years later he went on to make a number of Perspex spheres containing other smaller spheres, which were illuminated by turning projections of coloured light. The final stage in this development was his group of *Spirals*, which he described as ‘mobiles which utilize different circular structures in symmetrical and asymmetrical displacement *ad infinitum*’. Vardanega’s interest in the various types of natural and artificial light caused him to make a number of further investigations which will be reviewed in the course of the next chapter.

The aluminium works of Le Parc have no aesthetic pretensions. Like the mobiles of other members of the Groupe de Recherche d’Art Visuel, they are not designed to show off the artist’s individual creativity. They are designed purely as a means of provoking the spectator to action. And even when they are not necessarily meant to be altered or set in motion by the spectator himself, it is this direct relationship between the operation of the work and the physiological reaction of the spectator that counts.

Yet this does not mean to say that the spectator will fail to be delighted by the delicate interference effects created by black lines and translucent materials in one of Yvaral’s mobile cubes, or that he will miss the spatial subtleties of the white balls suspended in front of reflecting polyhedrons which Stein has designed. A large work by Le Parc – such as the *Continuel-lumière* of 1962 which was included in the 1964 Nouvelle Tendance exhibition at the Musée des Arts Décoratifs, Paris – gives rise almost inevitably to aesthetic considerations. Yet the description of this particular work which appeared in the exhibition catalogue was clearly intended to take all mystery out of it, and leave the spectator without any preconceptions. ‘Suspended over a matt white panel, a number of small sheets of polished aluminium. These sheets receive the light of a projector which





sets up – through reflection and projection – a movement of luminous images.’ ‘Research into movement, light, contingencies outside the work and the activation of the spectator.’

The *sphères-trames* of aluminium tubes by François Morellet, another member of the group, also belong to this line of research in which the mobile plays an important part. These works are particularly interesting, because of their size – some are over 6ft in diameter – because of the variety of the possible combinations which they offer through the suspended movement, and because of the real ambiguity between artistic and pedagogic intentions.

A number of other artists have produced mobiles at various stages in their careers. The works of the German sculptor Kricke, though traditional in conception, have sometimes comprised mobile elements. The Belgian sculptor, Anthoons, completed a series of suspended works in aluminium which were painted over and could be folded into different shapes. The Brazilian Lygia Clark has used the same folding principle for her own aluminium constructions, which are often suspended and so gain an additional range of movements.

Jean Peyrissac has been working since 1939 on the problem of spatial rhythms. He tends to compare his procedure as an artist with that of the musician, and he also makes use of analogies from pantomime and the movements of Nature. 'In their mutual relationships,' he claims, 'forms in movement are so many melodies which crowd on top of one another and dovetail with one another, as if their relationships were prescribed by an orchestral score. However, everything hinges upon the question of relationships . . . and it is these that are the connecting factor. The real difficulty is one of getting the whole into a satisfactory shape, or ensuring the continuity of the melody. A design in Time . . . Our desire to put the stamp of movement upon a three-dimensional form is a justification for abstraction. In this game, abstraction is a unique language, the one which allows the form full freedom of expression . . . and yet I am not at all sure that a form which has plastic pretensions, and is conceived for a precise role, bears any relation to the abstract, since these movements in fact reveal to us through their variety intimate correspondences which we find again in the gestures of Nature herself.'

The final division of this category of unpredictable mobile works consists of a number of unusual works which make use of elements of nature such as fire and water, chemical forces etc. Marta Pan, a Hungarian artist living in Paris, uses the motive power of water to animate some of her sculptures, which are usually constructed of wood or other light materials. These hinged sculptures are usually quite bulky and are liable to adopt patterns of movement which recall physical or physiological events. They harmonize extremely well with the natural world, as can be seen in the case of *Teck*, a sculpture which floats and propels itself over the water on a lake in the grounds of the Kröller-Müller Museum, at Otterlo near Arnheim.

Richard Lippold, the American sculptor, is the author of a *Fire and water fountain* at Akron, Ohio, and of the *Expanding Universe* in the Sterling Forest Garden, New York. He also devised the monumental mobile, *Orpheus and Apollo* (1962), for the Lincoln Centre. Lippold's important body of works does in fact border at several points on the field of kinetic art. As early as 1942 he was constructing mobiles made from metal thread, which he exhibited at the Willard Gallery, New York. In 1948 he began a series of sculptures composed of metal thread, tubes and, occasionally, small laminated bars. These were illuminated more and more brightly towards the centre, and gave the impression of radiating light.

● Yves Klein, Aubertin – Pyrotechnics

Yves Klein, whose death at the age of thirty-two cut short an artistic career that was remarkable for its visionary quality, foresaw numerous possibilities of utilizing water and fire as the motive forces in artistic projects. It is probably his example which inspired Otto Piene to compose a number of 'fire pictures' which involve the display of smoke and other effects of combustion.

B. Aubertin has performed some particularly interesting experiments with fire. He uses matches dotted over a rectangular or disc-shaped matrix to create pyrotechnical or, as he himself refers to them, 'pyromaniaques' spectacles. The

performance falls naturally into a number of different phases: the actual lighting, the course of the fire through the rows of matches, and the aftermath of the fire – at which stage the still incandescent matches gradually die down and finally snuff out. Sometimes Aubertin rotates the discs while this performance is taking place, which provides an interesting mixture of predictable mechanical movement and the unpredictable movement of the fire as it darts along the rows of matches. Of course this display of lines and sheets of fire passing from the stage of incandescence to calcination is accompanied by sounds of hissing and crackling. Aubertin is therefore justified in thinking in terms of a performance which appeals to more than one of the senses.

Aubertin has also constructed *Reliefs de feu*, which consist of charred balls of cork, and what he calls *Cages rouges de fumée*, in which the display is provided by smoke machines operating within the cages and points of light working in conjunction with the smoke are used to give the performance some shape. Chance clearly plays an important role in this process. Apart from the obvious influence of Yves Klein, Aubertin seems to owe something to the work of P. Manzoni, another visionary artist who died young. Manzoni had invented pneumatic sculpture in 1959.

● Metzger : auto-destructive art – Medalla, Haacke

Gustav Metzger, the pioneer of 'auto-destructive' art, uses hydrochloric acid rather than fire as his medium. He paints with the acid upon nylon cloth. When he gave the first demonstrations of auto-destructive art, the kinetic element in his work was still secondary. His performances were conceived more in terms of pacifist and social protest. But Metzger's continued interest in new areas of scientific knowledge has brought him closer to the concerns of the kinetic artist. As a result, he has added the concept of 'auto-creative' art to that of auto-destruction. He holds that: 'A belief in the molecular theory and similar beliefs, whether they can be defined or not, shared with the scientist or not, can best be expressed through works of art which transform their materials. Auto-destructive and auto-creative art are varieties of this.'

Metzger is anxious to get closer to the processes of nature by associating matter and time. He therefore needs to know a great deal about these two notions. He also specifies the use of the most advanced techniques in art and, in his view, this makes the use of destruction inevitable. Throughout his research, he finds movement an essential tool in providing solutions to the various problems which he encounters. And he is a champion of the aleatory principle, accepting the element of unpredictability in the work of art without reservations, just as he accepts it in the universe.

The various stages which a work by Metzger passes through present an interesting parallel to those of the mobile. The process begins with the initial impetus of the artist. But the movement which he sets in operation immediately becomes autonomous and therefore unpredictable. 'At a certain moment,' as Metzger puts it, 'the work takes the initiative and launches into an action which is beyond the control of the artist. It rises to a power, a grace, a living force and a transcendence which the artist *cannot attain*, except through aleatory activity.' Theory

has preceded practice by at least a decade in auto-destructive art. But its place in the evolution of modern art is now assured. As far as the kinetic artist is concerned, there is no doubt that auto-destructive and auto-creative activity have enlarged his scheme of social and aesthetic reference, as well as helping considerably towards the objectivization of the element of movement in art.

The Gutai, a Japanese group under the direction of Jiro Yoshihara, is investigating aesthetic problems which appear at first sight to be bound up with the destruction of materials. The dancers of the group pass through screens of paper, whose torn fragments suggest jasmine blossoms as they fall back into place. The interplay of the dancers and the movement of the paper combine to form an unpredictable kinetic spectacle.

The 'bubble machines' of David Medalla, a Philippine artist and poet who lives in England, are boxes filled with a chemical liquid which produces – in response to a low electric current – masses of tiny bubbles. These bubbles form slowly expanding columns which issue out of the boxes and spread along the outside surfaces. Medalla's principal aim is to illustrate the principle of aleatory growth, but his *Cloud Canyons*, which may seem at first sight to be no more than naive games, contain a very personal poetic message. They are a baroque expression which is in many ways typical of the younger generation. And Metzger has claimed for them that 'Medalla has shown incontrovertibly that the aleatory activity in art which transforms materials can take on very complex forms and movements. But it can also aspire to a higher aesthetic content'.

Hans Haacke has found a great number of possibilities for kinetic expression in the complex interaction of air and water – or other liquids, coloured or colourless. He requires the spectator to intervene in the operation of the work, which is in fact something that responds to its environment, existing in time rather than in the timeless world of the traditional work of art. In effect, he is attempting to articulate natural objects and natural forces: one of his most striking works is a group of white feathers set into dancing motion.



81 Hans Haacke
Wave I, 1964, 140 cm. x 20 cm.



7 Light and movement



82 Bainbridge Bishop
Colour organ, c. 1880

The majority of kinetic works composed on plane surfaces bring white or coloured light into play. We may therefore assign them in general to the field of 'luminous movement', or more precisely to the aesthetic grouping of 'light and movement'. There are three principal sources for this group of works: what were known as 'colour organs', the early history of photography and the cinema, and finally theatrical projections. It was in fact the convergence of these three lines of research which gave rise – originally in the 1920s and for a second time around 1950 – to an entirely distinct art of moving light.

● The 'ocular harpsichord' of Father Castel – The 'pyrophone' of Kastner – Scriabin's light keyboard

The colour organ dates back to the eighteenth century. It was probably the Jesuit mathematician Louis-Bertrand Castel (1688–1757) who constructed the first model. Castel's organ was devised in such a way that the keys, as well as operating hammers to make the strings vibrate, regulated the appearance of transparent coloured bands. These bands were probably intended to have light sources behind them.

'What stranger enterprise could be imagined in the whole field of art,' wrote Castel on one occasion, 'than to make *sound visible*, to make available to the eyes those many pleasures which Music affords to the ears?' Again he writes on the question of comparisons between light and sound: 'Two years ago I read the *Misurgie* (of Father Kircher). It was somewhere there that I came across the idea that, if at a fine concert we were able to see how the air is disturbed by all the different tremors aroused by voices and instruments, we should discover to our astonishment a sprinkling of the most vivid and well-assorted colours. That is what I would call a 'seed of discovery'... The modification of light gives us *colours*, and that of sound *Tones*: the mixture of colours makes *painting*, that of tones *Music*.'

Father Castel saw himself as a philosopher rather than a craftsman. But the chief dividend of his system was to be an aesthetic one: 'to give the colours, irrespective of their harmonic order, a kind of intensified quality of liveliness and lightness which they inevitably lack upon a canvas without life or motion.' He aimed to go beyond the chance effect and adapt 'pieces of music' to his instrument. He would then fix the sounds upon canvas, tapestry, slabs of marble,

or pieces of marbled paper. But this use was to be strictly 'for the ignorant', and the knowledgeable could expect greater rewards. 'This harpsichord is, if I may say so, a real education for painters, who can use it to find out all the secrets of colour combinations. . . a *music without sound*.'

There is general agreement that Father Castel's experiments with candles, mirrors and transparent coloured papers are of considerable interest. His theoretical grounding may have been inadequate, but his attitude to the theories of analogy between sound and colour grew more and more scientific. In fact we can claim with justice that he was working towards a new art of light.

The first half of the nineteenth century was to see the development of other instruments and theories, but there were no lasting results. Jameson suggested a system of notation for the new art. His own instrument consisted mainly of glass receptacles containing liquids of various colours, which acted as filters for light projections on to a wall covered with reflecting metal plates.

A very unusual invention was the 'pyrophone' of Frederic Kastner. This was a sort of gas organ, which gave out sounds comparable to the human voice, the piano, and even the full orchestra. Although Kastner placed his main emphasis on the union between music and science, it was the visual and plastic value of the spectacle that attracted the most notice. The same inventor subsequently created a curious 'singing lamp', which extended the visual aspects of his previous work by means of an electric lighting device. It was 'a sort of pyrophone with thirteen branches, all decorated with foliage and furnished with burners containing several gas jets, which opened into crystal tubes. These burners were brought into play electrically, through an invisible wire that connected to a keyboard in a neighbouring room or street – or indeed another part of the town.'

In America, around 1880, Bainbridge Bishop constructed an instrument which formed part of an organ and projected combinations of colour upon a small screen. Bishop was under the influence of the work of Chevreul and Field, and was apparently aiming for a kind of simultaneity between music and his projections. He first of all used daylight for the latter, but then switched to an electric arc.

At the end of the nineteenth century, several works on the subject of colour music were published. Alexander Wallace Rimington (1854–1918) gave public displays of the colour organ which he had constructed, and published *Colour Music, the art of mobile colour* in 1911.

This was also the year in which Scriabin's *Poem of Fire (Prometheus)* received its first performance at Moscow. The Russian composer had taken the remarkable step of introducing a 'light keyboard' or 'Tastiera per luce' into his score, so that the various modulations of his symphonic poem could be accompanied by changing nuances of colour. Scriabin held that each mode corresponded to a particular shade of colour, and each modulation to a nuance of this shade. Changes from the major into the minor could therefore be underlined by strong contrasts, on a visual as well as a chromatic level. This was one of the most important aspects of Scriabin's research into new areas of expression. His imagination had been stimulated by theosophical reading, and he dreamed of lighting up the whole of the concert hall to fit the music which was being played at the time. But in practice the performances of *Prometheus* which took place at the Carnegie Hall, New York, and the Bolshoi Theatre, Moscow, did



83 Frederic Kastner
The 'Pyrophone', 1869–73

not live up to his ambitions. The projections depended entirely on a small screen which was placed behind the orchestra, and they made very little impression on the audience.

Scriabin's last work, *The Mystery*, which remained incomplete at the time of his premature death in 1915, was to furnish a much more impressive demonstration of correspondences between the arts and the senses. It was to comprise musical, choreographic and dramatic elements, supplemented by grandiose chromatic light effects and perfumes released in profusion. Yet Scriabin was unable to complete the project for several precise reasons. There were considerable technical difficulties – for example, the lack of facilities for continuous movement in the projections. And there were also the theoretical problems which Scriabin created by adhering to the old-fashioned notion of a strict correspondence between the elements of colour and sound.

● Cinematographic projections – Survage, Eggeling, Richter, Léger

Between the years 1912 and 1914 Leopold Survage perfected his *Rythmes colorés pour le cinéma*. Maximilien Gauthier has described the process in the following terms: 'In 1912 Survage brought his project for a cinematographic film to completion. Five maquettes for this work are in the collection of the Museum of Modern Art, New York. It consisted of a succession of coloured rhythms, each of which formed a chromatic symphony in which metamorphosis of light played the same role as variation of sound in a musical composition. A number of similar films followed, but in 1914, when Gaumont were planning to realize them, the war put a stop to their plans. Survage still deserves the credit for being the first artist to reach the conclusion that the spectacle of a cadenced development of lines and volumes – associated with colours that were themselves arranged in a free yet balanced orchestration – possessed the same power to move us as the auditory properties of a musical work.'

Apollinaire identified the source of this art in pyrotechnics, fountains, illuminated signs, and 'those fairy-like palaces in every exhibition which accustom our eyes to the enjoyment of kaleidoscopic shifts in nuance'. 'So we shall have an art which is outside static painting, outside cinematographic representation, which we shall not take long to get used to – which will have its own admirers particularly skilled in responding to movement of colours, mutual penetration of colours, brusque and leisurely transformations, reconciliations and antipathies.'

We have already mentioned the art of the cinema proper, which is directly relevant to the course of audio-visual research. After taking into account the role played by the camera in the analysis of movement and the incorporation of stroboscopic views into the plastic arts, we must now turn to the experiments with abstract film which revealed and isolated movement as an essential element in plastic expression. The new element which arose in these experiments was the problem of dividing movement into its component parts and then recomposing it by means of the eye, taking account of three important kinetic factors: the direction to follow, the time or speed to be used, and the sequence of images to be determined. 'The *connection* by superimposition of *movements* which are morphologically analogous,' writes Etienne Souriau, 'was first used as a major

stylistic and syntactic procedure (in *Le Congrès s'amuse*). And many of these connections recalled the movements of choreography or those of everyday life (the legs of ballerinas, marching soldiers etc.). This fact alone suggests that there is an analytic interest in relating the stylized movements of the dance to that vast gamut of spontaneous, human, animal or cosmic forms of movement which the art of film takes as its universal datum.' 'The presence of music in the art of the cinema,' he adds, 'confers on it as a whole a secret choreographic character. Running and jumping, walking, going down stairs remain themselves *in the studio*, but *in the film* they acquire this choreographic character, once the musical score has captured them, organized them, underlined their rhythmic contexture and, at the same time, dematerialized them.'

This 'dance of things', which leads to what has been called the abstract art of the cinema, can be suggested by a parody of humanity – as in Chaplin's *Gold Rush* – or by the objects themselves, as in Léger's *Ballet mécanique*. It is this principle that we must use in getting to terms with the influence of movement as it appears in the cinematographic works of Eggeling, Richter, Léger – and indeed Duchamp, Man Ray, Len Lye and McLaren – upon the type of movement which occurs in two-dimensional plastic works.

Miklos Bandi tells us that Eggeling 'was the first to use cinematography to express the rhythmic movement of pure forms.' He 'found a fundamental identity – movement – in the various phases of external life.' Hans Richter brings out the principle that particularly needs to be emphasized. 'On the screen, flight and marching are subject only to the laws of filmic movement... not to the mechanical laws of propulsion... So it is not natural movement which gives expression to the objects in a film, but artistic movement – that is to say, an autonomous rhythmic movement whose variations and pulsations form part of an artistic plan.' We should remember that Richter was at the same time a painter and a man of the cinema. In his scroll-paintings, which recall the hieroglyphic rolls of the Egyptians and the *emaki* of the Japanese, he attempted the same 'spiritual analysis of the problem of space and time' as in his abstract films.

The fact that Richter used the term 'rhythm' as a title for his first abstract films testifies to the important place which this term occupied in his programme. He has written of two of these early films, *Rythmus 21* and *Rythmus 23*: 'I consider the film to be a part of modern art, a visual art before all else. There are certain problems and sensations which are wholly appropriate to painting and others which are the exclusive concern of film. But there are also problems which involve a degree of overlap and even interpenetration. Once I supposed that the rectangular form of the screen was given, as a formal element, I could concentrate entirely on the orchestration of time (as on form previously) – and on time alone. The same dynamic principles of kinship in contrast served me here as well. They brought me to a new area of sensation: rhythm, the essential, primordial element in all cinematographic expression. There had to be a final break with the absurd prejudice that problems in the art of our times could only be resolved through oil painting or bronze.'

Léger saw that plastic art and cinematographic art could run parallel in their development towards a new realism. His *Ballet mécanique*, with its innumerable kinetic *trouvailles*, is an apt illustration of this point of view.

To emphasize the importance of relationships between the cinema and works of kinetic art in two and three dimensions, we should return to Len Lye, who started making films in Australia as early as 1921, and experimented with the technique of drawing straight on to the film in the following year. Len Lye's interest in the cinema as an autonomous area of plastic expression led him to *Tusalava*, an animated film which had its first public showing in 1928, and *Colour Box*, which dates from 1935 and must therefore be regarded as the first directly drawn film. We have noted previously that Len Lye finally transferred his attention to three-dimensional works – the *Tangible Motion Sculptures*. But this does not affect the fact that his cinematographic research – like that of Eggeling, Richter, Dziga Vertov, Walter Ruttmann, Henri Chomette (see his *Jeux de reflets et de la vitesse* and *Cinq minutes de cinéma pur*), Marcel Duchamp, Man Ray and many others – played a most important role in the development of the branch of kinetic art which involves the use of screens.

It is interesting to consider the way in which two-dimensional, cinematographic work has been applied to the creation of three-dimensional kinetic objects. For example, Marcel Duchamp's film, *Anemic cinema*, clearly belongs to the same line of research as his *Rotative demi-sphère*. *Anemic cinema*, which dates from 1924, deals with flat shapes in movement passing to the third dimension. Each point in a rotating sphere, to take one example, shifts its position in time as well as space. The third dimension materializes as a result of the chronological dimension – that is to say, the movement creates a *trompe-l'oeil* effect and the moving spirals of *Anemic cinema* give the impression of being in relief. The *Rotative demi-sphère* of 1925, which has a revolving hemispherical spiral at its centre, follows exactly the same principle. Duchamp went on to make further investigations in this direction from 1934 onwards, in his series of *Rotoreliefs*.

● Light and movement in the theatre – Appia, Craig

The work of pioneers in the theatre has had a pronounced effect upon the aesthetic of light and movement in the plastic arts, just as kinetic research in the arts has been reflected in the evolution of theatrical techniques.

A development of particular importance in this connection was the introduction of electric lighting into the theatre, which took place between 1880 and 1885. This immeasurably increased the role of light in underlining the symbolic and dynamic features of the drama. The stage designer and theoretician Appia began to apply in practice the view that drama should be conveyed through a rhythmic organization of space, and that this space should be created through the use of moving light. So, for the first time, theatrical decor was being composed exclusively through light projections.

Edward Gordon Craig held similar views. He intended that the play of light should break up the various angles, and that abstract kinetic techniques – such as moving light controlled through the manipulation of screens – should be utilized in the creation of the decor. Movement played an important part in Craig's theories, as the following extracts from his published works suggest:

'The only true material for the art of the theatre is *light*, and by means of light, *movement*'.

‘The most important thing is that movement, which lies at the base of this art of revelation, should be translated by inanimate forms. Here I am speaking of movement in the real, not the imaginary sense. Impersonal movement, in the strict sense, does not exist at all in modern art; nor can it be said to belong to any other form of art, even in its imaginary sense.’

‘Movement will be there for its own sake, for the sake of perfect harmony, just as in music sound is there for its own sake, and for the sake of perfect harmony. . . The mind and spirit of the artist, passing by way of this instrument, should give rise to successive, transformable and ephemeral forms – which change ceaselessly, and even imperceptibly – which eventually arrive at the precision of their ultimate stage, only to disappear, and then reform again and again, in an infinite progression.’

Experiments and theories of this kind gave rise to a long series of theatrical productions in which movement became an integral factor in the drama, and in fact replaced the traditional succession of scenes. Mobile decors, revolutionary changes in choreography, the veil dances of Loïe Fuller and the *Ballets russes* of Diaghilev – all these in their turn made use of the new principles of light and movement. Rolf de Maré’s Swedish Ballet engaged in similar experiments.

The date 1920 may be seen as a watershed in the history of kinetic art, since it is at this stage that these various investigations into the possibilities of light, movement and colour begin to appear in a single perspective.

● **Wilfred: ‘Lumia’ and the Clavilux – Klein, Baranoff-Rossiné, Hausmann**

Thomas Wilfred, who was born at Nestved in Denmark in 1889 and took up residence in the United States in 1916, completed his first instrument for the production of visual compositions in 1919. The instrument, which involved no element of sound, was called the *Clavilux*. Wilfred chose the title ‘Lumia’ for the new form of art which he had brought into being.

The fact that the element of sound had been abandoned was the decisive feature of this new system. Wilfred had been struck by the divergences in the ways in which Newton and Father Castel treated the distribution of colour in relation to musical sounds. He noted that Newton’s *do* was red and his *fa* green, while Castel labelled the same notes blue and yellow respectively. He was also aware that Goethe had firmly rejected the possibility of a direct comparison between colour and sound, and that the enterprises of Bainbridge Bishop, Alexander Wallace Rimington and Scriabin had all more or less ended in failure. It was with these examples in mind that he turned his attention to an art of light in which sound and music were either completely excluded or admitted as mere accessories.

Although Isadora Duncan’s friend Perrine – an American painter and music teacher – had also made this decisive rejection of all musical allusion, Wilfred was the first to draw the full consequences of the decision. He had originally begun work in May 1905, when his components were no more than a cigar-box, a small incandescent lamp and a few pieces of coloured glass. The next stage came in Paris, where he was able to utilize several wooden boxes, a few glass



84 Thomas Wilfred

Two phases of *Study in black and white* (*Lumia* composition Op. 26) Art Institute of Light. First phase: the principal form emerges from the background, advancing and descending slowly, growing in volume and intensity in proportion to its progression in a curved orbit. Second phase: the principal form has turned towards the left. The secondary group mounts from the bottom and advances diagonally towards the exterior across an arc constituted by the principal form

lenses and a real screen. The Clavilux, which gave its first public recital on 10 January 1922, far exceeded these early experiments in technical sophistication. It consisted of a large 'keyboard with five rows of sliding keys and stops that could be coupled to obtain the colours; a battery of six principal projectors and a certain number of grouped auxiliary reflectors'. When it was permanently installed in a theatre designed specially for the purpose, it was very similar to an organ with its pipes. The large keyboard was set up in a separate room, behind the concert hall, and connected to a series of independent projectors behind the translucent screen. There were thirty-two of these projectors at the Lumia Theatre of New York. Obviously an arrangement of this kind made it easy to install new, and better, instruments when necessary. They could be connected to the keyboard just as new pipes can be added to an organ. In this way, Wilfred was able to keep each Clavilux to a specific pattern, while revising the optical principles of the system to keep pace with contemporary developments.

Lumia was originally conceived as an art of public performance and interpretation. It was only at a later stage that Wilfred began to compose works whose arrangements of colour and light were predetermined in the sense that they obeyed long cycles of controlled movement and metamorphosis. Wilfred referred to this particular departure, which necessarily resulted in a more intimate form of artistic expression, as a method of registering 'compositions that were originally conceived through the technique of the Clavilux and on the scale of the Clavilux'. Over the past forty years he has managed to complete a very large number of works of this kind. One of the most recent, which Wilfred was working on in August 1965, bears the opus number 160.

These planned compositions in the Art of Lumia, which are now to be found in museums and private collections throughout the world, are unique signed works, just like the traditional painting or sculpture. They are designed to continue playing indefinitely, and simply need their electric bulbs replacing after a certain time. Wilfred has told the author in a letter that his works have just the same degree of permanence as stained-glass windows. In both media the fusion of colours across a semi-opaque screen is taken for granted.

One of these individual compositions, which bears the title *City Windows*, reproduces in Wilfred's distinctive manner the impressions which he collected in the course of a walk through New York on an October night. As he himself has explained: 'It begins with a multidirectional weaving of lighted windows, all with cross-shaped bars and reflected from the lower third of the 'first field'. Progressively the windows turn dark blue, as if reflecting a night sky. Gradually the motion is retarded and the intensity decreased until only one tiny yellow-orange frame remains poised high up in a dark field. Very slowly a silhouette of tall buildings emerges, the sky brightens into pale magenta, and the single window suddenly goes dark.'

In *Abstract*, on the other hand, there is no such scheme of reference to the outside world: 'a triple radial solo form moves through an elliptical orbit in the vertical plane of the main sightline, while a contrasting double form moves through a double elliptical orbit in the same plane. The solo form completes thirteen orbital cycles while the accompaniment, the double form, completes six. This ratio of progress creates an intricate visual counterpoint, accentuated by

a complementary colour treatment.'

We can get some idea of the wide variety of ways in which Wilfred uses movement by examining a few more of his works. In *Rhythm in Steel*, the spectator is 'transported' slowly across a 'mobile network of characteristic steel structures'. In *Unfolding*, the artist's aim is induce an exuberant or happy state of mind in the spectator, while in *Convolutex* the forms follow one another rapidly, growing larger and larger, and finally 'submerging' the spectator in an ultimate climax before disappearing. Some of Wilfred's most recent works, such as *Multidimensional* and *Counterpoint in space* have very lengthy cycles. *Aspiration* consists of a theme which undergoes 397 variations: the cycle of screen projections is only complete after 42 hours 14 minutes and 11 seconds.

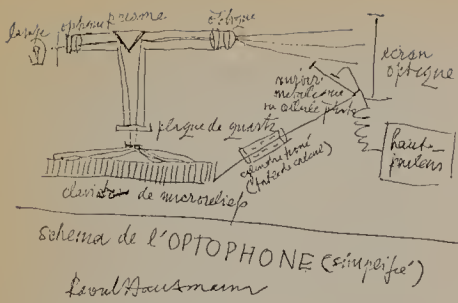
Wilfred's *Lumia suite* (Opus 158), which is permanently installed in the

85 Wladimir Baranoff-Rossiné
Disque optophonique, 1914-26.
Diameter 49 cm.



Museum of Modern Art, New York, has a screen measuring roughly 1.8 by 2.4 m. It involves horizontal, vertical and elliptical movement, and works according to an electronic programme which replaces the original keyboard. The spectator follows its performance in a kind of miniature theatre.

A. B. Klein, whose book *Colour-Music* is the classic account of the subject,



86 Raoul Hausmann
Simplified schema of the 'Optophone',
1927

himself constructed a colour projector for the theatre, which he made use of in his research into the possibilities of coloured light. Klein gave public showings of his projections in 1933 at the Astoria Cinema, London. The pianist Mary Hallock Greenewalt also gave public recitals with an instrument which was arranged to play in unison with an orchestra. This was supposed to have a range of 267 different shades and relied on power of 1500 watts. Another experiment of the same kind, which took place between 1920 and 1925, was that of the Italian Achille Ricciardo, who installed a permanent projector of coloured light in his *Teatro del Colore* at Rome. And Théremin, the composer of 'undulatory ethereal' music, and music with gestural accompaniment, was also interested in simultaneous light projections.

Other experiments from the same period bear a closer relationship to advances in the plastic arts. The Russian painter Wladimir Baranoff-Rossiné gave 'opto-phonics' concerts in Moscow, Berlin and Paris, with an instrument that was intended to project colours with a simultaneous musical accompaniment. The Dada poet Raoul Hausmann invented an 'optophone' with a keyboard in the early 1920s. Finally, Laszlo, whose book on colour music was published in 1925, constructed a 'Sonchromatoscope' in the same year, and proceeded to write *Preludes* for piano and coloured light with the aid of a new system of notation.

● Hartwig, Hirschfeld-Mack, Schwerdtfeger, Pesanek, Fischinger

In Summer 1922, at the Weimar Bauhaus, Joseph Hartwig, Kurt Schwerdtfeger and Ludwig Hirschfeld-Mack were trying out a shadow play which was to be given at a party, when one of the acetylene bulbs had to be replaced. So it was through pure chance that they discovered the phenomenon of doubled shadows on transparent paper. The fact that the acetylene bulbs were of different colours had caused a cold and a warm shadow to appear simultaneously. These three artists immediately got the idea of multiplying the sources of light by as many as six times, and placing coloured pieces of glass in front of them. In this way they laid the basis for what was to be an entirely new method of expression, involving mobile sources of coloured light and moving matrices.

Their work was demonstrated in public for the first time in May and September 1924. It had elements both of the theatre and the cinema. The moving forms acquired a high degree of definition, and, in the case of Hirschfeld-Mack's group, they were accompanied by music – generally played on the piano by Hirschfeld-Mack himself. Apart from the fact that the effects of moving light were not fixed once and for all, but had to be recreated at each performance, the whole spectacle was very similar to that of an abstract film in colour.

Hirschfeld-Mack has left an interesting score for his *Lichtsonate* and *Farbensonatine*, which takes account of the parallel development of music, light and form. This score is chiefly concerned with changes in tempo and movement, but also indicates variations in the lighting system, which depended upon different combinations of lamps.

Kurt Schwerdtfeger created his own *Farblichtspiel* in which coloured rays from mobile light sources shone through aerial forms cut out of cardboard, thus producing staggered projections on the screen. In this process the colours under-

went direct modification as well as being transformed by reflection. Schwerdtger accepted a compromise as far as the artistic aspect of his work was concerned. He was willing to adapt his instrument to both figurative and abstract forms, and did not specify that sound should be included in, or excluded from, his compositions.

During the 1920s the Czech artist, Zdenek Pesanek, was also perfecting a type of colour keyboard. And Oscar Fischinger, a pupil of Walter Ruttmann – the pioneer of abstract cinema –, had completed his *Filmstudien zu Musik* by 1929. Fischinger later invented a system called *Color-Instrument-Play*, which he patented in the United States. This allowed the participant to interpret musical scores on the screen, but required him to design the abstract forms which appeared with his own hands.

● Laboratory research

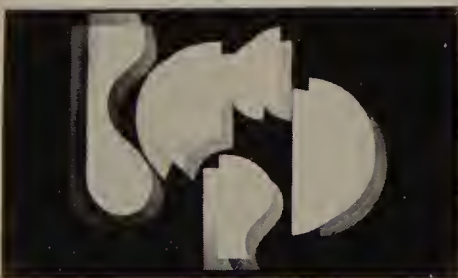
The technical innovations which have been introduced since 1930 have led to a number of more recent experiments in the field which has just been described. E. B. Patterson, a radio engineer, has described an electronic circuit which would 'regulate the sources of coloured light through frequencies and volume of sound in order to coordinate light and colour with the music'. Several inventors and industrial firms have made use of the resources of their laboratories to create instruments which produce large or small displays of colour and light, or more specialised machines such as fountains which are illuminated through electric or electronic circuits. Commercial firms were of course responsible for the large number of light organs which operated in pleasure gardens and cinemas throughout Europe and America in the 1930s.

● Luminous pictures: Palatnik, Malina, Calos, Vardanega, Martha Boto, Albrecht, Healey

It has already been mentioned that Thomas Wilfred, the great pioneer of the art of moving light, used his Clavilux partly as a means of discovering successful patterns of colour and form, which he then applied in compositions on the scale of the traditional easel picture. The Brazilian Abraham Palatnik has been working since 1950 on a series of 'cinechromatic' compositions which are on the same scale as those of Wilfred. These involve projections from within a box on to a frontal screen which is accessible to the spectator. The movement on the screen is generally slow and the large forms which appear are coloured in delicate pastel shades.

Around 1955 the experiments of the American artist and scientist F. J. Malina heralded a remarkable renewal in the art of moving light. Malina had been born in Texas, but spent five years of his youth in Czechoslovakia, where he became aware of his double vocation as artist and aeronautical engineer. His reading of Jules Verne's *Journey to the Moon* may have been important in this connection. Certainly he sees a link between this early experience and the proposal which he made as director of an international committee to establish a scientific laboratory on the moon. This particular project is now well under way.

87 Kurt Schwerdtfeger
Farblichtspiel, c. 1923



Malina's career as a scientist was extremely distinguished. He personally supervised the design, construction and launching of the first successful American high altitude sounding rocket. The launching took place in 1945. Later he directed the programme of research into humid and arid zones undertaken by U.N.E.S.C.O. From 1953, however, his work as an artist began to claim an increasingly large part of his time. Beginning with a series of pastels, frequently charged with scientific symbolism, he soon passed to an exploration of the third dimension. Through reliefs and structures of string, cord, wire and wire lattice, Malina increased his awareness of the possibilities inherent in different materials as well as developing his sense of space. In particular, he made the discovery that transparency could serve as a useful vehicle of expression.

From this stage it was only one step to the use of virtual movement and the moiré effect. In a picture like *Cosmic ray showers*, Malina gives us a study in tension, with the lines of force traced by coloured threads. The next stage in this development is marked by the appearance of artificial light, first of all in collages incorporating wire lattices and later in a picture like *Jazz*, where the lighting becomes intermittent. Malina's technique in *Jazz* was to use thermal interruptors in the electric circuits. Thus certain areas of the picture were illuminated while others became dark, at intervals of one or more seconds. The resultant movement was sufficiently varied to give the spectator an impression of complete unpredictability.

Malina abandoned this technique in favour of an electro-mechanical system involving four elements. This was the 'Lumidyne' system, which combined fixed sources of light, circular elements moved by small motors (the 'rotors'),



88 Frank Malina paints the 'rotors' of *Paths in Space*, 1963 ('Lumidyne' system). The principal composition, painted on the 'stator', is not visible here



89 Nino Calos
Mobile lumineux, 1966

a transparent sheet of perspex (the 'stator'), and finally a translucent screen of the same material. Although Malina has used this system for the majority of his works in light and movement, he has devised another technique – the 'Reflectodyne' – for certain small pictures. The reflectodyne also consists of four elements – a light source, a mobile chromatic disc placed in front of this source, a number of reflecting surfaces and a screen. In addition to these two basic systems, Malina has recently developed a technique of making music an integral part of his pictures. And he has turned to the remarkable properties of polaroid in a series of works which display an inventive use of geometrical form.

The geometrical emphasis of the polaroid works is uncharacteristic of Malina's style as a whole. In general, the forms which occur in his work suggest such natural phenomena as coral, diatoms and micro-photographed crystals, and the rhythms which they follow can be compared to the rhythmic movements of atomic, biological and astronomical models. But this distinction is false in Malina's terms, since he holds that so-called 'abstract' pictures differ from traditional pictures 'only in their subject matter', and that this subject-matter may include 'geometrical shapes,' 'unfamiliar views of objects as seen from aircraft, through microscopes' etc. This attitude is perhaps most clearly substantiated by the large number of works in which he deals with stars, galaxies and other astronomical phenomena. He has written: 'I see the work of artists as an important effort to communicate new visions of the universe as found through scientific research to the community at large. This seems to me to be highly desirable especially in societies where new knowledge is rapidly applied in technology.' Although the movements which Malina incorporates in his works are relatively slow, they symbolise on the plane of human perception the prodigious speeds of the universe.

Luminous kinetic pictures became one of the chief concerns of the Italian artist and poet Nino Calos from 1956 onwards. Calos collaborated with Malina and adopted his distinctive techniques, but his 'Mobiles lumineux' reflect a personal style which is unmistakable. In 1965 he referred to his main sources of inspiration as 'flowers, branches, grasses, fruits, oranges, lemons, shells, algae, coral – and stars'. At the same time he referred to his need for strong colours – 'red, scarlet, orange, yellow, blue, green and turquoise'. But if this statement applies exactly to the pictures which Calos had produced up to 1965, it has been superseded by his more recent work. The series of impressive panels which he exhibited at the Musée d'Art Moderne de la Ville de Paris in Summer 1967 was entirely monochrome, even though its subtle quality of movement was not wholly removed from that of the previous works.

Around 1958, the sculptor Maxime Descombin developed a technique which he called 'relief dynamistique'. This involved pieces of transparent coloured glass which were arranged in relation to chosen architectural features and set up a fascinating interplay of moving forms in response to the shifting conditions of natural light.

In the case of Vardanega, whose works in movement have already been mentioned, pictorial representation derives directly from sculptural discoveries. Since 1961 he has exploited his distinctive conception of space – with its dominant symbol, the spiral – in a series of luminous kinetic works on the scale of the

traditional picture. These so-called 'boxes' (boîtes) involve a whole range of different techniques: superimposition of materials resulting in a moiré effect, and all the combinations and permutations which arise from the diffraction, refraction, interference and reflection of moving light. Often they create a very strong illusion of three-dimensional space.

The word which Vardanega has chosen to describe these works involving light, colour and movement is 'Chromocinétisme'. Martha Boto also classes her work under this general title, and is chiefly concerned with the same aesthetic objectives as Vardanega. Yet she differs from him in concentrating upon such features as rapid movement, circular forms and intense luminous effects. The light source itself is constantly moving in many of her works, and this results in a strong impression of contraction and expansion in the interplay of circles and planes, as well as a tendency for forms to appear and disappear, ranging from intensity to diffusion. The problem of movement as it is conveyed through repetition lay at the centre of the programme of the Nouvelle Tendence. Martha Boto has extended this almost mathematical area of research in many of her recent works. The same could, of course, be said of Vardanega, with the reservation that Martha Boto's investigation leads into the world of reflection whereas that of Vardanega is concerned with the world of transparency.

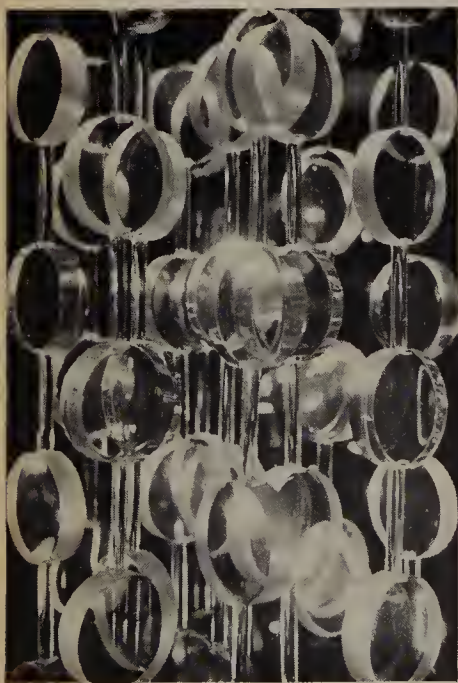
Another member of the Nouvelle Tendence, Garcia-Rossi, has produced a number of extremely subtle works in light and movement which keep to the scale of the traditional picture. One particular example, which was exhibited in 1964-5, consisted of permutations on the word 'movement'. The horizontal rows of letters projected upon the screen were subject to sudden shifts in position, and so assumed a fleeting, immaterial quality.

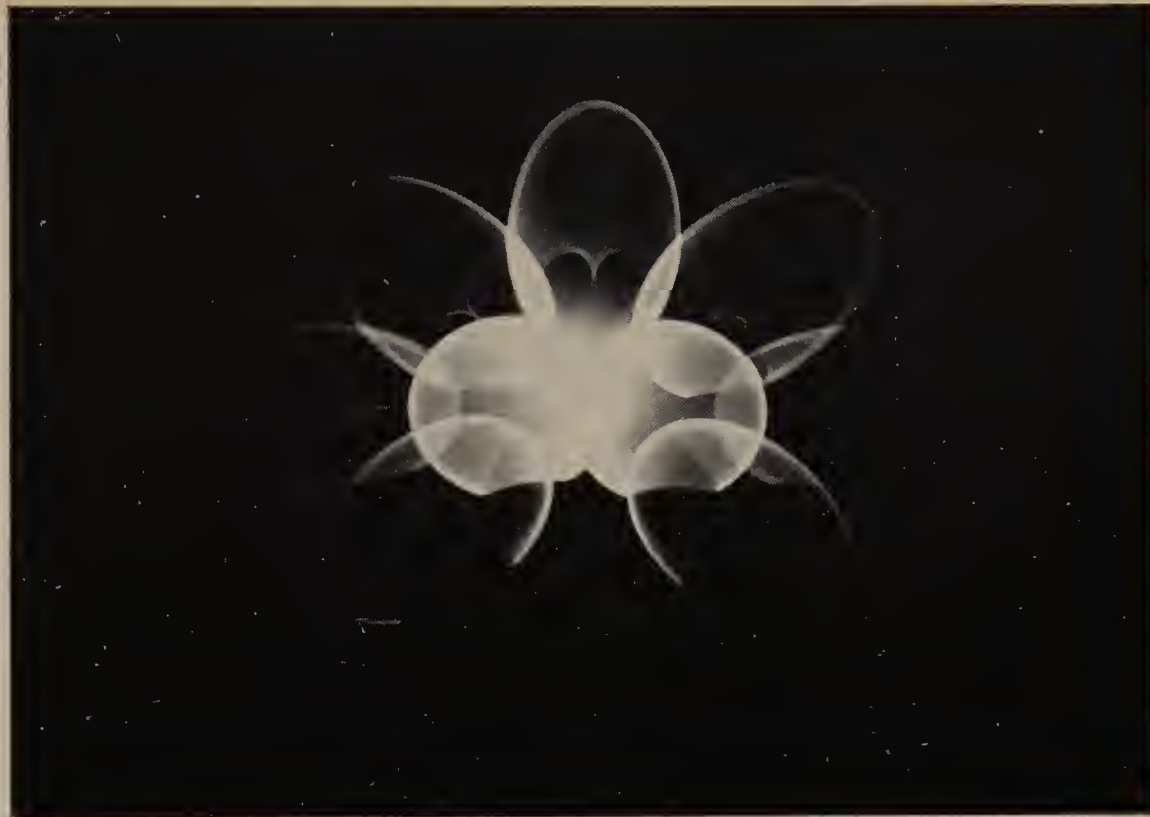
The German artist Siegfried Albrecht has developed his own use of coloured light from an idea which he discovered in Goethe's *Theory of Colours*. His work is freer, but no less poetic, than that of the members of the Nouvelle Tendence. His method is to project, by means of sources of coloured light, patterns of chromatic shadows upon the wall. By placing cut-out letters of the alphabet in between the wall and the light source, he manages to create an interplay of shadows which varies according to the movement of the spectator. Several of Albrecht's works have been in the form of 'boxes' with screens, which relied similarly on sources of white or coloured light producing coloured forms and shadows according to the shape of the objects arranged in between. The continuous movement of these works depends on the use of electro-mechanical motors.

This particular line of research has recently been developed by a number of artists, of whom Dadzu is an interesting example. Dadzu's use of circular forms and soft, subtly assorted colours recalls some of the works of Martha Boto. But he tends to keep to a two-dimensional pattern of movement, working upon the surface of the screen rather than exploring illusory depths.

With the *Luminous pictures* of John Healey, we are on a completely different scale – and perhaps in a completely new artistic field. Unlike the majority of the works which have been discussed previously in this section, Healey's compositions are specifically designed to be exhibited in large spaces. The personal history of Healey is also out of the ordinary. Although he had never at any point

90 Martha Boto
Structure optique, 1962.
90 cm. x 30 cm., detail





received any formal training in art, he began at the age of sixty to invent techniques and design particular works in light and movement. A group of technicians, working under his direction, carries out the actual execution of these works, which requires a period perhaps as long as twelve months and rarely less than two months.

Healey prefers to consider himself as an inventor rather than an artist, but the works which he produces certainly fall within the field under discussion. Some of his projections have been adapted to small-scale boxes, but the most characteristic and the most impressive are those which are used in conjunction with screens of very large dimensions – for instance, 3 m. by 2.4 m. Of course, the fact that Healey's compositions can be projected on to a surface of almost any dimensions places them in a different category from works which are designed specifically for a domestic interior.

● Hoenich: robot-art

The works of the Israeli P. K. Hoenich are also designed for a wider scale. They utilize the forces of sun and wind, and their movement is therefore unpredictable. Rimington had experimented with ways of exploiting the light of the sun in the nineteenth century. Hoenich has studied the statistics relating to hours of sunlight which are kept in the Mount Carmel Observatory at Haifa and devised a rational method of harnessing sunlight to his pictures. He has also studied wind forces, basing his investigations upon the Beaufort scale, and employs both a direct use of wind – with mobile parts of the works reacting to wind pressure – and an indirect use, through wind motors which again act upon these mobile elements.

Hoening uses two basic techniques, which he identifies by the two terms 'robot-picture' and 'robot-painter'. Both make use of the rays of the sun and the movement of the earth, but only the 'robot-painters' rely upon the unpredictable element of the wind. Hoening has described the 'robot-picture' in the following terms: 'you build a number of unmoving two- or three-dimensional projectors, which can be done by a single artist in a relatively short time. The running time of a robot-picture is from solstice to solstice (six months), and the picture is visible by sunshine. The movements in the picture are caused by the movements of the planet Earth.'

Hoening's aim in exploiting the natural forces of sunlight and wind is to give the plastic arts two additional dimensions – the dimension of time, and what we might call the spiritual dimension.

● Spectacles: Schöffer, Darié

In the winter of 1956–7, Nicholas Schöffer made a remarkable discovery while arranging coloured pieces of paper in front of a light source. This simple technique gave rise to a whole range of chromatic lights and shades upon the adjacent wall. Schöffer took this revelation as his point of departure in a series of kinetic experiments which remained, unlike his other works, on a two-dimensional basis. His method was to vary the focus of the projector lens and place multicoloured discs in front of the light source, this being the principle of the 'phantasmagoric' screen projection.

From 1957 onwards, Schöffer referred to this technique as 'lumino-dynamism'. This was also the year in which he gave the first lumino-dynamic spectacle involving both projections and music at Central Station, New York. *Lux I*, a moving sculpture whose coloured shadows were captured on a special screen, entered the collection of the Musée National d'Art Moderne in Paris at the same stage. But Schöffer's most important achievements in the realm of light and movement were yet to come. It was after introducing the concept of 'chronodynamism', or 'structuring of time', into his work in 1960 that he went on to create the *Musiscope*, the spectacle *Formes et Lumières* and the prototype which was to make possible the application of his 'lumino-dynamic' research on an industrial scale.

Schöffer's *Musiscope* was an instrument for the production of 'visual music', which operated by means of an electronic keyboard. In his own words, it was to be 'an instrument which realizes visual music' and 'has a place cut out for it in the concert hall.' 'A complete range of buttons (eventually replaced by keys), grouped together on an electronic keyboard, enable the performer to obtain on the screen – simultaneously or successively – a considerable number of families of images, colours and light effects, and to combine them or vary their degree of definition or intensity. Besides this, there is a rheostat which works upon the respective speeds of rotation of the coloured filters and the sculptural element, allowing the enactment of the images in time to accelerate, slow down or stop completely.'

The spectacle *Formes et Lumières*, which is next to the Cybernetic tower at the Palais des Congrès, Liège, was devised shortly after the *Musiscope* and completed

in 1961. Plastic roller-blinds are lowered over the 1500 square metres of the glass facade of the Palais to form a gigantic screen on which coloured light is projected. This is the central part of an audio-visual spectacle which includes, in addition to the illumination of the Palais, two projectors of coloured light which sweep the town itself, and the illuminated tower. Schöffer's design has an obvious similarity to spectacles of *Son et Lumière* but it remains unique as an attempt to bring out the properties of a modern building through an extended display of abstract forms.

A few technical details of this massive work may be of interest. The total spectacle makes use of 360 projectors, and spotlights of every kind, linked to a complex system of stops, as with an organ. This impressive battery of effects takes part in the actual spectacle, which lasts about twenty minutes. Meanwhile the projections on the huge 'screen' are reflected in the waters of the Meuse, which flows between the spectators and the spectacle itself. The sound comes from stereophonic columns equipped with loud-speakers which are arranged in front of the spectators in such a way that the music gives the impression of emanating from the light and movement on the screen.

Schöffer's designs for lumino-dynamic work on an industrial scale have been put into effect by the scientific laboratories of the Philips Company. His *Mur Lumière* is now on sale by the square metre, while his *Télé-luminoscope* is in mass production. The former, which was exhibited for the first time at the Musée des Arts Décoratifs, Paris, in 1963 as part of the 'Objet' exhibition, comprises one or more 'lumino-dynamic cells' of a standard pattern. These cells, which are not at all bulky, contain elements that are interchangeable and transformable: by modifying the combinations of elements, it is possible to alter the composition of images and colours at will. Although Schöffer generally uses these cells to project images upon an area of one metre square, they are devised in such a way that projections of a much larger area are also possible. And they can also be used in close conjunction with sound effects, since the rhythm and movement of the images can be determined by a magnetic tape which at the same time plays music.

Schöffer's *Télé-luminoscope* is 'an apparatus for making decors of rhythmic movement for television and the cinema'. In 1961, Schöffer arranged a number of broadcasts on and with 'lumino-dynamic variations' for television, followed by another broadcast which involved the 'luminoscope' *Z*. 'In this particular broadcast, the averted profiles of dancers and musicians, varying at the behest of the producer from large-scale, lifelike size to a group silhouette hardly larger than a postage-stamp, revolved upon a background of moving abstract images – or indeed, behind these images or in the middle of them – whilst the figurative image itself, at times soft, sombre or wavering, at other times bright or firm, double or triple as well, was gradually modified in the process and transformed to the extent of becoming abstract in its turn.'

Schöffer has defined his personal aesthetic of light and movement in the following terms: 'Lumino-dynamism is the exploitation of a surface, or fraction of space – of whatever size – involving the development of plastic and dynamic elements – whether coloured or not – through real movement or artificial movement (optical illusion). When it is reflected on a surface, this development goes

hand in hand with an increase of light by comparison with the surrounding milieu, producing a differentiation in energy which is measurable in quantitative terms. If it extends into space, the light penetrates and travels through the spatio- and chrono-dynamic structures, while increasing its luminosity, and in addition gives rise to a supplementary development – both plastic and luminous – on every opaque or translucent surface placed before the sculpture.’

Schöffer has made full use of the new techniques involving light – *video* circuits, light mixers operating with diverse staggered movements, and the cathode tube: he has adopted the techniques of television, believing the cinema to be no more than a prehistoric medium in the contemporary world. Yet the movement which he creates on large or small plane surfaces is directed towards fulfilling the artistic objective which underlies all his work – that of integrating moving structures into an aesthetic whole.

Similar considerations have led the Cuban artist Sandu Darié – once a member of South American groups orientated towards Constructivism – to develop his ‘transformable structures’. These works, which he began in 1953, were conceived in terms of ‘a spectacle in light and movement, which seeks to communicate across a transparent screen the new dimensions of a kinetic era, just as if the spectator were looking through the mirror of the imagination’. Darié’s research has resulted in the creation of a mobile spectacle which he calls the *Cosmorama*. This is a kind of fairground booth which is designed to initiate as large a number of spectators as possible into the kinetic branch of the plastic arts.

Darié’s booth does not require any very sophisticated modern techniques to operate successfully. It can be dismantled and measures 2.50 x 4 metres in floor area, 2.50 metres in height. The interior contains a circuit of projectors and motors which give rise to various gyratory movements. The public sees two transformable structures at the same time, and these are designed to ‘complement one another in a multiplicity of planes, intermixing their evolution’. Darié originally controlled the projections and their movements manually, but now he has installed a ‘governor’ which directs the preestablished programme automatically. The actual performance depends on the way in which the structures flatten themselves and grow less complex, a process which gives the illusion of passing from the third to the second dimension – and vice versa. The range of compositions is very large, since there are so many variable factors – the ways in which these light structures are articulated and set into motion, the ways in which the matrices can be made to change, or the light from the projectors to vary, and finally the effects of what Darié calls ‘mobile transparencies’.

Darié has no hesitation in making use of old materials, industrial waste products etc. He considers that these elements take on a new life once they have been transformed into images – ‘a poetic life after their functional life’. He explains: ‘I see things as a painter, and what interests me is the picture in movement, a controlled movement and one which alters the emotional effect of the composition. . . My objects are really actors, who play their drama in motion and undergo change on the screen. There is the spectacle.’ Although he has carried his experiments into another dimension by making a film of them, Darié retains a clear preference for the genuine spectacle which he has defined in the following



92 Sandu Darié
Cosmorama, 1966. 'Kunst Licht Kunst'
exhibition, Eindhoven

formula: 'Electricity + poetry in motion = spectacle.'

There is a certain similarity between the work of Darié and the project completed by the Laboratoire des Arts for the Third Paris Biennale in 1963. This enterprise, which was directed by the architect Jean-Louis Renucci, included the 'metaform' projections of Etienne-Bertrand Weill.

● Polaroid: Munari, Dantu

A fairly recent development in the field of light and movement is the use of polaroid. Bruno Munari, whose work in another area has already been mentioned, began his exploitation of moving polarized light for artistic purposes in 1954. He writes: 'The aim is to obtain images which change colour according to the laws of nature and not because of someone's personal taste. The answer in

technical terms is to use polarized filters and to place colourless materials, in varying numbers of layers, between the two filters. The layers and thicknesses will determine and define the stretches of colour, while the rotation of one of these filters will enable the colours to be modified, through a complete chromatic cycle. . . .’ A film of Munari’s experiments in polarized light has been made at Milan.

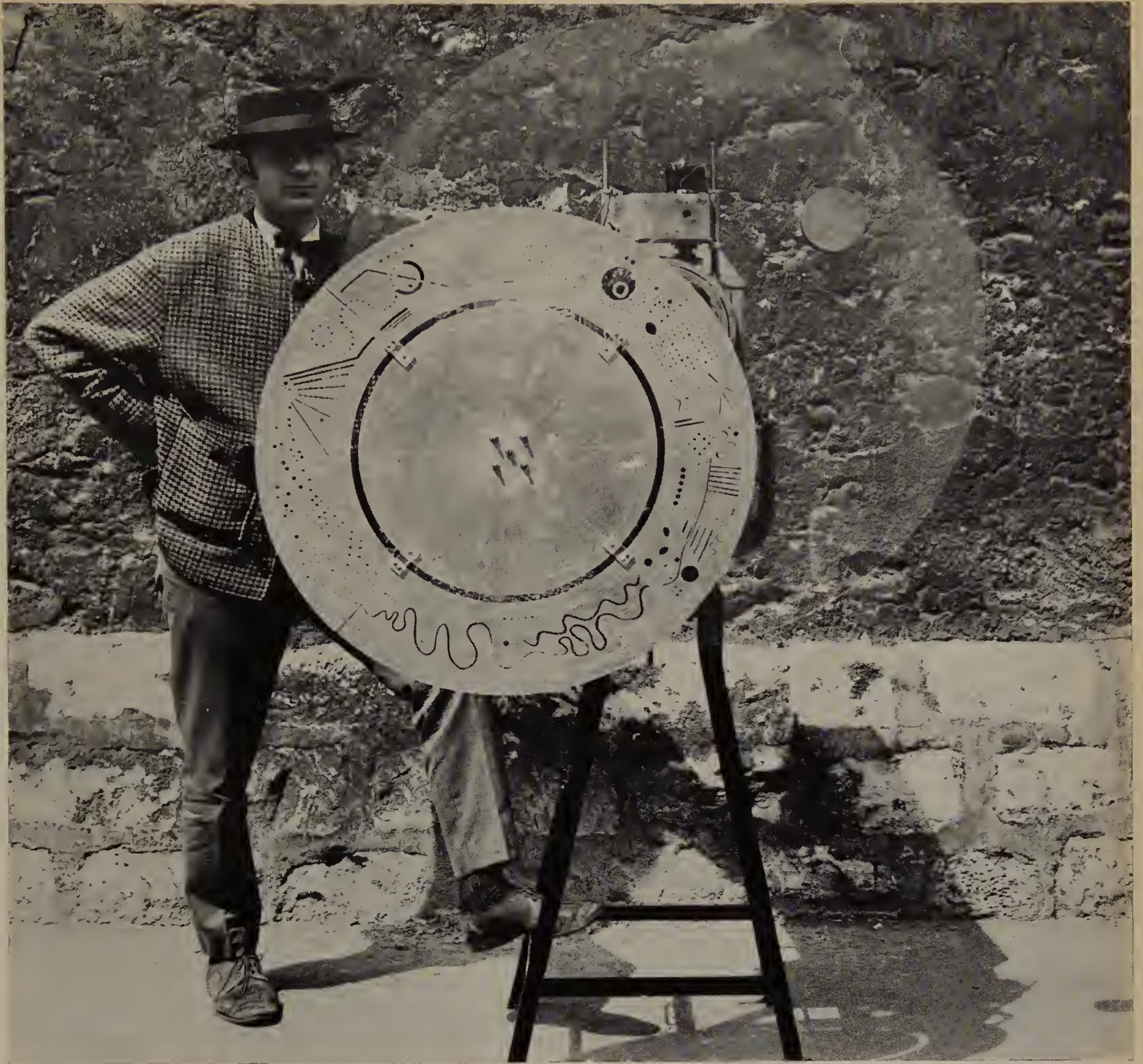
The young French artist Andrée Dantù has adopted a technique very similar to that of Munari. Dantù places cut-out pieces of cellophane between two sheets of polaroid, one of which turns mechanically. The whole apparatus is enclosed in a kind of box which can be hung on the wall like a traditional picture. As with Munari, it is necessary to emphasize that the colour effects are obtained without any sort of application of colour by the artist. Dantù endows her works with a continuous, regular movement, but provides each of them with a switch which can be used to ‘fix’ the colour changes at a point determined by the spectator.

Reference has already been made to Salvadori’s three-dimensional works involving polaroid sheets in motion. Another artist whose work in other fields has already received attention is Joël Stein, a member of the Groupe de Recherche d’Art Visuel of Paris. Around 1962, Stein began to utilize the effects of polarized light in his slide projections and projections within boxes. He devised a number of metal cones – in the spirit of the kaleidoscope – which produced the characteristic effects of polarized light when turned in the hand. Stein conceived these small works in terms of the aesthetic of the game, but his results bear comparison with the pictures which were mentioned above. Standish Lawder, an American expert on the history of the cinema, has also used polaroid in projections.

● **Valensi: cinépeinture, télépeinture**
Livinus: photopeinture, chronopeinture
Screen projections: Müller, Soriano

Another development in the field of light and movement has been the introduction of new methods of animating the cinema screen. Henry Valensi has journeyed to the limits of plastic and cinematographic research in a lengthy series of experiments. As a ‘musicaliste’, his constant dream since the first years of the century has been the introduction of a genuine symphonic musical movement into his plastic works. It was with this aim in view that he chose the difficult path of ‘cinepainting’ (cinépeinture). As Etienne Souriau has explained: ‘What Valensi intended was that the picture, itself a preliminary and preparatory moment, should be wholly composed in view of its further development in the film; the film was to be the authentic work, the goal and ideal of the artist’s effort. Certainly it was a symphony that he dreamed of, and he realized it patiently, image by image, with the techniques of animated drawing.’

In Valensi’s *Symphonie printanière*, the development in time of the season of spring is indicated in real and direct terms. Through his coloured drawings and surfaces, Valensi expresses in the language of sensation the way in which the evolution of the season affects time, nature and life – or, to take the titles of the three sections of the work, ‘The Sky’, ‘Nature’ and ‘Life and Love’.



93 Hans-Walter Müller with his
machine *M*

Shortly before his death, Valensi formulated the theory of another type of art involving light and movement, which he called by the title 'telepainting' (télépeinture). 'He imagined that he saw before him,' writes Souriau, 'a colour keyboard on which the artist could place his hands for an inspired piece of improvisation, exerting his mastery over pure apparitions of moving colour on a screen, phrasing, in just the same way as a melody is phrased, pauses, repetitions, strettis, sustained chords, silences. . . . Scarcely would the work have been created before it was recorded by the camera, while still in the process of execution, to be broadcast *urbi et orbi* immediately afterwards.' The technique of telepainting – painting at a distance – involved three essential elements: colour, rhythm and pauses. It also made use of the principle that the six elements of colour, value, duration, place, direction and form could be used to vary the intensity of an electric current. In making a direct connection between television waves and colours (which, for him, were in structure no more than waves and vibrations), Valensi shows that he was still thinking in terms of a form of colour music on a painterly scale.

From about 1960, the Dutch artist Livinus has been working on his technique of 'photopainting' (photopeinture), which he describes as 'a kind of direct painting making use of proportionate amounts of light on a sensitive film, in which the picture becomes luminous as a result of internal lighting. The picture constitutes an object which, through its spatial perspective, blocks out the wall, and through its radiation fills up the architectural space of the spectator. The facts of this situation influence everyone in an immediate way, even though they are taking place outside his brain or outside his direct field of sensory perception. The intense colours give the radiating painting a brilliancy and a constant animation that is accentuated by the presence of forms which it would be impossible to conceive of in other circumstances.'

Since 1963 Livinus has placed an increasing emphasis on the relationship between light and movement: he has chosen the titles 'Cinepainting' (Cinépeinture) and 'Chronopainting' (Chronopeinture) for the works which reflect this transformation. But the work which most conclusively draws together the various threads of his research remains the *Machine lumodynamique*, which was begun in 1960. At its present stage this electronic machine with a screen seems to represent a synthesis in Livinus' creative activity. It is a combination of fundamental forms, light reflections and elaborate colour changes, which involves effects of polarization and filtering at the same time, and is programmed by a mechanism that is sensitive to sound.

The German architect Hans-Walter Müller has discovered an intelligent way of animating white walls or screens with projections of forms and shadows in motion. His 'dynamic visual art machine', which also goes under the name of *Genèse*, uses a perforated sheet instead of a film. Müller had adopted a fascinating graphic notation, similar to that of music, to help him in the process of putting his ideas into effect. The instrument which he prepares with the help of this 'score', comprises two sheets – one of perspex and the other of board, with perforations covered by variously coloured pieces of cellophane. The two sheets are of different diameters and produce an effect of varying speeds. The actual speeds, which are regulated by a motor, can also vary from time to time. The

projection takes place from behind these two revolving sheets, and is itself characterized by interchangeable slides with painted or applied patterns, which are inserted immediately in front of the light source. The final result on the screen is therefore the result of the original pattern of the slide, and the shifting patterns of the two intervening sheets.

Müller's machines provide a great variety of possible types of movement. It is worth mentioning that he derived the inspiration for this new mode of expression from the experiments which he performed at an earlier stage in a number of fields bordering upon the kinetic: many of the most interesting features of his projections can be related to his skill in music, mime and conjuring.

The experiments of Raymond Soriano, who is also an excellent theoretical exponent of the possibilities of movement, are no less interesting than those of Müller. Soriano is aiming for pure projection, that is to say a film projection taken with an open camera. He is completely uninterested in portraying concrete objects or using the kind of techniques which have been developed in documentaries. The 'synfilmies' which he produces are simple studies in the movement of white, or occasionally coloured, squares. From 1953, he has experimented with the rigorous technique of drawing exclusively by means of the camera and the movements of the person who is controlling the camera. And in fact he is anxious for these two elements to replace the traditional brushes of the painter. He has written of the purpose of his 'man-camera': 'My aim is to draw with a new brush and so to obtain pure colour in motion.'

Behind the formal statement of Soriano's aims, there is the desire to penetrate into the secrets of movement – to investigate the biology of movement. This requires the existence of a new category of artists, who are able to work with 'extra lucidity'. Soriano draws a parallel between the art of 'musique concrète', which revealed sounds that were hitherto unknown, and the possibility of an art of movement which would be directed towards revealing qualities of movement as yet undiscovered. He continues to see a strong connection between gesture and the actual appearance of movement in the work – both in theoretical and in practical terms. And he holds that this relationship between kinetic elements provokes a corresponding sensation in the spectator, placing the art of projection upon an entirely new level.

The connections between cinema, architecture and the plastic arts can hardly be discussed without reference to the theoretical work and completed projects of Philippe Jaulmes, who has constructed the so-called *Panrama* at Montpellier. This work is a real laboratory in which plastic elements can be set off against one another, movement being one of the most important of these. It is 'a method of projection and cinematographic presentation which is intended to obtain an image projected within a hemispherical construction; the construction being arranged in such a way as to occupy the whole attention of the spectators.'

The most recent developments in the art of light include an abundant use of fluorescent tubes in the work of European and American artists. The French painter Martial Raysse achieves a high emotional charge with his use of white and coloured neon tubes. In the United States, Dan Flavin makes use of similar tubes in his ingenious explorations of space, while Chryssa, who is of Greek origin but lives in America, employs them in his sets of variations upon given

themes. A whole galaxy of American artists has set to work to explore the new art of light in its most unsensational aspects. Among them are Billy Apple, a New Zealander by origin, Robert Indiana, Stephen Antonakos, Earl Reiback, Thomas Tadlock, P. McClanahan, Tovish, Leo Rabkin, John Willenbecher and the USCO group, whose leader is Gerd Stern. Marshall McLuhan's book, *Understanding Media*, is surely not unconnected with this development.

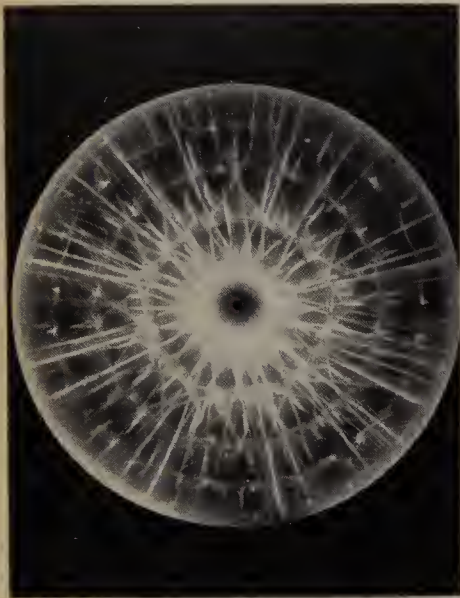
● **Light and movement in three-dimensional works: groups in Italy, France, Holland and Germany**

The recent developments in the art of light which relate to the use of the third dimension as a plastic element and the adjustment of the work to its environment are principally due to the work of groups of artists. Equipe 57, a Spanish group, has produced a series of engravings on lighted glass which relate to these two problems. Group N of Padua (Biasi, Chiggio, Costa, Landi, Massironi) have also touched upon them in their *Spectre cinéfilet No 1*, where the image is produced by a number of light rays, constantly changing colour and position, that are reflected on a white surface. This group also makes use on occasions of a complex device involving two beams of white light which are split up into the colours of the spectrum by passing through two fixed perspex prisms, and then reflected by four prisms turning at different speeds.

The members of another Italian group – Group T of Milan – try to create a similarly positive reaction in the spectator by means of their striking combinations of light and movement in a three-dimensional framework. Anceschi's 'virtual cylindrical structure' comprises metallic elements animated by electric motors which are brilliantly illuminated. Boriani's *Hypercube*, described as a 'three-dimensional modulator', is a series of concentric cubes turning at different speeds which owe much of their effect to the lighting. The aim is to bring out for the spectator's benefit a 'non-uniform dynamic organisation of space'. Through his perceptions the spectator is held to take part in this dynamic organization.

Another member of the same group, Colombo, describes his *Structure excentrique* (1962) as an accessible space bound together by two cellular units turning at uniformly accelerating speeds, in which the aim is to provoke 'cycles of intermittent light in time with the rhythmic mutation of colours'. Dadamaino's 'indeterminate optical-dynamic object' of 1964 is made up of three concentric circles in which lines are reflected upon 'mirrored metallic surfaces at the circumference'. The movement which is introduced results in the formation of a series of images which are at once simultaneous and successive. Finally De Vecchi, another member of Group T, is aiming at spectator participation through continuous dynamism and the 'spatial invasion' of a work such as his *Structure rotolinéaire*, which is constructed of materials which capture and reflect the light.

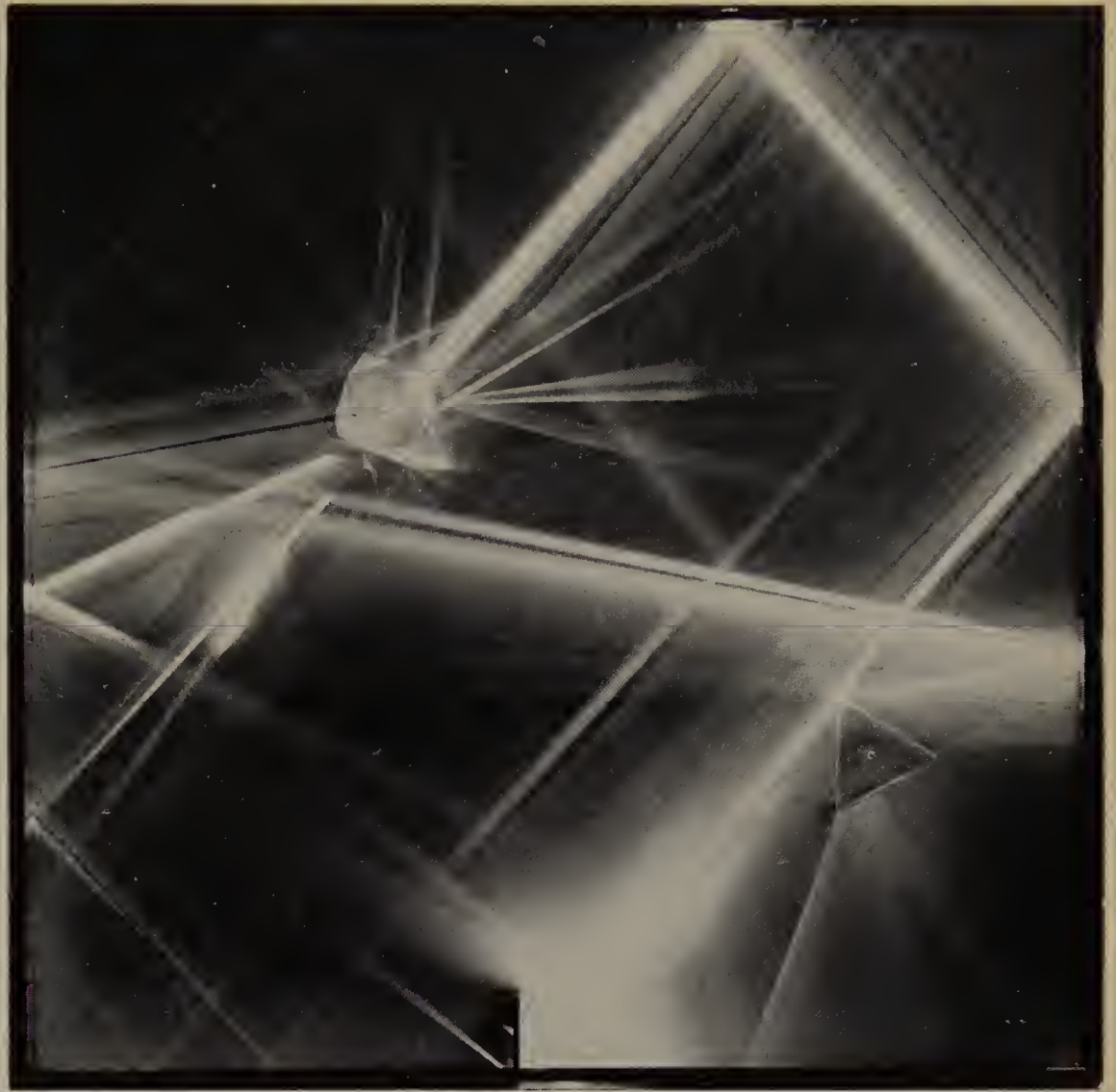
The Groupe de Recherche d'Art Visuel of Paris must be mentioned once again in this connection. Aspects of the work of Julio Le Parc have already been discussed at various points in this study. We should bear in mind that Le Parc's transition from two-dimensional to three-dimensional works was directly linked with the problems of colour, light and transparency: that he obtained good results at an early stage of his research from experiments with progressive sequences, displacements and rotations, which he soon extended by incorpo-



94 Davide Boriani (Group T)
P. H. Scope, 1964-6

95 Gianni Colombo
Plastic Statement in the environment
created by Group T at the 'Kunst Licht
Kunst' exhibition, 1966

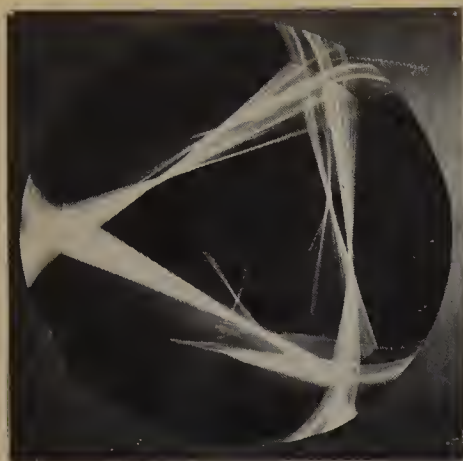




rating chromatic sequences – and the effect of four planes – into his original vocabulary of perspex cubes.

The reliefs and 'suspensions' which followed were an obvious development from the early plastic preoccupations. From projects involving rather rudimentary techniques – the perspex prisms for the investigation of multiple illuminated forms, the boxes with images and colours appearing in depth and lending themselves to an infinite variety of combinations, and the boxes with 'continuous mobiles' – Le Parc turned to more elaborate methods of expression which completely transcended the confines of the frame and the studio.

One of the most important dates in this development was 1960, when Le Parc undertook a systematic study of the multifarious possibilities offered by transparency, movement and light through a use of rotation to combine various colours – white on white, black on white, black on black etc. – in a more or less calculated scheme of probabilities. The crucial factor in this piece of research was the way in which external elements (the white on white) were incorporated in the plastic statement. Soon the mobiles were also being affected by elements



97, 98 Julio Le Parc
Instabilité, continuel-lumière, 1962

from the environment, such as effects of light and shade, and partial images moving at different speeds on surfaces adjacent to the work.

Also in 1960, Le Parc began to bring out the qualities of different surfaces and different levels in wood and metal reliefs. The progressions of these surface elements were revealed in their variable speeds by the rotation of regularly ordered elements. It was the combination of this line of experiment with the one mentioned previously that presented Le Parc with a significant plastic problem: how to make use of reflected, interrupted and 'skimming' light as a medium of expression.

In solving this problem, Le Parc was helped by the experience which he had gained from his *Ensembles* – mobiles installed before light sources which provoked reflections of light all around the spectator. He was able to develop the use of skimming light, in particular, until in 1962 he achieved spectacular results with his 'continuels-lumière' and 'cylindres'. At the Kunst Licht Kunst exhibition in Eindhoven (1966), he was able to demonstrate the ultimate refinement of these particular techniques. This was particularly appropriate at an exhibition which represented the flowering of artificial light as a means of expression on an international scale.

After devising the 'continuels-lumière' in 1962, Le Parc chose to place the accent upon the *visualisation* of light in relation to movement. To begin with, light sources were simply placed behind a screen pierced with holes. Le Parc used this idea in the *Labyrinthe* constructed for the 1963 Paris Biennale and also in the one which was constructed at New York two years later. It was in 1963 that the ideal of associating the spectator with the aesthetic process began to be applied in practice. The spectator's *participation* was invited in a number of different ways: he could affect the work by his own movement, by manipulating the elements of the work, or he could himself be affected by obstacles placed in his path, or by objects which modified the normal conditions of vision and touch. This development led to the exploitation of light as a means of provoking an instant stimulus, and to techniques of surprise movement which relied upon the instantaneous production of light.

If we turn to Le Parc's continued experimentation over the past few years, there is an extraordinary variety of new techniques which extend the possibilities of spectator participation in several directions. Le Parc has devised uneven passage-ways composed of rocking wooden blocks: he has constructed a chair on a spring which lets the unsuspecting visitor down in a hurry, and produced pairs of eccentric spectacles which give a distorted view of the surrounding world. It is important to realize that all these new projects – and many more – derive directly from the research which Le Parc began with an investigation of simple geometrical forms and chromatic permutations. And at the same time it must be stressed that his remarkable effects with artificial light and the use of mirrors are merely one aspect of an overriding purpose – the pursuit of a fundamental *plastic research*, orientated always towards the future.

Garcia-Rossi, Morellet, Sobrino, Stein and Yvaral, the other members of the GRAV, have numerous points of contact with the work of Le Parc. For instance, Garcia-Rossi's reduction of subjective choice to an absolute minimum, and his desire to make use of every technical, scientific, perceptual and material



possibility, recall the attitudes of Le Parc in his first period. There is also a parallel to be drawn between Le Parc's use of light and Garcia-Rossi's *Boîte lumineuse à manipuler*, which consists of a mobile cylinder of perforated metal that gives rise to light vibrations.

The pattern of Morellet's research corresponds closely to that of Le Parc, beginning with experimental programmed paintings and leading up to the use of 'visual shocks' provoked by intense light. Mention has already been made of Morellet's *Sphère-Trame*, which is suspended so as to allow free movement and gives multiple shadows and reflections in response to the light of powerful projectors.

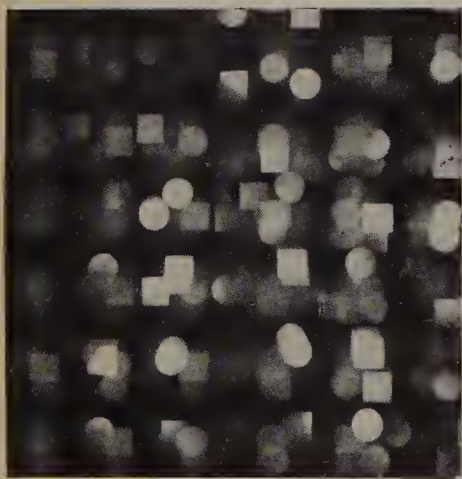
Sobrino also worked on a number of problems involving the plane surface before developing his characteristic use of perspex cubes and other transparent objects, which reflects the group's general preoccupation with *unstable* transformations. In the same way, Stein began his research with a series of essays in form and colour which were directly parallel to the concerns of other members of the group at the same period, and progressed towards his more mature style within the framework of group policy. His more recent works are concerned with such problems as the movement of suspended objects and the light effects to be obtained from reflecting polyhedrons and kaleidoscopes. Stein carries out the policy of the group to the extent that he neglects the object in itself and emphasizes the element of play.

Finally Yvaral, who acquired early experience in the visual properties of materials such as Perspex, india-rubber, and vinyl thread, began by relating these materials to the formal problems of superimposition, displacement and acceleration. His subsequent work branched out into the use of transparencies, cubes, moiré effects, structures and games which involved sensations of instability in the spectator when confronted with networks of black and white in 'optical acceleration'. Here again there is a close connection between the individual programme of research and the overall policy of the group.

Obviously the degree of cooperation which has been maintained in the first few years of the group's existence has depended on constant contact between the various members. Most important of all, it has been vindicated at certain stages by the mounting of common collections of work, such as the three *Labyrinths* and the *Journée dans la rue*, which took place throughout Paris on 19 April 1966. The latter, which involved a display of grouped and isolated objects in various streets of the city, was perhaps most successful in the phase which took place in front of the church of Saint-Germain -des-Prés. This item involved the spectator in a particularly interesting way.

The direct antecedents of the *Journée* were the various *Labyrinths* of the group. *Labyrinthe 1*, which was inaugurated at the third Paris Biennale in July 1963, and *Labyrinthe 3*, which was on show at the Contemporaries Gallery, New York, in March 1965, are perhaps the most important of the series. The intention of the group was to use these collective exhibitions, with their extreme variety of perceptual phenomena, as a method of obtaining the highest degree of participation from the spectator. The dominant aesthetic impression was to be one of *instability* – that is to say, the impression that the formal aspects of the separate items on view could never be precisely localized or identified. For

99 Horacio Garcia-Rossi
Boîte lumineuse, 1964



instance, the fifth stage of the July 1963 *Labyrinth* consisted of a cell with walls covered in polished aluminium, in which the spectator was surrounded by mobile reflecting plates. The 'games-rooms', which covered stages 6 to 16, were full of different indications of light and movement. Stage 7 consisted of a series of transparent perspex elements which were worked by the spectator, and stage 9 of an open cell with mirrors whose direction could be altered by the spectator – and whose walls were animated by the interplay of 'transformable reflections'. The aesthetic of instability reached its final paroxysm in stage 20, where Morellet had arranged parallel rows of inclined neon tubes, which followed completely different rhythms of being turned on and off, and yet impressed consecutive images on the eye of the spectator.

Without going deeply into the various declarations and manifestoes of the GRAV, it is possible to state that their principal aim is to play down the traditional significance of the individual artist and his masterpiece, and to bring out the crucial role of the spectator. In their view, the most revolutionary aesthetic propositions of the past have stopped short at the point of modifying the relationship between artist, spectator and work of art. Their aim is ultimately the creation of an entirely new situation, in which the work of art is replaced by the 'plastic statement' – representing a line of *open* research – and the spectator becomes an actor, not simply through his own contact with the work but also through his observation of other spectators and his participation in the activity of the group.

The Dutch group Nul and the German group Zero are both indebted to the metaphysical spirit and the monochrome exercises of Manzoni, Yves Klein and Fontana. Of the Dutch group, Henk Peeters of Arnheim, De Vries of the same town, J. J. Schoonhoven of Delft and Armando of Amsterdam have all produced interesting 'visual statements' with the use of light. Their basic attitudes are reflected in the following passage: 'Pollock, Rothko, Tobey and the monochrome painters are the precursors, Fontana and Yves Klein make the rupture final. The signs are everywhere: reduction, limitation or disappearance of contrast, silence, the sensation of emptiness, decomposition of the surface, and finally movement and vibration as purely sensory effects. Fontana lays down that the new synthesis is the sum of the elements, of colour and of movement, all three of which are perceptible to the senses. A new art results from this synthesis, based upon time and space. Yves Klein prepares a pictorial art without painting.'

Heinz Mack, one of the founder-members of the Zero group, has left his own description of the role of light and movement in a text which dates from 1959: 'The dynamic structure of colour and light is a delight to my eyes, which become irritated with the static nature of my thoughts; it is this structure that animates the rhythm of my heart and the rapid respiration of my desires. The beautiful is in a state of motion and displays the quiet of unquietness as its form. The dynamic actually becomes a form. But the unquietness of quietness destroys the form and becomes its opposite. The motionless and the finite tire our vision and deny it in the last resort. Pure movement does not know the relativity of frontiers and measurements; directionless and without actuality, it remains on its own terms. That is, its vibration, its respiration, its liberty, its vitality and its metaphysic.'

The aim of Mack's research is to transpose thoughts such as these into visible



objects, without revealing their secret: he does this mainly through the use of light. For a number of years, however, he has been preoccupied with the idea of utilizing vast stretches like the Sahara, where there is an abundance of calm, space and light, for what he refers to as 'the other limitless stretch' of art. In these circumstances, works using light – such as the *Sahara relief* (1961) and the *Light Pyramid* (1964) – would have an aesthetic import hardly dreamed of up to now.

A characteristic work by Piene – another member of Group Zero – is the *Luminous ballet*, which can be operated in two different ways. In the first case, the aim is to represent or demonstrate, through projectors and matrices, the conquest of space by modulated light. The artist and his assistants transmit the experiment to the spectators, who immediately try to assimilate the space and become active in their turn. In the second stage, the artist relies on projectors which are automatic though controllable. A small quantity of energy results in a transformation through light, expressed in a coherent manner. The spectators are then invited to relax.

Clearly the title 'Luminous ballet' should be taken in its literal sense. The light follows a particular order, or choreographic pattern. Yet it is also possible to note an element of improvisation, since sound is introduced on the same terms as one of the controlled light sources. Piene has no intention of establishing a correspondence between optics and acoustics. His aim is to introduce an element

which is just as noticeable as breathing into the work, so that the articulation of light will 'carry it off in the dramatic action against opposition.' The sound which he introduces is not musical, but simply serves as a sound accompaniment. It may sometimes take control of the spectacle and then give place to a period of quietness in which the light alone holds the field.

If Piene's work is all directed towards the aim of articulating light, and thus making it real and perceptible as such, the work of his colleague in the group, Ücker, is no less closely concerned with the realization of form through light. The virtual or potential movement of his white structures, which is particularly intense, can become a dynamic interplay of real light and movement if a motor and a turning disc are installed under the original arrangement of closely packed white nails.

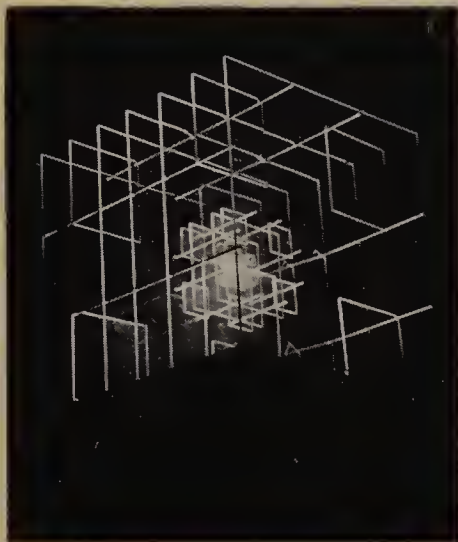
At the exhibition Documenta III in Cassel (1964), these three members of the Zero group mounted a *Homage to Fontana*, which consisted of a room filled with elements that they had developed since 1960. Many of these were noteworthy because of their intense luminosity and the variety of the movements which they performed.

Another German artist, Hermann Goepfert, exhibited a complex work which he called *Optophonium* in 1961. This had several characteristics which put it in the class of the spectacle. In 1962 Goepfert exhibited his *Lichtrotor*.

It is a significant fact that a group of Soviet artists called 'Dvizjenie', which consists of Lev Nusberg, Francisco Infante, Volodja Galkin, Stepanov and several others, has recently made great advances in kinetic research through the use of light. Nusberg, who is himself an artist by profession but directs the work of several technicians who belong to the group, has written of his own work and the development of 'Dvizjenie': 'Almost from the outset of the more



101 Group Zero
Programmed room at the 'Kunst Licht
Kunst' exhibition, 1966. On the left: the
lamp-spectres of Otto Piene seen through
Ücker's construction; on the right: a
work by Mack



102 Francisco Infante
Kinetic object *Soul of crystal*, 1963.
Materials: motors, sources of coloured light, programmed structure, metal, perspex, loud-speakers etc.

or less conscious transition in my creative work from painting and literature to objects in physical space – it was towards the end of 1961 that I began to concern myself with experiments in movement and materials for the first time in the USSR since the avant-garde work of the Twenties – I found a constant impulse towards the creation of a NEW REALITY: in concrete terms, towards the creation of grandiose kinetic objects, living machines. In general, and for all sorts of reasons, I did not simply follow the move towards Op art, but set myself moving and developing in another direction, though my work may have seemed superficially akin to the Op art that painters all over the world were already beginning to practise.

‘In our country, up to 1962, the very name of Optical art was unknown. But all my subsequent activity, including that of the creation of the ‘Movement’ (Dvizjenie) group in September 1962, brought into clear evidence the fact that there were similarities as well as differences between our work and what was happening in the West. I myself would regard the work of art as a means or a form of contact between human beings, but only on the most subtle level of association.

‘At the present moment I am working on the development of two large projects. The first is the creation of a World Institute of Kinetism. The second is a project for a kinetic labyrinth, which will be called ‘Yesterday – Today – Tomorrow’. This is to be a real labyrinth, about 500 metres long in all, with several ramifications. The performances, which are calculated to take two hours, involve a large number of separate places (with varied forms and colours) arranged in a sequence. The methods of the cinema, music, pantomime, texts, kinetic-objects, changes of smell, air movements etc. will be used in these separate stages. The idea is that man should voyage in the world of the stars, turn back on his own personality and see himself from the outside like a man of the future looking at contemporary man. But this is not theatre, and certainly not a ‘magic lantern’ show.

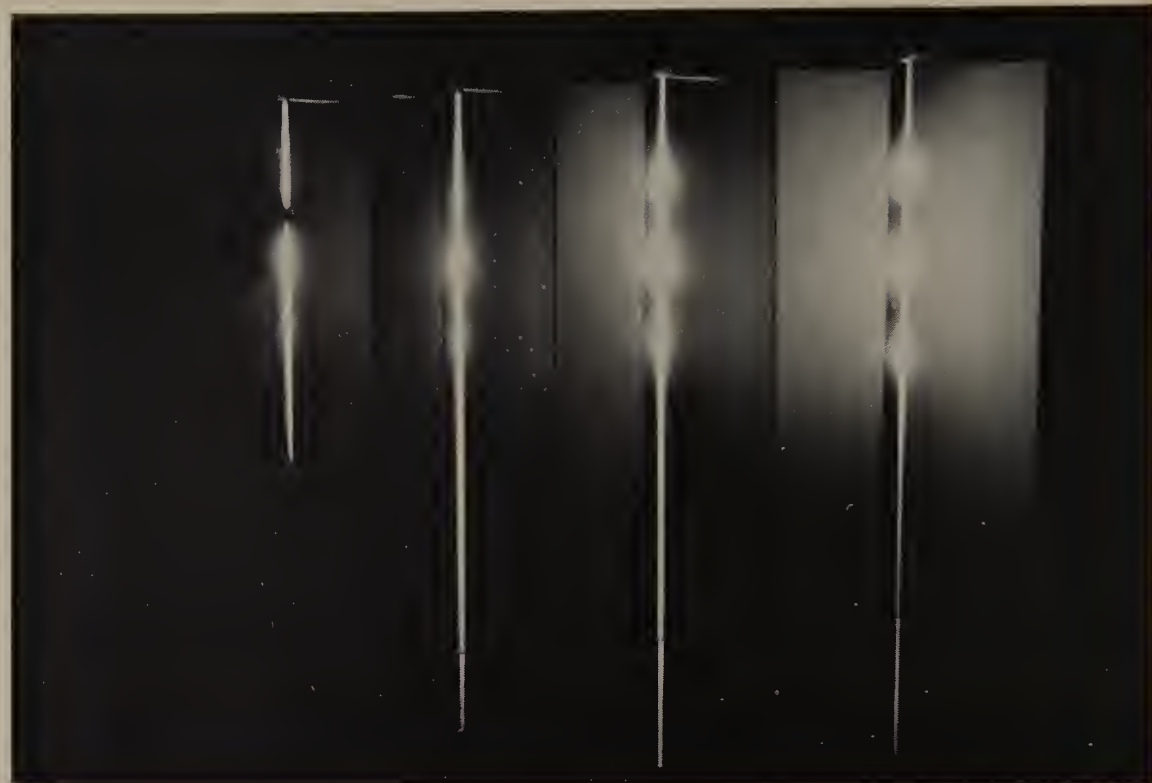
‘And now we are hurriedly making kinetic maquettes to serve as sketches for a presentation at Leningrad on the occasion of the fiftieth anniversary of the USSR.’

● Lassus – kinetic objects and the environment

The research of Bernard Lassus is typical of the vast perspectives which open up when an attempt is made to find applications for the plastic art of light and movement. If we take a *Boite à lumière* by Lassus, dating from 1958, we find that the aesthetic purpose is not the only one in the artist’s mind. Lassus has constructed this work from three projectors which are fixed separately and at different heights on the interior surface, in front of a cube which is painted black on the inside and the outside. With three beams of blue, green and red light he succeeds in demonstrating the composition of white light. This is through the use of a rotary movement which animates the uneven relief and produces variation in the way in which these beams are intercepted. Coloured shadows, superimposing and overlapping with one another in continuous movement, appear momentarily on the various planes, while the white light which is not intercepted brightens the other surfaces and falls upon a white-painted area

103 Lev Nusberg
Kinetic object *Flower* (phase 5), 1965





in relief. Lassus' purpose in devising this fascinating exercise was to demonstrate the way in which form and colour can operate quite autonomously. And this demonstration fitted directly into his programme of experiments as a 'coloriste-conseil.'

It is important to realize that while the work of Lassus and other 'coloriste-conseils' comes to fruition in the large-scale facades and planned groups of buildings which they undertake, the point of departure for the principles which they apply is their research on the plastic level – in the studio or laboratory. Lassus' work at the Centre de Recherche des Ambiances (Centre for Research into Environment) has led him to create many works which are both spectacles and experiments. His lengthy investigation of volume/colours and plane/colours has led him to introduce the apparently paradoxical concept of fixed colour mobility, which relates to the fixing of colours according to their functions in full knowledge of the circumstances involved, and brings into focus the mobile properties of natural and artificial light.

A significant number of kinetic artists, including those who originally took only a passing interest in expression through light – such as Agam, Pol Bury, and Takis – are now thinking in terms of works which affect the environment through this remarkable medium. One may mention Gerstner, Lily Greenham, Dobes, Luther and Kowalski in this connection. An interest of this kind may take on many different forms, as can be seen from a comparison of works exhibited by Lily Greenham and Kowalski at the 'Lumière et Mouvement' exhibition, Paris (1967). While Lily Greenham achieves her effect through the use of brilliant metallic paints in homogeneous patterns, Kowalski turns the spectator into a laboratory assistant. His hollow gas-fitted balls glowed red or blue as they were

placed on or near a surface with an electronic circuit, when they were lifted they became transparent once again.

Among the new perspectives which are opening out in the use of light and movement, let us bear in mind the particular one which is associated with the 'intermediary' image – that is to say, the image which is neither object nor perceptual process, but lies between the two in an environment which has lost its material properties through the operation of light and movement (in Demarco's case, it is 'black light' which provides the foil for violent vibratory movement). In the work of the groups, and especially in the case of Le Parc, this dematerialisation is carried out through the use of skimming light, reflected and refracted light, and direct light: the spectator's active participation is secured through the use of complicated passage-ways, invitations to games, different types of structuring, environments that can be altered by the spectator, and the programming of light effects.

Moving light has therefore proved itself to be a particularly effective means of acting upon the environment. The spectator feels the challenge of the new situation in an unusually direct way. Far from being absorbed in the mechanical universe, he is invited to discover – and in a sense to create – through his intelligence and sensitivity, the new connections between physical phenomena, man's environment and art.



8 Recent developments in Kinetic art

Recent developments in kinetic art have taken several different directions. Virtual movement has been explored for its potential application to architecture and town planning. Actual (three-dimensional) movement has certainly not yielded up all its secrets: there are still new possibilities of expression which go beyond the purely technical innovations. One particular field in which there has been a great deal of progress is that of natural and especially artificial light. Transparencies, reflections, interceptions and transmissions of light have all been widely used, as well as the techniques of polarization and the kaleidoscope. But this does not mean that artists have confined themselves to visual effects. There has also been an increase in audio-visual research, and in the type of spectacle which involves more than one of the senses simultaneously or successively. The attempt to encompass the whole environment has led to entirely new uses of light and movement, as well as influencing the treatment of traditional features such as colour.

Another fundamental problem which has been raised by the rapidly evolving programmes of research undertaken by various artists and groups of artists concerns the role of the spectator. Now that the spectator is fulfilling a more active role, the work of art itself is liable to disappear into insignificance by comparison with the psychological effects which it induces. At the same time, new aspects of technology, cybernetics, electronics, television techniques and the production of industrialized *multiples* play their part in narrowing the gap between art and science, while the possibility of programming haphazard events contributes towards the prospective integration of the plastic arts into modern life.

● Recent exhibitions

The perspectives which are opening up in the field of kinetic art can be glimpsed not only in the research of the artists, which is carried on continually, but also in the various recent exhibitions and other manifestations which serve as landmarks in the rapidly changing scene. From 1965 onwards, there has been a series of more or less comprehensive exhibitions which have attempted to deal with particular aspects of the field. Virtual movement was the central preoccupation in the exhibition entitled *The Responsive Eye* which was held at the Museum of Modern Art, New York, in 1965. From this point the expression Op – or Optical – art came into common use. Three-dimensional movement was the

keynote of the important *Directions in Kinetic Sculpture*, which took place at the University of California, Berkeley, in 1966, as it was in the first large-scale survey of works employing artificial light – the *Kunst Licht Kunst* exhibition at the Stedelijk Van Abbemuseum, Eindhoven, which belongs to the same year.

This last exhibition was also devoted to exploring the relationship between artificial light and our environment, which has subsequently proved to be one of the most promising – if not *the* most promising – perspectives in the field. Environment was one of the important subsidiary themes in the *Lumière et Mouvement* exhibition, held at the Musée d'Art Moderne de la Ville de Paris in summer 1967. Here the main theme was of a more restricted nature, since only the kinetic artists of the new Ecole de Paris were exhibiting, and they were restricted to works incorporating both real movement and artificial light. But it was still possible to single out the more interesting subsidiary themes, such as the tendency towards spectacle, the introduction of direct action by the spectator and the prospect of new applications for architecture.

A number of additional exhibitions which have taken place at museums and galleries during this period have played their part in stimulating the development of various trends in kinetic art. The Galerie Denise René of Paris presented their important survey. *Mouvement 2*, in 1964, and have continued to put on exhibitions of unusual interest. With the Howard Wise Gallery in New York, Signals Gallery in London, the (Op) Art Gallery in Esslingen and the Denise René/Hans Mayer Gallery at Krefeld, they have been in the forefront of activity. The Hanover Gallery of London also presented a general exhibition in 1964. In the next year, there were exhibitions at the Albright Knox Art Gallery, Buffalo (*Kinetic and Optic Art Today*), the Royal Scottish Academy, Edinburgh (*Art and Movement*), and the Museum of Tel-Aviv (*Art and Movement*). *In motion*, an exhibition mounted by the Arts Council of Great Britain, followed in 1966, while the Museum of the 20th Century, Vienna, mounted *Kinetika* in 1967. There have also been several exhibitions devoted specifically to the art of light – at the Institutes of Contemporary Art in Philadelphia and Boston (1965), the Carpenter Center for the Visual Arts, Harvard, the Addison Gallery of American Art, Andover, Massachusetts, the Museum of Contemporary Art, Houston (all in 1966), the Galleria dell'Obelisco, Rome, the Howard Wise Gallery, New York, the Walker Arts Centre, Minneapolis (all in 1967) and the Cleveland Museum (1968).

The attempt to bring kinetic art out of the galleries and to make it accessible to the spectator without any need for a preliminary move on his part has made only limited progress. Small demonstrations have taken place in Paris and in Central Park, New York, but it seems likely that the attempt to influence the inner and the outer environment will be most successful when a museum, or other place set aside for cultural activities, can be brought into use. This has already been done in Europe, especially at the Maison de la Culture, Grenoble (*Cinétisme, Spectacle, Environnement*), the Kunsthalle, Berne (*8 Environments*) and the *Documenta 4* at Kassel. All of these exhibitions date from 1968, as does the comparable show at the Second Buffalo Festival of the Arts, in the Albright Knox Museum, Buffalo. The *Magic Theater* exhibition at the Nelson Gallery of Art, Kansas, also belongs to this category.

● Visions for architecture – Riley, Leblanc, Cruz-Diez

Many of the aspects of virtual movement which were investigated intensively, by American and British artists in particular, have now lost their original attraction. William C. Seitz adopted a number of different headings to classify the works which were included in the *Responsive Eye* exhibition – the colour image, ‘invisible’ paintings, ‘optical’ paintings, black and white paintings, moiré effects, reliefs and constructions being among them. But it would seem that these various divisions only correspond to genuinely new aesthetic possibilities in so far as they can be subsumed in a wider conceptual framework – that of integration into an architectural framework or, on a more general level, functional utilization in space. What was at once stage an attempt ‘to dramatize the power of static forms and colours to stimulate dynamic psychological responses’ now acquires significance as a modern experimental method of creating architectural visions – environments in which the element of virtual movement is combined with those of manipulation, spectator movement, physical movement and real light.

Bridget Riley has moved some way along this path through increasing the size of her statements in black and white, and venturing into the chromatic field. In a similar way, Albers’ basic investigations into perceptual ambiguity and colour interaction have been taken up and transposed on to a larger scale by such American artists as Tadasky, Anuszkiewicz, Poons, Kelly, Stella and Molinari. The Canadian Molinari, to take one example, applies his strips of colour in rhythmic progressions, exploiting spatial volumes as well as large flat surfaces.

If we remain within Seitz’ categories, the ‘black and white paintings’ can be identified with the recent work of two English painters, Jeffrey Steele and Peter Sedgley. The moiré effects which have been a vital feature of Soto’s work can be rediscovered in the recent experiments of other South American artists such as Ravelo and Salazar, who are exploiting them as a means of penetrating new regions of space. Ravelo with his *Lumière fragmentée* and Salazar with his metallic structures are both responding to this challenge, as are Martinez with his coloured virtual volumes and Padron with his *Boîtes à métamorphose*.

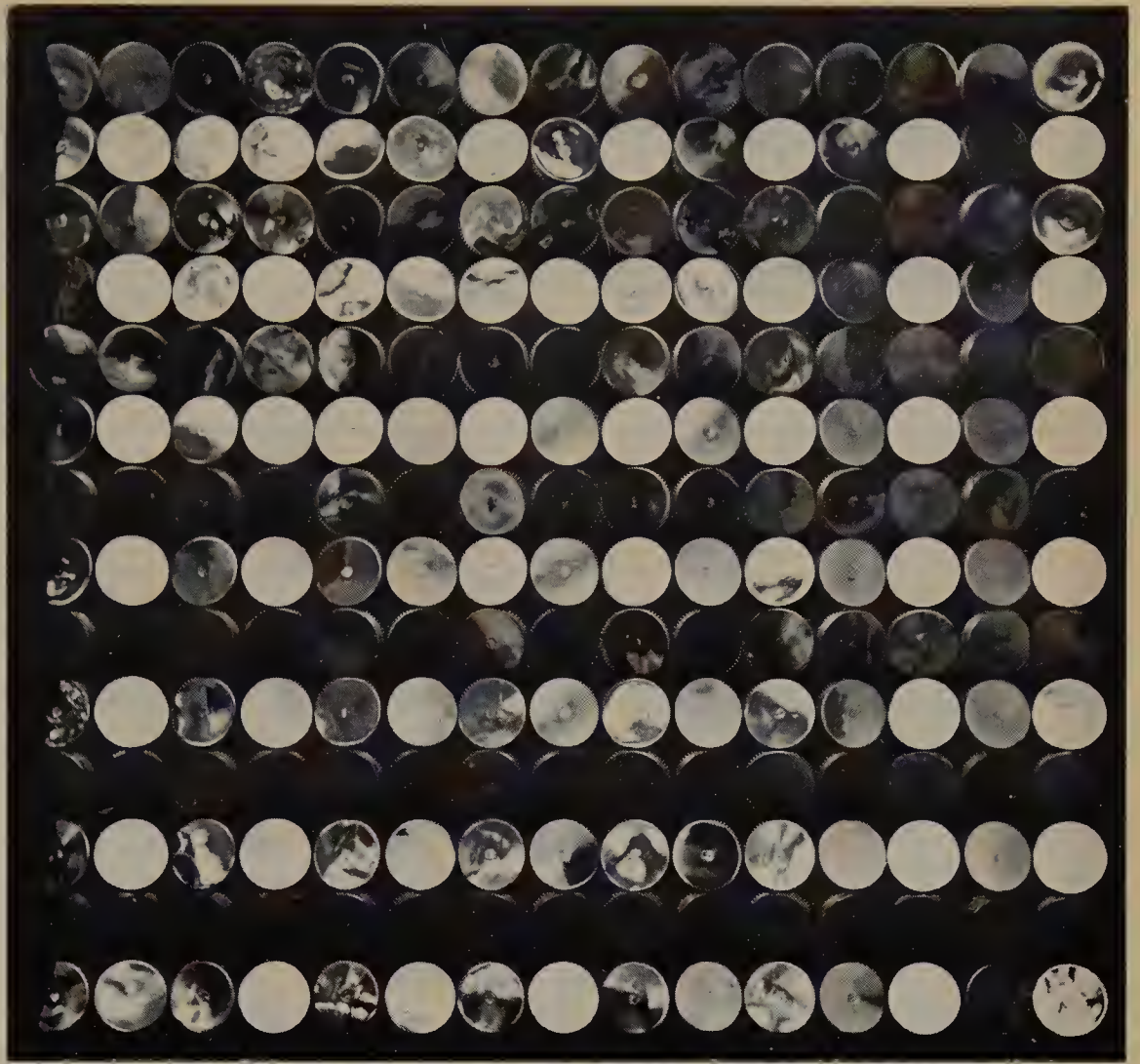
Two artists who have clearly moved far in the direction of a truly architectural vision are Walter Leblanc and Carlos Cruz-Diez. Leblanc’s ‘mobilo-static’ polyvinyl strips constitute an ideal basis for interaction between the ‘optical’ statement and elements of colour, light and spectator movement, lending themselves readily to transposition into the third dimension. Cruz-Diez’ *physichromies* have recently been extended into a genuine spatial analysis of colour. The artist has combined the results of successive experiments in pure colour in a final environmental ‘situation’. We shall return to the significance of these experiments at a later stage in the chapter.

Spatial considerations have therefore become an increasingly important factor in the most recent kinetic work. A relevant example is the sculpture of Mary Martin, whose concern is still with virtual movement although her structures now reach out into space. Like the sculptures and mobiles of her husband Kenneth Martin, recently crowned by a superb aluminium *Construction* at Cambridge, her works are conceived in terms of sequences based on mathematical relationships.

In spite of this tendency for artists using virtual movement to introduce

105 Kenneth Martin
Construction in aluminium, 1967.
Department of Engineering, Cambridge,
England. Height 518 cm. (17 ft)





three-dimensional elements, there has been no lack of research among those who confine their investigations to real, three-dimensional movement. New materials and techniques have played an important role here. Among mechanically driven works, the *Pulsations* of the Canadian artist Roger Vilder occupy an unusual place because of their reliance on optical effects. Yet Vilder speaks for a good number of artists of the younger generation when he writes: 'there is no physical or moral phenomenon which is static or permanent, whether in the atomic or the cosmic universe – whether man's senses can perceive it or not. All is therefore unstable and in motion. But there exists in this instability a repetition, return or resumption, as with the seasons, day and night, or the waves of the sea. These natural physical phenomena imply notions of time and rhythm, which are integral features of the cycle. It is this cycle that exists within the overall instability that I am trying to convey in my work through the repetition of certain optical effects that are obtained through the movement of one unit, and result in the setting up of a visual pulsation.'

In the field of the mobile, which presents notoriously difficult problems to the contemporary artist, Henri Gabriel – a Belgian artist – has succeeded in developing a genuinely new form of movement. Gabriel began, like many kinetic

artists, from an initial interest in optical work, and continued his research with a series of experiments in superimposition. But his principle aim has been to employ real movement in the creation of optical illusions. Thus his carefully constructed mobiles in polished aluminium provide an interplay of four 'dimensions' – space, perception, light, and movement – and through this interplay establish the illusion of an empty space or volume in rotation.

● **New uses of light – Cappello, Sempere, Luther, Gerstner, Megert**

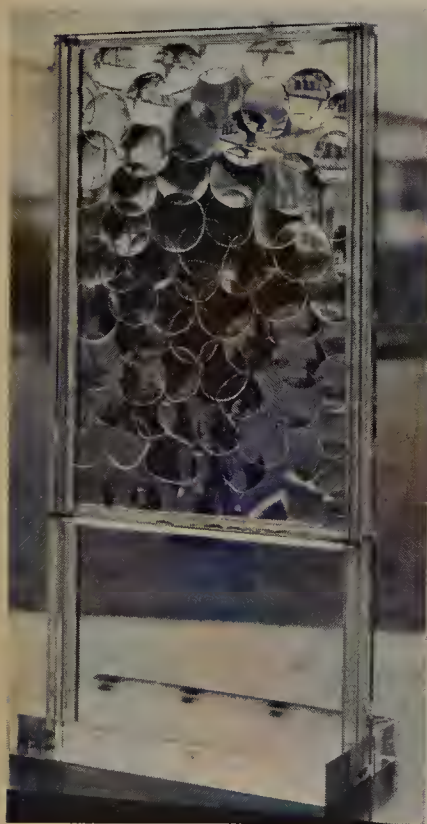
The most striking advance in the whole field of kinetic art since 1965 has, however, taken place in connection with the widespread introduction of artificial light. This is a development which has radically affected the more elaborate 'environmental' projects as well as the more traditional illuminated objects and other works involving projected light. It could be argued that this luminous section of kinetic art possesses an independent status, and various terms – such as 'luminocinétisme' – have been devised to establish it is a separate genre. What cannot be denied is that this line of investigation has dominated the more adventurous courses of research, both in Europe and in the United States. This is due at least in part to the remarkable possibilities of affecting the spectator which it offers.

The combination of movement and light has proved so fruitful during the past few years that it seems impossible to classify the works which have been produced according to the old categories of relative dimensions. Many large-scale works must now be assigned to the new class of environmental art. It may even be permissible to speak of the environmental art of light.

There have been interesting attempts to introduce subsidiary categories into this field, such as that of Athena Tacha-Spears, who is a fine light artist as well as a stimulating theoretician, and that of Nan Piene, who has extended and developed that classification which I myself proposed in the catalogue to the *Kunst Licht Kunst* exhibition. But for the purposes of this chapter, the most useful classification seems to be that which was included in my catalogue for the *Lumière et Mouvement* exhibition.

Among the many illuminated (or light-receiving) objects which have been produced recently, those of Cappello, Sempere, Goepfert, Luther, Gerstner and Megert deserve to be singled out. All of these form part of a continuous programme of research which treats light in connection with movement and space. They range from low reliefs to structures involving many-sided volumes which capture the interplay of light and shade. Transparencies, reflections, and kaleidoscopic effects play an important part in the overall realization. The Italian Cappello has concentrated particularly on electro-mechanical movement, involving two distinct *tempi*. Two examples of his finely finished works are *Superficie-spazio: itinerario circolare* (1965) and *Rotatorio circolare* (1967). The Spaniard Sempere has managed to transpose the principles acquired over many years of visual research into exercises in the third dimension such as his *Movil* (1967), which allows a considerable role to the movement of the spectator and the play of light. Goepfert has continued his 'optophonic' research, and has succeeded in installing an 'optophonic room' in a school near Frankfurt. He

107 A. Luther
Optogon, 1966



deserves the credit for seeing that light represented a new and independent plastic medium at an early stage in his career, and he has continued to put it at the very centre of his research. But in works like the *Lichtwalze*, he allows sound to play an integral role, and he has also made considerable use of magnetic fields. In fact he is one of the artists who, while working away from the limelight, has extended his control over virtually the whole range of kinetic media. In all of them he continues to be concerned with 'nature, artistically formulated.'

The purpose of A. Luther's *Lichtschleusen*, *Glasobjekte*, *Lichtblenden* and *Aluminiumobjekte* is to 'concretize' light, or to make it 'objectively' accessible to our perception. Like Goepfert, he considers that light is, in the first place, energy – invisible energy. In order to make it entirely visible, it is necessary to exploit not only our everyday visual experience of light, but also the realms of physics and optics. Materials such as glass, with its transparency and its capacity to act as a lens or a mirror, enable the spectator to discover light as a transoptical reality.

108|Karl Gerstner
Lens picture, 1962-5



The objects of Karl Gerstner are based on a meticulously elaborated programme of theoretical and practical research. His role in the general advance of kinetic art over the past few years has been immense. He has taken an active part in the work of the Nouvelle Tendance, but his own artistic activity has never been neglected. His scheme for the permutational exchange of elements possessing different degrees of brightness and reflective capacity offers as rich a variety of combinations – if not a richer variety – than the game of chess. Gerstner sees every structure as a specific order, a unique example from among the multitude of possible groupings. There are therefore a thousand different types of order readily accessible to our perception: but at the same time there are a hundred thousand different kinds of disorder which we perceive simply as one. This principle can be illustrated with reference to one particular structure, and Gerstner insists: ‘I am only speaking of the abundance of the smallest field: how large is the world?’ Works such as his *Lens pictures*, *Prism pictures*, *Tension pictures* and *Texture pictures* are an attempt to convey some of this limitless fascination.

Mirrors and light are the main tools employed by Christian Megert in his quest for a new vision of space. This new space is not simply an illusory ‘optical’ phenomenon, but a dimension without beginning or end. It can be lived in by the spectator, who thus becomes himself a creator, and it can also be made to move, change or come alive by the agent who is in control. Besides the physical implications of this situation, there are also quite clearly metaphysical implications. Megert has followed a strict path of progress in his research. Beginning with compositions which utilized mirror fragments, he later constructed geometrical compositions and incorporated light into a series of boxes which he referred to as ‘mirrored rooms for young collectors’. Finally he introduced real movement with the aid of a *zoom* mirror – a sheet of reflecting material set in motion by a motor. In these *Zoom* works, the onlooker experiences spatial sensations of an unsurpassed originality and flexibility. Megert has made a decisive step towards the creation of an environmental form. Among the luminous (or light-emitting) works, there are still a large number of light pictures or ‘boxes’, some of which now involve the introduction of lenses as well as effects of interception, reflection, transmission and interference of light. The pupils and followers of Thomas Wilfred are still well to the fore in this field, which they continue to term the art of ‘lunia’. Christian Sidenius pursues a vein which is closely related to spectacle in its dramatic form and content. He writes: ‘I derive a curious pleasure from the processes of composing a sequence in the theatre, and that is probably why I do it. Lumia allows me to compose a moving image, develop and control it. . . (Lumia technique) provides me with an amazingly large repertoire of imagery, plus the control of its elements to a very subtle degree.’ The engineer Earl Reiback has developed the chromatic possibilities of light projection on collecting screens as well as perfecting an audio-visual component.

The new range of opportunities open to those who continue to work on a limited scale is well demonstrated by the work of Chuck Prentiss and Valerios Caloutsis. Prentiss, who belongs to the group of West Coast artists associated with the Robles Gallery of Los Angeles, has developed light boxes which afford entirely novel illusions of space through the combination of colour and movement.



Caloutsis, a Greek artist living in Paris who held his first exhibition of light boxes at London in 1968, manages to superimpose degrees of luminosity with impressive spatial results.

● **Luminous objects in three dimensions – Chryssa, Indiana, Antonakos, Hogle, Tadlock**

There has been particularly intensive research during recent years in the field of three-dimensional luminous objects. American artists have taken a leading role in this development, sometimes making use of the light sources in such a way that the frontier between Pop art and kinetic art in their work becomes uncertain. This is the case with artists such as Chryssa, Indiana, Antonakos and Billy Apple, who have all incorporated straight or bent glass tubes filled with neon or other gases and emitting white or coloured light. The allusion to the environment in these pieces often remains on an anecdotal level, as with Chryssa's *Times Square Sky* or Indiana's *EAT sign*. Indiana illustrates this point with a fascinating passage that throws some light on the psychological



110 Steve Antonakos
Hanging neon, 1965

origins of his work. 'Signs loomed large throughout my whole life. First there was the huge round Philips 66 sign that rose high above the flat skyline of my hometown. I saw it and felt it every year of my youth there for it happened to stand, perched on two girders, on the very route that my father took to work each day for many years. It also just happened that he worked for the very company that it announced red and green against the blue sky. His sign, my sign – Not long after came EAT signs. Ubiquitous in that part of America they signal all the roadside diners (no DINE signs) that were originally old converted railway cars, taken off their wheels and mounted on blocks amid zinnias and petunias when the motor bus displaced the railroad in the '30s, and the cheap cafés (rivalled by café signs). Some of the latter were operated with strict 'home-cooking' by my mother when she had to support herself and her son during the Depression when Father disappeared behind the gasoline sign (66) in a westerly direction, leaving home and family for other signs. The son, burning to be an artist from the age of six, painted the window signs of those establishments. It was fitting that the very last word she uttered to him at her death was 'eat.'

Antonakos' *Hanging Neon* arrives at a more direct functional equation with the surrounding space, while Billy Apple has chosen the medium of neon because he holds that there is no other way of capturing the experience of pure and vivid colour in an uncontaminated form.

Artists such as McClanahan, Hogle, Willats and Thomas Tadlock remain closer to the central trends in kinetic art. McClanahan, for instance, uses light as a raw material, just as he might use stone or pigment. All materials, in his view, can be processed by the artist 'for better or for worse'. Yet he suggests that light has a privileged position since it is itself colour, and there is no other medium of which this could be said. He applies this dictum most ingeniously in a whole range of different types of statement. In his most recent works, such as *Flame On*, *One Two Three*, *Cloverleaf* and *Star Trees*, light is used to produce a chromatic dematerialization of the aesthetic object in space.

Richard Hogle treats light in a similar way in his plastic *Light cubes*. Steve Willats, on the other hand, regards the use of artificial light primarily as a means of isolating sets of stimuli. 'Darkness does this most conveniently,' he writes, 'and enables me to keep my stimuli constant.' Willats is particularly concerned with the relationship between the artist and his environment, and with the connections between artists and the 'control mechanisms' of society. He sees the art object as a means of communicating a particular set of ideas: the observer is placed in a situation where he can identify with an omni-directional object and so temporarily achieves this state himself. When the observer thus becomes an integral part of the object, the artist is able to isolate certain stimuli and so provide a controlled reference frame in constant movement, which the observer is obliged to follow.

The American artist Thomas Tadlock also began his experiments with a series of exercises in light and movement. He later developed his *Kinetic Light Constructions*, which employ patterns of light built up from small squares and rectangles turning on a central axis and using rotary symmetries. Other works such as his *Marijuana equipment* or *Freak lights* involve various patterns ('logistic or illogical') which are related to musical sound – either in direct synchrony or

purely at random. Tadlock's research has been painstakingly developed over a large number of months, and its most recent achievement is the unprecedented *Archetron*, which employs electronic devices to produce endlessly changing fragmentations of the image on a television screen. Here, as in the work of so many other contemporary kinetic artists, the conjunction of image and sound already borders upon the realm of the spectacle.

● **Spectacle – Light/Sound Workshop Leonard, Snyder, Stern, Tambellini**

There are many different degrees of spectacle, several of which have been explored in recent lumino-kinetic research. Slide projections, perforated cards and colour transparencies are some of the many techniques which are involved. The trend had definitely been towards the introduction of other human senses besides that of vision, and towards a stage where the spectator himself provides the element of performance. In England, the Light/Sound Workshop which has been established by the Hornsey College of Art has been developing techniques of projection on to an architectural scale. Clive Latimer, Michael Leonard and Dennis Crompton have been the main organizers of the programme, which also involves a large number of students. One of the first completed projects was an automatic light projection machine which involved various devices for modifying the image and covered a sweep of 180° in cycloramic projection. Careful study enabled the group to increase the power of the light sources by successive stages. The automatic projection head, which is a little similar to that of H. W. Müller's *Machine M*, has been developed for programmed control. The actual machine is dependent on multiple edge-driven discs, which carry the optical material and allow permutations of speed in both clockwise and anti-clockwise directions as well as a stop-start control. The programmed control also extends to the groups of linked projectors which provide complex sequential developments.

The Light/Sound Workshop, under Clive Latimer, has exhibited at the Museum of Modern Art, Oxford, in 1967, where the complete range of their research was on view. Another exhibition took place at the Young Contemporaries show, London, in 1968. Here the main feature was an assemblage of eighteen screens arranged in depth and programmed from twelve automatic projectors according to a fourteen minute time cycle. This work also incorporated synchronized multi-source sound.

Michael Leonard is now experimenting on his own with various light projection techniques. His *Test Rigs* have been developed to allow maximum flexibility in the design of light projections: all elements, including lights, lenses, and patterns can be moved on three basic axes. Leonard has also built a number of projection machines, the last of which has a three-way optical head which can be programmed electronically. His largest machine to date employs no less than 70 projectors which are electronically programmed according to a 15 minute cycle.

Apart from machines of this type, various other methods of projection have been practised in the field of lumino-kinetic art. The American artist Don Snyder has used painted slides of remarkable brilliance which are projected simultaneously from two or more machines and dissolve and strengthen in

111 Thomas Tadlock
Archetron, 1967-8



programmed sequence. Earl Reiback has projected images from small slides which are coated with multiple layers of crystalline, organic chemicals. Jackie Cassen and Rudi Stern have used their 'psychedelic visuals' to simulate experience under LSD in a *Trips Festival* held at New York's East Village in 1966, as well as contributing 'Kinetic lumia visuals' to a production of Stravinsky's *The Rake's Progress*, which was presented by the Opera Company of Boston in 1967. Gustav Metzger, the English pioneer of autodestructive art, has made use of slides coated with a crystalline substance which is transformed by the operation of the heat from the projector. The German artist Manfred Kage also makes use of chemical action which causes permanent transformations in the coloured liquids through which he makes his projections.

Other artists who have used slides in a more straightforward way are the American Aldo Tambellini, who uses translucent paint and inks on glass to produce his images, and Marian Zazeela, who transfers abstract calligraphic drawings on to black and white photo transparencies and adds layers of green and red.

● **Involvement of the senses – Dvizdjenije, Goodyear, Martin, Lye, Jones**

But the most important step towards the achievement of 'total' spectacle lies in the kinetic development of senses such as hearing and smell. The Dvizdjenije group of Moscow have been working on this problem for several years, although their more recent achievements seem to lie more in the field of public spectacles and theatrical environments. Robert Rauschenberg, who certainly cannot be classed as a kinetic artist but whose preoccupation with human action and environment follows a parallel road, has used the human body as a conductor of electricity. His aim is to make the participant aware of his whole body and his physical location. Much of the recent work of the Brazilian artist Lygia Clark, who received a large retrospective at the 1968 Venice Biennale, is directed towards a similar objective. A recent demonstration at the Stedelijk Museum, Amsterdam, involved an elaborate arrangement of microphones and sound filters, which offered electronically controlled light responses to the human body in action. Other attempts to involve the various senses, and even the whole organism, in the kinetic work include experiments with heat by John Goodyear and Paul Matisse, with corrosion and fire (*Fire Works*) by John Van Saun, and with modular light programming control consoles by Tony Martin. Len Lye is now looking for a basic correspondence between sound and the qualities of movement which have preoccupied him up to this point in his kinetic film and sculpture. Howard Jones' *Sonic pieces* have achieved a remarkable fulfilment in the *Sonic Games Chamber*, which he contributed to the *Magic Theater* exhibition at the Nelson Gallery of Art, Kansas City, in Summer 1968.

Goodyear's preoccupation with heat is the result of a series of experiments involving light reflections, moving grid elements and transparent plastic effects. The gradations of heat in his new works produce an entirely original aesthetic emotion in the participant who is often taken completely unawares when he touches the object. Paul Matisse uses heat in a less direct way. Currents are produced in a liquid which is warmed from the bottom and the liquid eventually



112 Howard Jones
Skylight Two, 1966

rises. Every once in a while, the heat is turned off so that the flow is reduced and becomes more easy to follow. These particular works have been mass-produced under the title *Kallirosopes* (from 'kalliroos' = beautiful-flowing and 'skopein' = to see). Matisse is only interested in reproducing *natural* effects, in creating works where the 'active artist is nature alone, the stage-setter having left the scene'.

The development of Tony Martin is in many ways typical of the careers of a number of North American artists. He had an initial training in music, began painting in 1955 and started working with light in 1960. He lived in San Francisco from 1961 to 1967, where he was able to develop techniques of light composition with the San Francisco Tape Music Center. Many of his original compositions were performed at universities and museums in Canada and the United States during this period. He designed the well-known light shows at the Fillmore Auditorium, San Francisco, and the Electric Circus, New York, which have played a substantial part in associating research in light and movement with the life of the community without passing through the accepted cultural channels. Most of his innovations, including the electronic consoles which he uses for the programming and control of light, are connected with his deeply serious attempt to find an imagery which corresponds to sound. The spectator takes his decisions within an environmental context and according to four parameters which correspond to the four natural elements – air, earth, fire and water. An integral part of his method is that all these parameters should be detailed in the score. If we consider the scope of his experiments, it seems hardly surprising that he should insist on the necessity for large spaces. He hopes to build a Planetarium where new possibilities could be explored.

Len Lye is planning a similar construction to demonstrate his extremely varied research into new kinetic media. This is conceived as a 'temple of lighting', in which the dominant feature would be the hypnotic effect of the presence of unusual energy. Len Lye thinks that in an environment of this kind the kinetic and the psychological will become intertwined, and the distinction between the static and the kinetic image abolished: instead, it will be the 'skull which will resonate.' The 'old brain' will come into its own. In effect, Len Lye's artistic philosophy resides precisely in the development of the 'old brain' through kinetic means. He holds that the only source of information for the creative imagination is the organic and physiological basis of all creation – the genes. He is constantly conducting experiments to demonstrate the basic correspondences between the resonance and vibration of materials and the properties of sound. But it must not be concluded that the auditive properties of steel, for example, are the only areas of interest in one of his compositions. The visual effect, which stresses the poise and balance of the construction, is usually dominant, and the sound is merely a by-product.

While John van Saun attempted to capture 'the pure essence of electric light' in his original *Light Boxes*, Howard Jones began in a vein that was not very far from Pop art. His first works in this medium were sometimes monochrome and sometimes incorporated a painted human silhouette. Elements of sound and flashing lights was also included in the programme. Jones' *Sonic Games Chamber* is concerned almost exclusively with sound, although it is the shadow of passing

spectators that releases the various tracks. Ralph Coe has written: 'The sonic range, from screech fragments to thuds to booms, can be controlled by the body empathy of the participant as he moves in any number of patterns and ways. The sound-controlled viewer becomes himself the object of a sonic game, and even steps into his own sound patterns, since he may activate speakers behind him as well as before him. One hesitates to speculate on the quality and number of sonic combinations possible within the chamber at varying times.'

It can therefore be seen that developments in audio-visual research, and attempts to combine other senses than that of vision in the kinetic programme, are leading to new possibilities in the realm of spectacle. The new 'polysensorial' art has been demonstrated at a number of manifestations or *events* – the distinction between the event and the happening being the crucial point that the event can only take place after a long period of preparatory research while the happening is essentially unprepared.

● EAT, USCO, Mefferd, Piene, Durante, Lacroix, Ascott

One of the most important of these events extended over nine successive evenings in October 1966. The building where it took place was the Armory of the 69th Regiment on the corner of 25th Street and Lexington Avenue – the site of the famous Armory show in 1913. The performances were designed to demonstrate the relationship between theatre and engineering, and the chosen materials were to be light, movement and sound. Billy Kluver, a physicist working in laser research, was the leader of the whole project, which involved the cooperation of Robert Rauschenberg, Oyvind Fahlstrom, John Cage, Steve Paxton and Lucinda Childs – and others – as well as several highly qualified engineers. The relationship between art and science was demonstrated in such items as Rauschenberg's aesthetic programming of a game of tennis. In Rauschenberg's, tennis was movement, and in the context of theatre it could be seen as a formal dance. It could also be used to control various sequences of lights and to produce combinations of sound that resembled orchestration.

This group of performances represented one stage in the development of a large undertaking known as *Experiments in Art and Technology Inc.* (EAT). We shall return to this organization and consider its work in fostering cooperation between artists and engineers at a later stage in the chapter.

Other manifestations of this kind which could be classed under the general heading of spectacle are the many performances involving light and movement which combine slide or film projections with the movements of actors and with music. Such enterprises as Pierre Henry's 'Pour le temps présent' and La Monte Young's concerts in the Theater of Eternal Sound might be mentioned here. Nan Piene refers to the theatre which Stan Vanderbeek built in his backyard. Vanderbeek's 'Movie-Drome' is hemi-spherical in shape, and acts as a diffusing screen for films, moving spotlights and slides. Sound and even ballet performances can be integrated with this spectacle.

One recent characteristic of kinetic experiments throughout the world is the insistence on an interplay of strong sensations which the spectator is often expected to register in a lying position. The intense atmosphere of almost religious con-

templation contrasts very strongly with the attempt to rouse the spectator to physical action which tended to be foremost in this field until recently. The USCO group of New York, which is composed of poets, film-makers, artists and engineers, defines its communal identity in the following terms: 'We are all one, beating the tribal drum of our new electronic environment.' Many of their works are enshrined in the USCO tabernacle at Garnerville, New York. But they have also performed 'Be-ins' across the United States, created an audio-visual multimedia 'World' comprising 21 screens in New York, and set up a *Strobe Environment* (1967).

The *Magic Theater* exhibition at Kansas City, from which the project by Howard Jones has already been described, also involved an unusually penetrating use of strobe lights. Boyd Mefferd's *Strobe-Lighted Floor* was an entire room with an elevated and carpeted floor, from beneath which strobe lights flashed at random through translucent panels. In the words of Ralph Coe: 'The squares of light appear in the mind's eye and travel in sequential directions – to anywhere. They will travel along the ozite covered floor, rise vertically, rest on one's clothing, then pass away. At times they seem capable of being touched. For a while they can even be recalled to mind. Then they travel off into a mental existence of their own, having filled the Magic Theater's thesis of psychic bombardment.'

The German artist Otto Piene has also been working on plans for a light spectacle over a number of years. He has actually realized 'light ballets' and is at present planning a 'light theatre'.

Naturally this polysensorial aspect of kinetic art requires a large degree of disciplined control. This it certainly receives from an artist like Armando Durante, who is primarily interested in the visualization of sound, and utilises a whole range of very modern techniques – generally programmed electronically – for his purpose. Durante has, for example, made wide use of television sets, with and without colour effects and direct light or sound. The audio-visual effects which he obtains are among the most intense to have been produced in this field of kinetic art.

In many of these experiments, it is difficult to decide whether it is the element of polysensorial performance, spectator participation or simply that of the unified environment which predominates. An artist like Richard Lacroix of Montreal manages to work successively and even simultaneously in all three directions. In 1964 he was the co-founder of a local group which included the critic Yves Robillard and was entitled 'Fusion of the Arts'. This group produced an impressive kinetic sculpture involving light and sound for the Canadian Pavilion at Expo 67. In 1968, Lacroix himself designed his *Diamond Point*, a kinetic light sculpture extending to fourteen feet in height, whose movements were determined by the sounds of aerial traffic at Montreal International airport. He has also completed a number of sculptural and kinetic musical instruments which involve the active participation of the spectator. These are known as *Les mécaniques*. Dorothy Henaut has described them in the following terms in an article for *Arts Canada*: 'Spotlight on a slowly revolving instrument, the *Rodrigo*, whose octagonal delimitation of a circular area is defined only by the sliding action of scores of metal washers. Coloured lights reverberate on a tall undulating sheet

113 Richard Lacroix
Diamond point, 1968. Height 36 cm.
Movement directed by sounds of aerial
traffic





114 Richard Lacroix etc.
('Fusion des Arts')
A kinetic light and sound plastic structure,
1967

of stainless steel, *La Fefeuille*, vibrating deliciously as thickly padded drumsticks beat electrically with studied alternance... Musicians, suddenly inspired, rise up and move on stage from the audience.'

The English artist Roy Ascott provides an interesting basis of comparison with the work of Lacroix and the *Fusion of the Arts* group. In Ascott's view, the trend towards applications which involve all the senses and combine features of artistic genres which were formerly separate, can be explained in terms of the growth of a 'Cybernetic vision'. He writes: 'Modern art is characterized by a behaviourist tendency in which process and system are cardinal factors. As distinctions between music, painting, poetry etc. become blurred and media are mixed, a *behaviourist synthesis* is seen to evolve, in which dialogue and feedback within a social culture indicate the emergence of a *Cybernetic vision* in art as in science.' His theories were effectively demonstrated in the retrospective exhibition of his work, entitled *Ideas and Edges*, which took place at the Laing Art Gallery, Newcastle-on-Tyne, in 1968.

● **Environment – Soto, Cruz-Diez, Hausmann, de Clercq, von Graevenitz, Oster, Landsman, Bell, Stafford, Haacke**

Since 1965 there has been an almost universal tendency among kinetic artists to enlarge the physical size of their projects, and even to conceive them in direct reference to an existing or prospective space. This is how the difficult concept of the 'environment' has come into use. The term can be made to refer to purely physical dimensions, or it can acquire a psychological flavour. It can be used in a strictly architectural sense, to designate a narrow internal space, or it can be extended to cover the cosmos. It may simply refer to the space which encompasses man. But there is always the implication that this space can modify or even determine the evolution of man's life and character.

Whichever of these definitions we are inclined to choose, we must recognize the fact that kinetic artists have found the term environment exceptionally useful in the theoretical background to their work. They realize that they are not simply extending their statements to an amplified scale, but also bringing them into a definite relationship with the movements, actions and reactions of their public. The space occupied by the work and the space occupied by the spectator are no longer separate. Thus a subtle game between illusory space and real space, between illusory movement and real movement, is established. The frame which was the artificial barrier around the plastic arts is completely superseded, and the way is left open for union with the spheres of architecture and town planning.

The strictly aesthetic areas which artists have investigated in recent years include those of the interior and the exterior, and the near and the far. Works have been developed in function of some specific space which the spectator can approach on his own terms, or even penetrate. Old-established kinetic artists like Soto and Cruz-Diez have proceeded in this direction, without accepting all the implications of the term 'environment.' Soto's *Pénétrables*, which are forests of metallic strips that the spectator actually penetrates, are intended to provide an idea of the totality of relations in the world. Man is thrown into the totality of space and must accept it as his own element. Mention has already

been made of Cruz-Diez' experiments in conditioning and deconditioning through colour. The spectator is given successive experiences of blue, red and green within an area that is free from any other colour stimuli. Finally there is a demonstration of the simultaneous effect of additive, reflective and subtractive colours, which not only encompasses the spectator but also thoroughly penetrates his consciousness. Cruz-Diez has therefore rejected the notion of an active environment as an end in itself, since it runs the danger of becoming merely decorative or merely 'psychological'. In place of this, he favours the use of a confined space to provoke successive *situations* which are themselves liable to give rise to chromatic *events*.

These particular examples of the recent work of Soto and Cruz-Diez help to demonstrate that the importance of the 'Ecole de Paris' in kinetic art has by no means diminished in recent years. If the main emphasis of this chapter rests with the artists who are working in America and England, this is simply because the majority of important kinetic artists working in France have already been dealt with in previous chapters. The latter can be fitted with greater ease into the historical framework of kinetic art, while the former are dispersed over a much wider area and necessarily present a more heterogeneous picture.

While Cruz-Diez implicitly rejects the use of light environments for decorative purposes, an artist like Hausmann is directly concerned with the decoration of an internal space. His work in the theatre at Ingolstadt succeeds in integrating a kinetic statement with the architectural space which serves as a background to the dramatic performances. Gyula Kosice has completed several schemes in Argentina, which achieve a particular impact in their environment. His materials have in most cases been light and water in motion. Gyorgy Kepes, an important pioneer in the art of light, completed his *Light Mural* for the New York offices of KLM in 1959. The complex array of moving spotlights, fluorescent tubes and incandescent lights, which perhaps suggests night flights over cities, appears through perforations in a painted aluminium screen.

Hugo de Clercq's sculptures, which combine elements of vibrating aluminium, steel and perspex in a natural environment, are characteristic of a number of other Belgian artists, such as Leblanc, Yves de Smet, and Verstockt. All are anxious to make a complete break with the enclosed world of the galleries and museums, and to apply art more freely in the human environment.

In Germany there have been some notable examples of the application of kinetic art on an architectural scale. Gerhard von Graevenitz has devised a 'kinetic wall' which is a thirty-foot long expanse of moving white light. Piene has completed a successful facade of 'sculptured' light, which is operated by a programme, for a store in Cologne.

In North America, there have been experiments such as those of Gerald Oster, whose *Instant Self Skiagraphy* (1967) floods the room with light and subsequently retains the shadowy impressions of passing objects and people. But the most interesting tendency seems to involve the artist in creating a definite space or 'cube' of light. Dan Flavin can hardly be considered as a kinetic artist, since his aim is simply to instal a coherent system of fluorescent light. He has no wish to set up a stylistic or structural development of any significance. Boyd Mefferd, on the other hand, uses electronic circuitry in an attempt to transcend the spatial

limitations of the environment through light. In his view, light is equivalent to time itself. His sequences of light and colour are therefore designed to act directly on our perception. Mention has already been made of his contribution to the *Magic Theater* exhibition.

The American artist Stanley Landsman is also in favour of great purity of style and condemns what he calls 'carnival-happening orientated art and cabaret-type environments.' Such works as his *Fuji Raku* and *Damte* assume environmental proportions through his use of aluminium-coated mirrors, which multiply the small points of electric light to an almost infinite degree. Charles Ross works with the reflective and refractive properties of light, which he concentrates in his characteristic prisms. Mineral oils and distilled water can be used to give particular purity to these devastatingly simple forms, which are usually arranged in linear or geometrical sequences. Ross' work is equally effective in outdoor or indoor space, under natural or artificial light. In both circumstances the environment is subtly transformed by the almost unobtrusive presence of the prisms.

Larry Bell works in a slightly different vein, using his cubes to create remarkable colour effects. The observer first notices a cube composed of plates of coloured glass. Each face is different in colour, according to whether it has been covered with gold dust, platinum or rhodium. But soon the transparent surfaces of the cube allow the hidden faces to appear as well, and a second interplay of surfaces and colouring is set up. Finally the cube takes its place in the surrounding space, but the irony of its situation is not lost since the contradictory spatial clues remain.

James Stafford's *Environmental machine* (1966) saturates space with coloured light, while Michael Hayden has collaborated with other members of the Inter-systems group of Toronto in producing a series of environmental experiments which go a long way towards the ideal of a 'total' experience. He refers to this enterprise as the 'presentation of many artistic expressions within a unifying bond.' The environmental element is implied in his concern with working in 'relation to modular area systems.' For example, he and his colleagues hold that an art gallery should itself be a work of art. The separate galleries should each bear a particular relation to the central context. The 'gallery environments' which are thus established within an overall environmental structure are designed to provide the public with the greatest possible degree of choice. Poetry and music are both integrally involved in the light projections, which consist of programmed sequences of strobe lights and coloured slides. The entire performance is achieved with the aid of computers, electronic sound and chemical devices. The Inter-systems group is also planning a 'Mind Excursion Centre' which will make full use of modern developments in technology: 'space that seems to change; sound and lighting that interrelate in strange effects; visual material that ranges from mirror finish to confetti; and even smell and touch.'

Many of the North American artists who are using the environment in ways similar to this owe a great deal to the influence of Allan Kaprow. But it is difficult to class Kaprow's experiments within the context of kinetic art as Katharine Kuh does. For example, the *Garage environment* (1960) and the *Environment in the courtyard of Martha Jackson Gallery* (1961) are only very remotely

connected with time and movement as they are understood in the plastic arts, although they have a definite theatrical component. Not even the *Four-room environment* created by the USCO group at the Riverside Museum, New York, in 1966 or the *Environment* created for the Architectural League, New York, in 1967 can be properly associated with the history and development of kinetic art, or classified under the term kinetic.

Stephen Bann has already drawn attention to the difference implicit in an art that could be termed environmental between at least two very different types of work – the ‘anxious’ object which points to a disproportion between the work of art and our environment and the ‘secure’ object which serves as a natural extension to our exploration of space. Moreover he makes a distinction between Environmental art, on the one hand, and environmental Art, on the other. The former establishes an environment on its own terms, while the latter only animates the existing environment. Recent work by kinetic artists who use these categories has borne out these distinctions and carried them to a further point.

In effect, it may now be possible to sort out the data for a new art of environment, which would range from the plastic event to possibilities of radically transforming the urban landscape. The artists who are working in this field are concerned with man’s direct and incidental effects on his surroundings, with possibilities of coming to terms with – and even modifying – the atmosphere, and with such problems as the investigation of indoor and outdoor space, the near and the far. For this new art to be genuinely kinetic, it is not enough that optical, physical or luminous movement should be playing an essential part. There should also be a degree of precision and functional aptitude in the research and in the final product. These are characteristics which have marked most of the successful achievements of modern times, whether in the scientific or in the artistic field.

There is thus an increasingly evident line of demarcation between the ‘environments’ or happenings which are mounted to demonstrate anecdotal or otherwise haphazard aspects of everyday life – and frequently involve ‘anxious objects’ – and the kinetic art of the environment which, on the contrary, seeks to make use of precise items of knowledge and actual patterns of sensation that can be regarded as giving change the status of an aesthetic factor in man’s psychology. Kinetic artists of this type are often chiefly concerned with this kind of relationship between the physical and the psychological phenomenon, which they regard as a means of bringing the spectator as close as is humanly possible to such basic plastic elements as movement, light and colour. The spectator can then be induced to pursue his own activities in a space or series of spatial situations which symbolise his wider environment.

There are, however, interesting borderline cases in the art of environment defined according to these principles. Hans Haacke, who has already been mentioned for his work with feathers and balloons – moving in a confined space in response to the wind of an electric fan – has managed to transpose such small-scale effects into an extensive demonstration held at Central Park, New York, in which the sky-line was modified in an extremely poetic way. In this case Haacke confined himself to natural phenomena. Filko, on the other hand, represents the so-called Happsoc (social happenings) exhibitions which have taken place in Czechoslovakia. There is a strong constructivist tradition in that

country, represented in particular by the Synthesis group of Prague and Milan Dobes of Bratislava. Filko moves away from this tendency to some degree in his *Universal Environment*, which offers the spectator a modern universe conceived in his own dimensions and adapted to his basic needs.

● **New roles for the spectator – Group Effekt, Cinétisme – Spectacle – Environnement at Grenoble**

The problem of the role of the spectator is a recurrent subject of interest for many of the kinetic artists of our generation. For this reason it is perhaps worthwhile to enumerate several of the most recent solutions to this problem. But first of all it is necessary to emphasize that the original approaches to the problem now seem to have been superseded. The methods of activating the spectator which were inaugurated by Agam, taken up in the first projects of the members of the Nouvelle Tendance, and reflected in the work of such individual artists as Roy Ascott, have given way to a new phase which is dominated by the concepts of surprise, instability and – in particular – the game.

Collective works, or confrontations between the group of artists and the group of spectators, seem to be best adapted to this new situation. For example, the Group Effekt of Munich has devised a series of confrontations in which the spectators are able to exercise their physical and intellectual capacities on a wide front. A new development in this field is the habit of forming groups of this kind for a single occasion or project. This took place in the planning of the exhibition *Cinétisme – Spectacle – Environnement* at Grenoble, for which a number of groups were constituted with a specific project in mind. A Franco-Italian group, a Swiss group, an English group, a German group and a group from Venezuela took part. The Franco-Italian group worked on a series of suspended statements, which were designed to be placed in the mobile auditorium of the Maison de la Culture, and went under the general title of *Propositions pour un espace en rotation*. The Groupe de Recherche d'Art Visuel of Paris, which formed one half of the group in question, concentrated on a *Parcours en mouvement continu*, which obliged the spectators in negotiating highly-coloured balloons, aluminium rods and other suspended objects while moving ineluctably forwards. The Italian team, which consisted of Boriani, Chiggio, Colombo, Devecchi and Mari, called their contribution *Percorso a passaggi programmati*. Visitors were obliged to pass through cut-out silhouettes, placed judiciously at varying distances, while sounds and flashing lights provided an accompaniment. The public response to this project was immediate and 'total', with very little distinction between age groups.

● **The kinetic artist in modern society – EAT, Centre for Advanced Study of Science in Art, Kowalski, Tsai, Larrain**

It would seem that an experiment of this kind points the way not only to future types of spectator participation, but also to the artist's new role in modern society. The formation of groups presents many difficulties, on a sociological, aesthetic and psychological level. But it is probable that the solution lies, at least on the sociological level, in the cooperation of different artists for a particular

115 Stano Filko
Universal environment, 1966–7



116 Hans Haacke
Sky line, 1967. White helium-filled
balloons, approx. 250 yards long



project. Of course groups of this kind can serve as a model for more radical forms of organization, which might involve scientific, industrial and architectural representatives. This trend is well illustrated by the evolution of the Czech 'Synthesis' group, which consisted of ten kinetic artists in 1964, but now comprises a composer, a choreographer, an architect, an electronic artist and industrial designers among its nine additional members.

Team-work between artists and engineers has in any case already become a reality. This is due partly to the artists' desire to explore the relationship between art and science, and partly to their wish to harness the new technology in their research. Often the impulse may come from the other side, since many scientists show great interest in contemporary artistic developments even if others tend to regard art simply as an emotional domain. A number of successful attempts have been made to establish permanent relationships between the two fields. *Experiments in Art and Technology* (EAT) of New York see their role principally in the establishment of personal contacts between artists and engineers – what they refer to as 'matching.' They have no intention of setting up libraries or purchasing equipment, since they consider that existing libraries and laboratories are quite adequate, and only require to be used more fruitfully. But they are organizing courses at which artists can acquire the necessary technical and scientific knowledge. They also intend to raise funds which are needed for the use of computers and television equipment. In effect, they are not so much promoting art as making materials available. As Billy Kluver, the director, puts it: 'The system employed in the matching is the constitution of local groups, but one of the problems lies in the fact that, although by 1968 four hundred engineers all over the United States were interested in this cooperation, most of the artists were domiciled in New York. Moreover the different specializations of the engineers did not all correspond to the technical needs expressed by the artists.' In spite of this difficulty, projects such as the laser research of Denis Darragh, of Vancouver, and Bernard Kahn, of New York, have been helped considerably by this organization.

Another institution of a similar kind is the Centre for Advanced Study of Science in Art, of London. The priority in this case has been given to the establishment of a technically well-equipped laboratory in which artists can work on special projects. Marcello Salvadori, the founder of this centre, was engaged in 1967 on the advanced stages of a kinetic building. This was to have a stainless steel structure, in the form of an asymmetrical dodecahedron, and was to be covered with plastic panels. Some of the panels were to be specially treated so that they produced a sequence of rainbow colours varying in intensity throughout the day. Others were to be of photometric glass which darkens as the light outside becomes stronger. Of the other members of the centre, Raymond Connor is using sound vibrations to produce gratings for use in his three-dimensional work. He has already completed *Artifact*, a device which is intended to simulate some aspects of human behaviour. The behaviour pattern is derived from a suitable matrix – an array of numbers used in mathematics to specify the transformation of a vector. The observer chooses and imposes his frame of reference on the assembly. Another member, Michael Milne, is engaged on research into the structure of materials. It should be noted that the centre operates in collabo-

ration with various outside bodies and institutes.

A large number of individual kinetic artists have established direct contact with laboratories or industrial groups in order to complete special projects or to further the general course of their research. In the case of Schöffer and Takis, the prototype of an art object which can be manufactured industrially has been the result of this cooperation. This seems to be the most satisfactory route for the production of the kinetic 'multiples' – works that are generally of reduced dimensions and have tended up to now to be distributed in strictly limited numbers by private galleries.

The problem of finding an adequate framework for the development of kinetic research in conjunction with modern techniques still awaits a satisfactory solution. Artists such as Kowalski, Tsai, Nam June Paik, Gilles Larrain, Gerstner, Luccioni and Couchot are already so advanced in their plastic research that their future progress can only depend on their having access to an extensive and well-furnished laboratory. Kowalski's use of the facilities of the North American Aviation Company at Los Angeles is an astonishing example of the possibilities which lie before the modern artist. Adapting their technique of moulding metal through the force of dynamite explosions, he has been able to obtain polished steel structures of up to 7.50 m. in height. The principles of the experiment were, in the first place, to make an absolutely *direct* use of the source of energy; secondly, to explore a system that would instantly 'condition' an intractable material, and thirdly, to show that the kinetic artist can work in any dimension.

These principles are reflected in the whole range of Kowalski's work, which illustrates the same basic concept with the aid of a multitude of different materials. His *Manipulator*, *Oscillograph*, high neon sculptures, *Sisyphé géomètre* (involving different coloured gases), and even his development of the simple plastic theme of the cube, all go to show that he has no difficulty in proving that art and technology are based on common premises.

Tsai, an American who was born in China, is moving rapidly in the same direction. His *Kinetic Wall*, which was shown at the Amel Gallery in 1965, consisted of dynamically integrated multiple constructions – in his terms *Multi-Kinetics* – to a total of thirty-two units, each of which contained a particular configuration of multi-coloured gyroscopic forms. Willoughby Sharp has written that 'Tsai has created an active environmental field that could be infinitely extended... By controlling the time sequence of each unit and skilfully composing them, Tsai has used engineering principles to achieve aesthetic ends.' In 1968, Tsai started to construct *Cybernetic Sculptures*, consisting of stainless steel rods in constant motion in an electronically activated environment filled with high-frequency lighting. Here the apparent motion is controlled – as in Rauschenberg's experiments – by the electrical charge of the viewer's body, as well as by the volume of his voice. The visual effects range from rapid and agitated motion to slow undulations. It was noticeable that when these sculptures were exhibited at the Howard Wise Gallery, New York, in May 1968, they took on the visual characteristics of three-dimensional solid forms in slow motion. They appeared to be merging into one another's space, 'making a visual reality out of a physical impossibility'.

Another exponent of Electronic art is the Korean, Nam June Paik, who is

117 Kowalski
1965. Sculpture produced with the aid of
dynamite charges, Los Angeles



working – like Thomas Tadlock – on the deformation of television images. John Cage wrote in a preface to his work: ‘What is this thing called Art? TV? (Everything at once, no matter when/where we are?) On video-recorder Paik records Pope – validity or *raison d’être* for society – making an electronic fact event.’

Gilles Larrain has used plastic, fluorescent paint and mercury lighting; Gerstner has operated his light sculptures according to a punched-card system; Luccioni and Couchot have made use of photo-electric cells and electronic circuits, while Mariano Carrera strongly upholds the view that art objects should be produced on an industrial scale. All of these artists need to establish a permanent liaison with science and industry, and to find a common laboratory where they can elaborate their electronic and cybernetic devices. But there are important signs that the use of the machine in art is giving place to a genuine art of the machine. Max Bense, Abraham Moles and Kurd Alsleben, among others, have recently contributed to a book of essays on Computer art. By the end of 1968, two important exhibitions on this theme will have taken place – *The Machine* at the Museum of Modern Art, New York, and *Cybernetic Serendipity* at the ICA, London.

Now that these various aspects of contemporary kinetic art have been explored, it remains open to question which one of them leads most confidently towards the future. Can we predict with any degree of certainty the further developments in kinetic art? At least one principle is clear from the outset, although this is negative rather than positive in its implications. The work of art as we have known it is becoming less and less applicable in the kinetic field. The art of the future may enter our experience directly through the perception, as in the case of Bryan Gysin’s *Dream machines*, which cause ‘mystical’ experiences through the play of interrupted light almost directly on the brain – they are to be looked at with *closed* eyes. In the same category are Agam’s *Que la lumière soit* and Schöffer’s recent *Effects*, which are the direct result of the artist’s ‘idea’. Schöffer’s projected 1150 ft cybernetic light tower for Paris also illustrates this tendency.

But other perspectives open up at the same time. Kinetic art may continue as an independent art form, develop into a polysensorial art or an art of spectacle, or even emerge as an industrial product with the increased diffusion of plastic or filmic multiples in unlimited editions. Perhaps the radical transformation in aesthetic values which is taking place may be interpreted in the sense that the work of art is becoming an open statement before it disappears altogether. The artist is becoming a researcher, while the spectator becomes performer, actor and participant. At the same time, the fact that we are moving from traditional ‘space’ through architecture and town planning to the wider environment ensures that the definitive link between kinetic art and the modern world is preserved.

Part 3





9 The typology of movement: simple procedures for the expression of movement in the plastic arts

There are at least four different ways in which it would be possible to establish a typology of movement in the plastic arts. In the first place, there might be a general classification of all conceivable types of movement – linear, circular, whirling etc. – and these could be compared directly with their counterparts in the field of art. Another possibility would be to undertake a semantic typology of movement, or classification of the themes involved. For example, the movement could be classed according to the different ‘universes’ in which these themes or motifs are included: the physical universe, whether visible or invisible, the mechanical universe, the human physical universe, the human psycho-physiological universe, the ludic universe, the universe of pure imagination, and the universe which is already within the boundaries of aesthetics (as in the case of an image of the dance used to signify movement in the plastic arts.)

Another approach would be to adopt a point of view which was confined purely to plastic values, and to classify the types of movement according to the plastic elements – colour, line, volume, texture etc. – Each of these three possibilities would present certain disadvantages. The first approach, for example, would be too general to take account of the real preoccupations of the artist: the second and third, even if considered in conjunction, would tend to introduce a distinction or even a separation between ‘content’ and ‘form’, which is bound to become artificial in any problem relating to the general field of aesthetics.

A fourth approach is possible, and this is the one which will be followed here. It consists in examining the procedures used by artists to convey, represent, suggest or introduce movement into the plastic arts. The notion of ‘procedure’ is sufficiently general to allow us to deal with the technical, semantic and plastic aspects of movement. At the same time, is it sufficiently particular to allow us to make distinctions between the various ways in which artists have approached the problem.

In establishing the relevant categories, the work of the following has been of great use: the aestheticians E. Souriau, L. Rudrauf, R. Arnheim, J. Segond,

Figuration of movement

- 1 Academic pose taken up by a model
- 2 Agitation of the characters
- 3 Simple figuration
- 4 Figuration of several successive moments in the same work (*enactment*)
- 5 Figuration by signs (symbolic)
- 6 Figuration by successive scenes
- 7 Movement denoted by external signs
- 8 Figuration of instability of characters or objects

Representation of movement

- 9 The choice of the right moment, reconstruction of before and after
- 10 Several successive moments in the same character or object (or several characters or objects synchronized in different attitudes or positions)

Formal suggestions

- 11 Contrasts between sensible data:
 - a) 'Values' (luminosity)
 - b) Colours
 - c) Forms
 - d) Graphics
 - e) Volumes
 - f) Transparency
 - g) Texture
- 12 Contrasts in the composition:
 - a) Cutting out by arabesque
 - b) Change in size
 - c) Change in axes (and displacements in relation to the diagonal)
 - d) Change in positions
 - e) Dynamo-plastic arrangement
 - f) Disequilibrium of volumes

Precise perceptual suggestions

- 13 'Striving forces' (the spectator completes the movement)
 - a) ambiguity in structure
 - b) scintillation of colours
- 14 Perceptual itinerary (viewing)
- 15 The trace of the instrumental gesture (action-painting)
- 16 Virtual movement and *trompe-l'oeil*

'Photographic' procedures

- 17 The snapshot (immobile mobility)
- 18 Superimpression and superimposition (and juxtaposition)
- 19 Photographic disjunction (*découpage*)
- 20 Stroboscopic views (decompose and juxtapose)

'Filmic' procedures

- 21 Cinematic procedures (decompose and recompose)
- 22 Filmic animation of a picture
- 23 'Ciné-peinture'
- 24 Techniques of animated drawing

Movement expressed by movement itself

- 25 Simple mechanical movement
- 26 Electro-mechanical, electronic, thermal, hydraulic and magnetic movements
- 27 Mobiles (suspended objects)
- 28 Projections, reflections, refractions of light (variations in projected colours and forms)

Various procedures

- 29 Animation of the work by the spectator (active participation)
- 30 Movement through the growth or deterioration of the material
- 31 Repetition of formal elements (permutational order)

A. Moles, R. Passeron, M. Scriabin, G. Prudhommeau, M-Th. Poncet, C. Gottlieb and M. Wahl, the art historians E. H. Gombrich and S. Giedion, and the artist-theoreticians A. Rodin, U. Boccioni, W. Kandinsky, R. Delaunay, N. Gabo, L. Moholy-Nagy, J. Itten, J. Albers, C. Lapique and J. Bazaine. Their works are cited in the bibliography.

The list of *simple* procedures in this table does not claim to be exhaustive. But it may be useful in the interpretation of the different artistic phenomena involving movement. Obviously, there are virtually no works of art in which one single procedure has been used. It would, however, be reasonable to say that there is frequently one procedure which dominates the work, whether as a semantic or a plastic element.

In the first group of procedures, which are classed as *Figuration of movement*, time is not involved. It is either absent, or it cannot be considered apart from the figuration. Procedures 1 to 8 require little comment. The 'academic pose' (1) has been adopted in both painting and sculpture, while 'agitation of the characters' is the procedure which was extremely widespread at the time of the Renaissance, and can often be equated with the use of gesture, as in Poussin's *L'Enlèvement des Sabines*. Procedures 3 and 5 are very close to one another. The theme of the rearing horse in Delacroix or of the running horse in Géricault and Degas could be classed with 3., while the surrealist use of the wheel or Redon's balloon might be classed in the other category. Procedure 4 can be illustrated by Breughel's *Parable of the Blind*, Watteau's *L'Embarquement pour Cythère* (in Gottlieb's analysis) and Marchel Duchamp's *Nu descendant l'escalier*. Figuration by successive scenes (6) is the procedure which has been generally been used in fresco painting since the Roman epoch. It has been taken up again by some of the so-called 'naive' painters. Procedure 7, movement denoted by external signs, can be illustrated in sculpture by the modification of clothing to give the impression of people walking against the wind – as in the case of the *Winged Victory of Samothrace*. Lastly, the suggestion of instability as an indication of movement (8) is well demonstrated by Degas' series of *Danseuses* in both painting and sculpture.

In the general category, *Representation of movement*, the element of time is tacitly understood. E. Souriau holds that a distinction must be made between the time which is implied within the universe of the work, and the time for the spectator's contemplation. Thus, in Rubens' *Coup de lance*, a 'dramatic' time is implied by the choice of the particular moment, whilst in the same artist's *La Descente de croix* it is necessary to reconstruct a 'before' and 'after', which gives a 'poetic' time (9). The essential feature of procedure 10 is brought out by a perceptive analysis of Rude's *Le Marechal Ney* by Rodin. Rodin suggests that the passage of the eye from the feet to the raised arm of this statue recreates the successive moments involved in the representation.

It would probably be appropriate to introduce a large number of sub-divisions into the category of *Formal suggestions*. These would correspond in the first place to each individual formal element, and also to the principal combinations of elements. Colour 'value' (or luminosity) as a simple datum lies at the basis of the types of contrast which provide an impression of movement by 'vibration'. The pictures of Turner, Whistler, Monet (*La Régate par temps gris à Argenteuil*) and Redon (his *Noirs*) are relevant examples. Colour contrasts are frequently

associated with music. Kandinsky claims that the rhythm of sounds can be transposed into painting, while Seurat attempts a 'scientific' juxtaposition of colours in addition to his application of the principle of complementarity. The same type of problem preoccupied Delaunay, who was aiming, in the view of P. Francastel, for a system of 'static relationships between elements of colour which would translate the dynamism of light', and be realized as an image in the 'dynamic circular rhythm of the colour.' It is also worth remembering that Tatlin was anxious to create 'kinetic' effects through the juxtaposition of different materials, possessing different natural colourings (his *Counter-reliefs*). Mondrian's interest in the juxtaposition of colours was directed towards discovering an equilibrium between the static and the dynamic element. At the end of his life, he made use of the dynamism of 'scintillating' colours to express dynamism in much the same way as Pinturicchio and Veronese had used the technique of *tempo*. Herbin and Mortensen both used colours in juxtaposition to create movement, the former associating them with a kind of symbolism recalling that of Kandinsky, and the latter attempting to arouse precise psychological reactions in the spectator.

The 'suprematist' work of Malevich is relevant to procedure 11 (c), since it involves the creation of different arrangements of moving forms around the diagonal axis, with the aim of establishing 'pure movement.'

The element of virtual movement in horizontals, verticals and diagonals has often been underlined. It still needs to be asked, however, up to what point the so-called 'psychological' lines which are held to form the 'secret geometry' of works really fulfil the function of capturing and directing the vision, and of obliging it to follow the gesture or glance of a person – rather than simply falling in with the accepted rules (of perspective, for example). The virtual properties of line were studied and put into effect by Kandinsky in the majority of his non-figurative works. They also formed the basis of Klee's teaching at the Bauhaus, while the Vorticists took straight lines and geometrical arcs as an expression of 'the energy of the spirit.' Of course the 'dynamizing' power of the arabesque has been brought into use at all periods and in all stages of civilization. In modern art, it is the works of Gauguin and Matisse and the various manifestations of Art Nouveau that are its most eloquent representatives.

Contrast between volumes, which is a frequent feature of modern sculpture, leads to a genuine style of positive and negative, concave and convex volumes, as in the work of Lipchitz, Henry Moore, Zadkin, Archipenko etc. Contrast between different types of transparency in materials has also been employed as a plastic effect since the early experiments of Archipenko, Tatlin and the Constructivists. 'Synthetic' Cubism is quite close to this field, in the sense that it creates movement through contrast of textures.

Besides these various contrasts which are obtained through sense data, there is another procedure requiring several sub-divisions – that of contrasts in composition (12). These contrasts may be set up by a sharp linear division, as in the case of the arabesque, which has already been mentioned for its dynamic qualities. This is one way in which personal *tempo* can be introduced into compositions – for example, those of Delacroix. The various sub-classes of this procedure – change of size, change of axis (especially in relation to the diagonal), 'dynamo-

plastic' arrangement of the figures – are to be found in the technical vocabularies of innumerable painters. In sculpture, the corresponding field would be the interplay between equilibrium and disequilibrium of volumes.

This last category has been classified by Gottlieb under the heading of 'Striving forces' (13). It belongs half-way between the class of *Formal suggestions* and that of *Precise perceptual suggestions*, in which the 'psychological' time of the spectator enters into account. If we suppose that the spectator necessarily completes the movement, we can accept this classification. But in this case, there would be a temptation to include several of the procedures already described, such as the scintillation of colours, the juxtaposition of textures, and the opposition and division of colours. Certainly the best way to resolve this question would be by experimental means.

Procedure 14, the perceptual itinerary, can be identified also with the intellectual itinerary which Klee so often provides in his pictures. Some of Raphael's works could also be invoked here, as could pictures by Breughel, Rembrandt's *Angel leaving Tobias* and the work of the Romantic painter C. D. Friedrich, especially if this category is also to include dream journeys.

Two other procedures belong with those that have been mentioned. In Procedure 15, the artist gives an impression of movement by his use of line or brush-stroke. The origin of this approach lies undoubtedly in the personal gesture of the painter, which has already become a conscious technique by the time of Van Gogh. It was to be taken up again by the Expressionist painters and finally by the Action painters. Procedure 16, by contrast, involves the restatement of what were, in the Renaissance and Baroque periods, mere curiosities connected with anamorphosis and *trompe-l'oeil*, with the modern purpose of arousing precise perceptual reactions in the order of movement. This 'virtual' movement is above all created by graphic means. But the works of the modern protagonists of 'virtual' movement – Vasarely, Agam, Soto – also involve contrasts of colour and volume. They invite comparison with certain perceptual phenomena that are well-known in psycho-physiology.

A preliminary remark is necessary before considering the *Photographic and cinematographic procedures*. There has been an attempt to discover 'photographic' procedures in plastic works before the invention of photography, and cinematographic procedures before the development of the techniques which were to make up the art of the cinema. The basic assumption behind these attempts was that a particular state of mind could exist before the actual invention of the technique. While this is a possible theory, it seems hardly probable, and this enquiry at least is confined to historically valid examples. It is equally implausible on the aesthetic plane that the artists should have limited themselves to a technique which in a sense 'fixes' the eye, without having undergone the influence of external events. The fixation of vision which takes place in the photographic snapshot can therefore be seen in direct relation to our category of 'immobile mobility' (17). Degas' *La Voiture aux courses* (1873), Seurat's *La Parade* and *Le Cirque*, and the majority of Monet's temporally treated 'themes', such as *La Femme à l'ombrelle* and *Les Cathédrales* are examples of this particular procedure.

Procedure 18, which combines superimpression and superimposition (as well

as juxtaposition), can be identified in Degas' picture, *Aux Courses: Jockeys amateurs* (1877–80), which also involves procedure 19 – photographic disjunction. The former procedure is also featured in Seurat's *Le Chahut*, as well as in Lopicque, several of the Surrealists and the majority of Futurists.

Stroboscopic views (20), which have the effect of decomposing and juxtaposing the forms within the work, are at the base of several compositions by Duchamp. This particular procedure is now the subject of experiment by photographers such as Etienne-Bertrand Weill.

The cinematic technique (21), which involves the decomposition and recomposition of the picture, has encouraged the temptation to explain sequences of narrative images – such as the reliefs from the columns of Trajan and Antonius at Rome and certain medieval frescoes – in terms of a cinematographic vision. Hans Richter's scroll paintings and the permutations on a visual theme which occupy the attention of a number of young artists seem to derive directly from the techniques of cinematography.

The actual animation of the picture according to film technique, that is to say the invention of a kind of filmic process which develops through methods based exclusively on movement of the camera and photomontage, has been developed in particular by Luciano Emmer. It puts into question the whole problem of the relationship between the plastic arts and the art of the cinema, since the least intervention by the camera seems to transform the work and place it in a completely different artistic category. It would therefore be true to say that Valensi's *cinépeinture* (23) and the techniques of animated drawing (24), which have been taken up by painters, belong on the frontier between the two art forms.

Movement expressed by movement itself has been described as an attempt to incorporate the notion of space-time into the plastic work. The origin of what has come to be known as 'kinetic art' has been ascribed to imitation of the phenomena of movement in nature, to half-artistic, half-natural works like fountains or fireworks, to works on the boundaries between art and mechanics like androids and mechanical toys, and also to the continuous evolution and final liberation of the element of movement in the plastic arts themselves.

The automata of the eighteenth century have a direct relationship, in fact, to procedure 25 in our table – simple mechanical movement. But there seems little doubt that the modern manifestation of this technique actually derives from a reaction to the machine age, which may take the form of fascination or irony. Picabia and Duchamp, in the first place, followed by such members of the younger generation as Tinguely and Kramer, have adopted this procedure in order to bring out the simultaneous beauty and monstrosity of the machine in motion. More complex effects can be achieved by the use of electro-mechanical, electronic, thermal, hydraulic and magnetic forms of movement (26), as in the works of Schöffer, Kosice, and Takis. This procedure sometimes makes it possible for the machine to replace the actor or dancer.

Procedure 27 involves a less predictable type of movement, and puts the accent on the aesthetic of the object or construction, leaving aside any form of programming or mechanical predictability. After Tatlin's suspended 'counter-reliefs' and Rodchenko's mobile constructions. Calder took over the technique

and gave it a largely playful character, drawing his inspiration from vegetable forms and from the neo-plastic research of Mondrian. Nowadays, a number of South American artists have taken up the procedure once again, making use of perspex in particular, since this is a material which lends itself admirably to the purpose because of its lightness and transparency.

In procedure 28, the main emphasis lies on variations of colour, light and form in projection. The 'ocular harpsichord' of the Jesuit Father Castel, which is the ancestor of the colour organs, dates from the eighteenth century. In the twentieth century Scriabin, Wilfred, Klein, Pesanek, Hirschfeld-Mack, Schwerdtfeger, Schöffner and Malina have developed the same basic idea in their own ways. The essential feature of this procedure lies in the changes in colour, form, and luminous intensity, which are usually projected on to a screen. When polaroid is also used, these effects can be multiplied to an astonishing degree, as can be seen in the works of Munari, Dantù and Salvadori.

In the last category of *Various procedures*, the active participation by the spectator can be a derivative of procedure 16, and result in the actual movement of the spectator in relation to the work. Agam has devised pictures and sculptures around which the spectator must follow a precise itinerary for the various compositions to unfold before his eyes. He also invites the spectator to touch and set in motion his audio-visual works. The Groupe de Recherche d'Art Visuel of Paris offer an even greater variety of situations involving purely plastic phenomena, challenging the spectator to take an active part in the development and appreciation of the works.

Procedure 30 is a rather special category. Gustav Metzger uses the slow deterioration of a sculpture or the rapid destruction of nylon sheet by hydrochloric acid in his attempt to make the effects of time perceptible. The 'organic' growth which is a feature of Medalla's work belongs to the same line of thinking: the artist makes use of the foam of a chemical liquid which is in a constant process of growth and decay.

Finally, we are putting under class 31 a procedure that is very old but has had an interesting history in recent years. This is the simple repetition of motif, theme or formal element. This 'parallelism' was developed, in one case, by Hödler, who aimed to arrive at a unity by the repetition of like parts. The artists associated with the Nouvelle Tendance have almost made a dogma out of this procedure. The *order* which the glance of the spectator follows in tracing the sequence of like elements is crucial for the appreciation of movement – and would be an excellent subject for experimental study. It is quite possible to imagine that the kinetic work of the future will be composed by a permutational machine.

How can our table of procedures be developed further, or used in its present form? On the historical plane, there are indications that the procedures used to denote movement in the same period by artists of widely differing aesthetic positions often possess curious points of contact. For instance, it is possible to make a study of prehistoric art in so far as it relates to ritual and magical practices involving the theme of the hunt: to study Egyptian art in its relationship to both sacred and profane ceremonies, or the art of the Greek vases in relation to the cult of beautiful bodies and attitudes. A similar relationship could be drawn

between the animation of tympanums, stained-glass windows and frescoes in the medieval period and the intense religious life of those times, and between the figuration of movement in the Renaissance and the Baroque and the new conception of human life as drama which arose at this stage in history.

In our own age, the coincidences are particularly striking in the period around 1910, when special attention was being given to the problem of movement and to the machine aesthetic. Cubists, Futurists, Rayonnists, Orphists, Vorticists and Expressionists may be opposed to one another in their theoretical assumptions, but they make use of similar procedures for the expression of movement. An even more relevant example for our purposes is the introduction of real movement into the works of artists which subscribed to entirely different aesthetic positions – Constructivists and Dadaists in particular. Both Moholy-Nagy and Duchamp created machines, both Rodchenko and Calder devised mobiles, both Malina and Schöffer have more recently been concerned with lumino-dynamic projections. These coincidences must surely imply the existence of some common spirit or *Zeitgeist*.

As far as the psychology of movement goes, our table is probably useful only in so far as it may throw some light on the studies of eye movement which are likely to be undertaken in the future. Psycho-analytic studies, such as that of Anton Ehrenzweig, have dwelt upon the problem of the animation of the pictorial surface by unconscious projections, but they also invoke the notion of parallelism between eye movements and movement in the picture itself. In the field of experimental aesthetics, there is interesting research on this particular problem being carried on at the Institut d'Esthétique et des Sciences de l'Art, Paris, by Molnar, and at the Cybernetic Centre, Milan, by Ceccato: both propose to establish a scientific basis for assessing the readability of signs and elementary forms. J. A. M. Howe has worked in a somewhat different direction, tending to establish that a plastic statement of rather more complexity gives rise to entirely random eye movements.



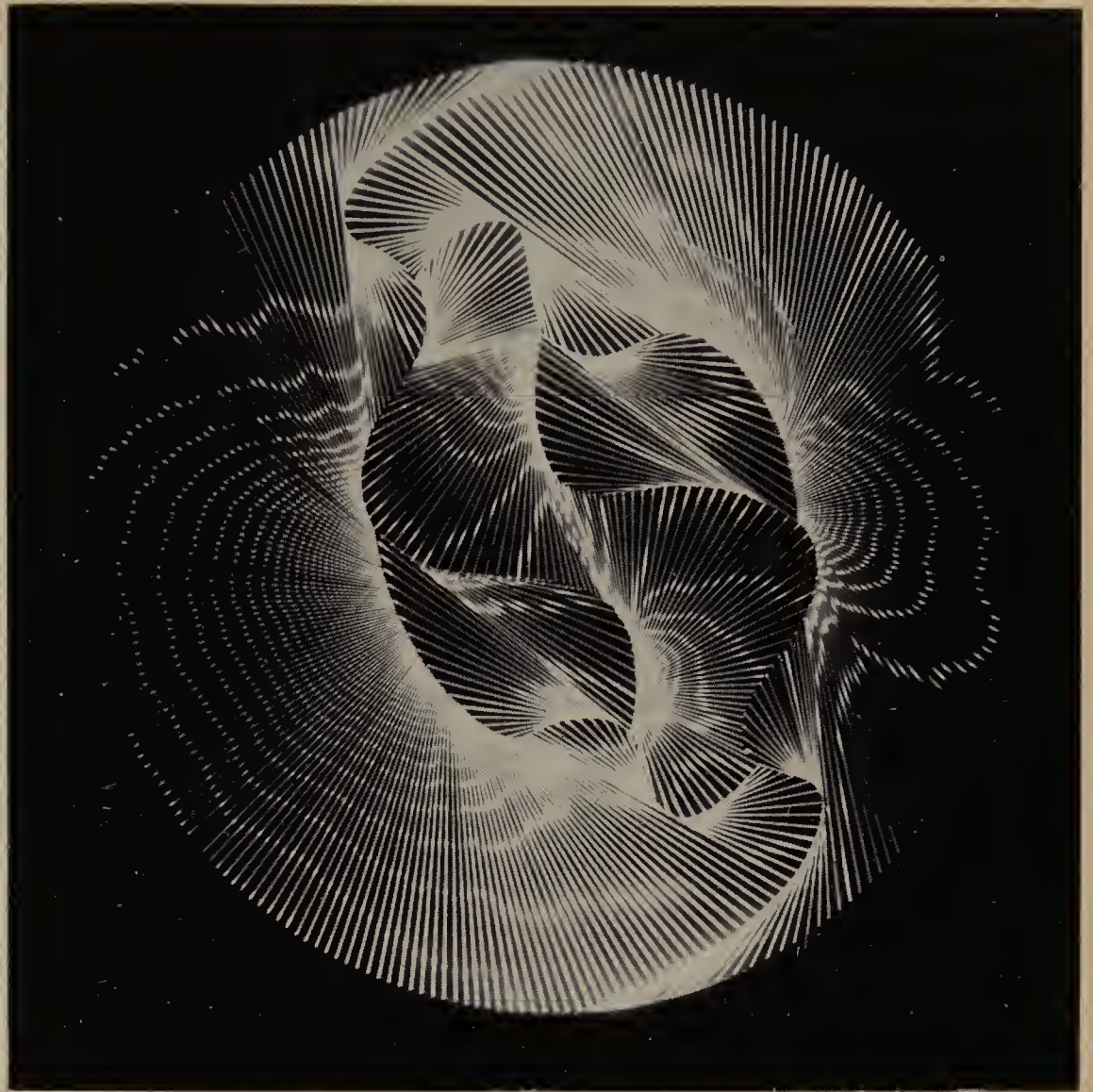
10 Sketch for an aesthetic of movement

The aesthetic of movement can clearly be approached from several different directions. As far as this study is concerned, it seems appropriate to follow up our analysis of a number of works dating from the period which began in 1860 with a statement of the aesthetic categories involving movement, and a commentary on these categories drawn from the theory and practice of the artists under consideration. The question of the spectator will have to be left to a subsequent study, when there is sufficient evidence of the effects of movement in art on the public as a whole. But some initial indications can be given from considering the reactions of observers who are also art critics, art historians and aestheticians and who can therefore be presumed to be reasonably sensitive in their attitudes.

It may be said in parenthesis that, for the conjunction of artistic intentions and spectator reactions to be of value, the development of the artist's views and the fluctuations of popular taste must be followed step by step. For this reason, any aesthetic analysis or experimental test is only valid in relation to a particular stage in the research of the artist and the visual education of the spectator. Any aesthetic research which deals with artistic phenomena should therefore involve a historical factor, the word historical being taken to mean in this sense that an artistic problem such as that of movement is posed afresh in every period, and a new solution arrived at in accordance with the historical and cultural context. Quite obviously, the urgency of the problem diminishes each time such and such a discovery is made, and the problem then remains dormant until historical or technical developments bring about a new way of looking at the subject and the old solution rapidly comes to seem out of date.

Paul Souriau showed astonishing foresight when he posed the problem of the aesthetic of movement primarily in terms of the scientific study of relationships between man's physical movements and those of the animals, on the one hand, and the perception of movement – and pleasure in movement – on the other. He held a distinctive view of the problem of the expression of movement, which involved finding up to what point we experience, in our consideration of movement, the exact counterpart to the emotion of the person who effected the movement, and what effect this sympathetic emotion might be said to exercise on our judgement. In these terms the expression of movement could be seen as the expression of ease (or grace) of movement, the expression of force or the expression of moral feeling. The perception of movement might on occasions be reduced to the level of pure appearances and subjective judgement, as if in

119 Angel Duarte
(Equipo 57) *Composition*



response to the following question: 'Does it please me, or doesn't it?' But whatever the value of appearances, 'it would be impossible to deny the existence of a special type of art which undertakes specifically to bring them out.' As the last sentence shows, Souriau performed the remarkable feat of anticipating the development of an art of movement. He also realized that this art would have to stand on a scientific and rational basis.

The importance of Bergson in this connection can be demonstrated by the quotation of a few passages on the subject of movement which are particularly significant. 'Pure change,' he writes, 'real duration, is something spiritual or impregnated with spirituality. Intuition is the quality which reaches the spirit, duration, pure change. . . There is however a fundamental meaning: intuitive thinking is thinking in duration. Intelligence arises ordinarily from the immobile, and constructs the quality of movement as well as it may from juxtaposed immobilities. Intuition arises from movement, posits it or rather notices it as reality itself, and sees nothing in immobility but an abstract, instantaneous moment which our mind has singled out of mobility. Usually it is of things - that

is to say of the stable – that intelligence is given, and change becomes an accident that is supplied afterwards. For the intuition change is the essential.’ ‘There are changes, but there are not, beneath change, things that change: change has no need of a support. There are movements, but there is not an inert, invariable object which moves: movement does not imply a mobile object.’

Benda has suggested that Bergsonism is the result of ‘equivocation on “mobility”’. He asks: ‘Is it continuity or force that Bergson is looking for? Is it the phenomenon taken in a state of *continual* change, in its *infinitely small* variations as opposed to the phenomenon taken in its *very small* – but always determined and established – variations; or is it movement, posited as the indivisible effect of a *force*, as the irreducible release of a *tension*, by contrast with any attempt to compose movement from *points* in space, with spatial notions (in which case there is nothing infinitesimal in this “mobility”)’

A defender of the Proustian method, Henri Bonnet, also questions Bergson’s theory of mobility: ‘Bergson pretends to rediscover quality by plunging us into mobility, by inviting us to wed within the depths of the self that progression of states of awareness which have ceased to be distinguished one from another. Proust uses exactly the opposite method’ (i.e. involuntary memory, which is outside time).

A. Chide, sharing the views of Bergson, considers the basic problem of philosophy to be that of the one and the many, the immobile and the mobile. ‘The motionless,’ he writes, ‘was once at the very heart of the world, but for modern science it has become a mere illusion that arises from categories vitiated at their very basis.’

Friedrich Engels took as his starting point Hegel’s statement: ‘There is no matter without movement, any more than there is movement without matter.’ From here he developed the view that movement, when applied to matter, is ‘*general change*’ and that there is ‘nothing to say about a body which is not in motion.’ In an important letter dated 30 May 1873, he wrote to Marx: ‘The study of the different forms of movement is therefore the essential object of the science of nature.’

For Sartre, movement plays an ‘unveiling’ role. ‘It is the speed of our car or aeroplane that organizes the great terrestrial masses.’ Man’s mediation is therefore necessary: we are the ‘unveilers’ but we are inessential in relation to the object which is unveiled. ‘The literary object is a strange kind of top, which only exists in motion,’ since it is reading that makes writing live.

Maurice Merleau-Ponty is ready to affirm the primacy of vision over the construction of the mind in so far as the painterly representation of movement is concerned. ‘My movement is not a decision of the mind, an absolute *doing*, which decrees, from the depths of the subjective retreat, some change in position that is miraculously carried out in extension. It is the natural consequence and the maturing of a vision.’ Relying principally on the views of Rodin and Michaux, and bringing out the well-known paradox inherent in the distinction between an arrested movement and a photographic snapshot, Merleau-Ponty then launches into a discussion on the aesthetics of movement which results in a phenomenological explanation, very much in the tradition of Husserl: ‘Painting does not seek the externals of movement – but its secret codes. There are more subtle

examples of these than the ones which Rodin mentions: Every kind of flesh, even that of the world, radiates outside itself. But whether, in accordance with the period and the school, people become particularly attached to obvious movement or to the monumental, painting is never entirely outside time, because it always belongs to the carnal.'

For Merleau-Ponty, movement, depth, colour, form, line, contour and physiognomy are the 'branches of Being' and 'each of them can lead back to the whole clump; in painting there is no separate 'problem' and there are no truly opposing paths, no partial 'solutions', no cumulative processes, and no options which are entirely closed.'

The phenomenology of Gaston Bachelard, which is based upon the emergence of images and not upon an analysis of discourse, goes further than the continuity and duration of Bergson. Movement, or rather change, is not situated on the level of vision, as in the case of Merleau-Ponty, but on the level of the imagination: 'If there is no change of images, no unexpected union of images, there is no imagination, no *imagining action*.' 'The value of an image can be measured by the extent of its *imaginative aura*.' 'A psychology of the imagination in relation to movement would have to determine the mobility of images directly. It would necessarily lead to the tracing of an actual hodograph for each image, to sum up its kinetism.' For Bachelard, the importance of movement lies in the fact that intimate impressions of mobility create a sympathy for a particular form of matter. In the case of the air, he admits that movement has a greater importance than substance: 'in that case there is only substance when there is movement.'

Bachelard adopts an uncompromising position in favour of the dynamic view of movement – as opposed to the purely visual notion. 'We must take into account the fact that the movement which is delivered to us by sight is not *dynamized*. Visual mobility remains purely cinematic. Our sight follows the movement too gratuitously for us to learn to experience it integrally, within ourselves.' It is therefore dynamic, willed movement – an ascension of the psyche, as with Nietzsche – that preoccupies Bachelard. Above all it is the intimate transformation which is the cause of this movement. 'Explaining change in terms of movement, quality by vibrations, is taking the part for the whole, the effect for the cause. If metaphysics wishes to explain movement, it will have to undertake the examination of beings in which the cause of movement lies genuinely in an intimate transformation.'

The following passage is a fine illustration of Bachelard's deepest thoughts on the aesthetic of movement: 'In addition to the purely cinematic description of a movement, it is always necessary – even in the case of a metaphorical movement – to give dynamic consideration to the material which is being worked by the movement.'

● Categories of movement at the present day

According to E. Straus, movement that is lived is not an execution of movement, and Becoming is not succession in time – just as a situation is not a position. Straus therefore draws a distinction between lived movement and mechanical movement, concluding that the object of physical knowledge is the body that is

moved, whilst the body *in motion* should be the subject of psychological research.

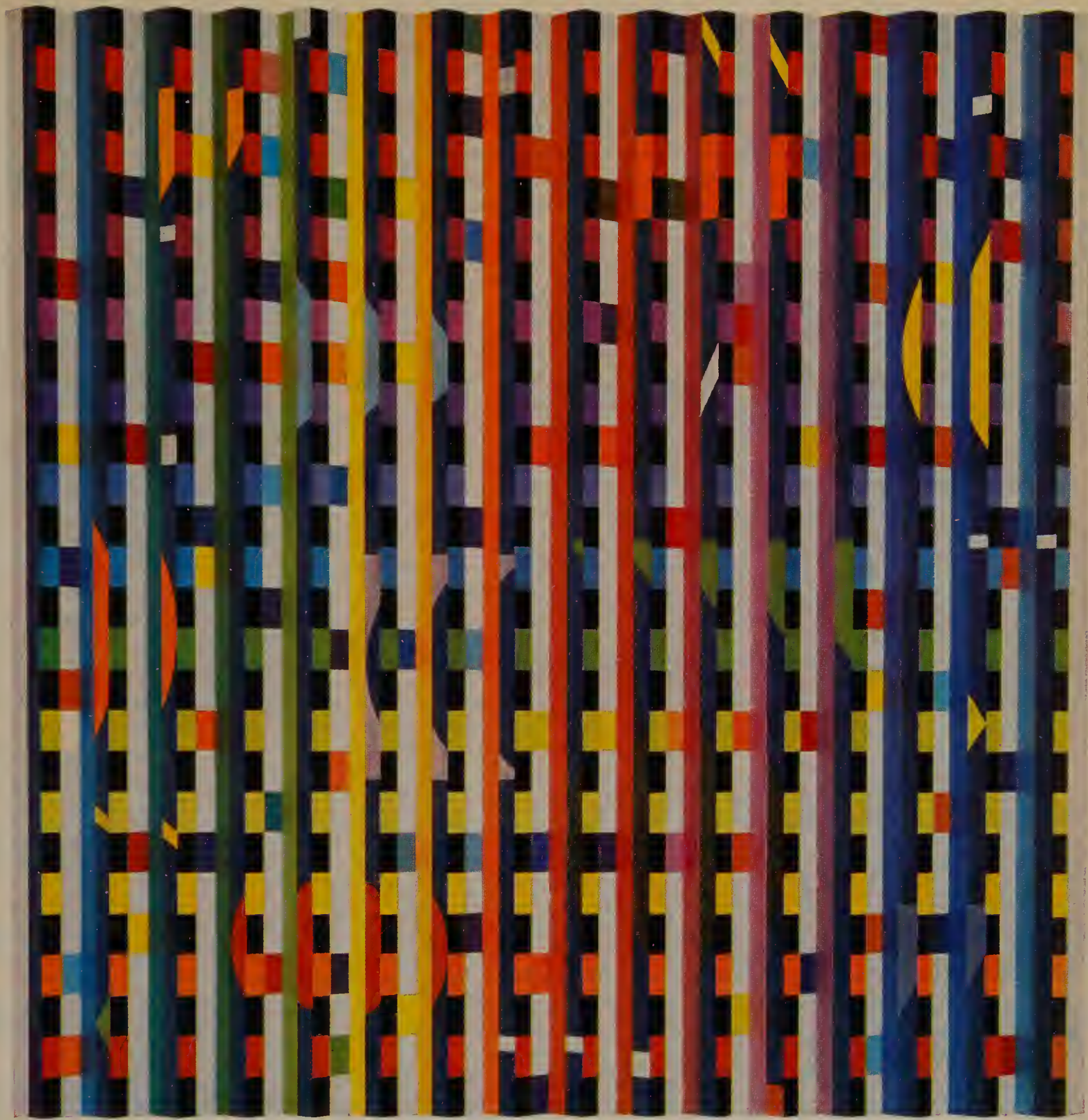
As far as the categories of movement go, V. Basch – the proponent of sympathetic imagination – divides the field of aesthetics into the Beautiful, the Sublime, the Gracious, the Tragic, the Comic, and the particular spheres of art and the artistic imagination. Charles Lalo, who bases his conclusions on the observation of facts – positively observed and methodically elaborated, divides the aesthetic categories into groups of three. Those dependent on the intelligence are the Beautiful, the Sublime and the Spiritual, those dependent on activity the Grandiose, the Tragic and the Comic, and those dependent on the sensibility the Gracious, the Dramatic and the Ridiculous.

Raymond Bayer puts the main emphasis on four categories, the Sublime, the Baroque, Grace and Humour, whilst Etienne Souriau has established a ‘compass’ with twenty-four categories: the Beautiful, the Noble, the Grandiose, the Sublime, the Pathetic, the Lyric, the Heroic, the Tragic, the Pyrrhic, the Dramatic, the Melodramatic, the Caricature, the Grotesque, the Satirical, the Ironic, the Comic, the Humorous, the Fantastic, the Picturesque, the Pretty, the Gracious, the Poetic, the Idyllic and the Elegiac.

Souriau returned to the same problem in 1956, when he either added or specially singled out the following categories: the Beautiful, the Ugly, the ‘small categories’ of the Pretty, the Suave, the Graceful and the Elegant, the Tragic and the Dramatic, the Comic, the Picturesque and the so-called ‘agogic’ categories, which are particularly relevant to our purpose. In Souriau’s view the agogic or *tempo* (with its nuances of andante, adagio, presto, prestissimo etc.) must be firmly distinguished from the rhythm which only refers to ‘a certain structural organization of time, generally realized by a cyclic figure’. ‘The agogic also refers to nuances of acceleration or slowing down (allegro and andante in music), and this category is technically almost impossible to explain – fastness and slowness being simply the response to an impression.’ Two groups can nevertheless be singled out: values connected with excitation or incitation, and values connected with appeasement and calm. Souriau applies this whole range of categories to the plastic arts, on a very wide scale. He holds that the agogic categories may achieve the Sublime if they ‘raise themselves to the highest pitch of being’.

R. Bayer suggests: ‘Grace is movement, and a state of ease within movement.’ His view of the aesthetic of movement is expressed in the following terms: ‘Phenomena of the aesthetic order are all characterized, in all their registers, by a certain constancy; and this constancy is revealed to us by the study of rhythms.’

It was Kant who added the category of the Sublime to the traditional system of aesthetic categories, which centred on the unique value of the Beautiful. As can be seen from the examples detailed above, the categories have multiplied since then, and a very long list could be made to cover all the categories which have been established – those obeying the criteria of perception and language, and respecting the different points of view of the aesthetician, the artist and the spectator.



● I Categories of the intellect

1 SURPRISE

This is intimately connected with the concept of innovation. The artist is attempting to discover new domains of vision and feeling. There is a kind of pleasure associated with this activity of exploration, as there is in the violation of established rules and canons. At the same time, the artist's intentions may spring simply from a voluntary or involuntary naiveté.

It is very difficult to establish to what extent the shock administered to the Salon-going public of the 1860s by the light vibrations of Manet and Monet arose from the conscious intention of these artists. But it is quite clear that the effect on the spectator cannot be distinguished from the surprise caused by the element of movement in these particular works. Modern works in virtual movement, like Jeffrey Steele's *Harlequinade* or Bridget Riley's *Fall*, involve both the pleasure of exploration and a kind of giddy reaction that can easily become unpleasant.

The *ready-mades* of Duchamp and Man Ray were the first modern works to aim primarily for shock – as in the case of Duchamp's *Bicycle Wheel*, a work of art and anti-art. Subsequent works by both Tinguely and the Nouvelle Tendance obtain shock effects through real movement. The *Labyrinths* of the Groupe de Recherche d'Art Visuel of Paris cause the surprise of the spectator to increase as he advances into the confined space.

Another relevant field lies in the movement of worlds which are generally inaccessible to the human mind. Vardanega and Malina have provided interpretations of astronomical and astronautical movement, while Tomasini has evoked sub-aquatic movement.

2 THE HUMOROUS

This can be placed on the borderline between ethical and religious categories. Or it can be related to the serious, and to the feature of repetition, which Kierkegaard and Bergson hold to be the chosen technique of the humorous. This repetition can give rise to an aesthetic appreciation of the structure, and does so in the case of several kinetic artists. Again, the humorous can also be related to the game – with the laugh becoming a kind of defence against deception.

Bergson held that the comic and, to a certain extent, the humorous as well, were related to the qualities of stiffness and automatism in movement. His famous formula for humour was 'the mechanical grafted on to the living,' which implies that the gesture ought to have as much life as the thought which gave rise to it.

Freud held that the source of the pleasure which we feel in humorous movements lay in 'the saving of an affective expense:' it was 'a contribution offered to the comic by the intermediacy of the super-ego.'

The development of this category can be traced either from the 'machine aesthetic' of Picabia, or from the 'spiritual and dream-like' works of Klee, both of which introduce the idea of humour in connection with movement. This development continues with the virtual movement enjoined upon the spectator in Kurt Schwitters' *Merzbau*. Cruz-Diez has adopted a humorous and poetic attitude towards current discoveries in the field of physiological vibration and

colour mixture, which he puts into practice in his *Physichromies*. In the field of real movement, first Balla, and later Calder, Tinguely and Pol Bury lend irresistible humour to their works in motion.

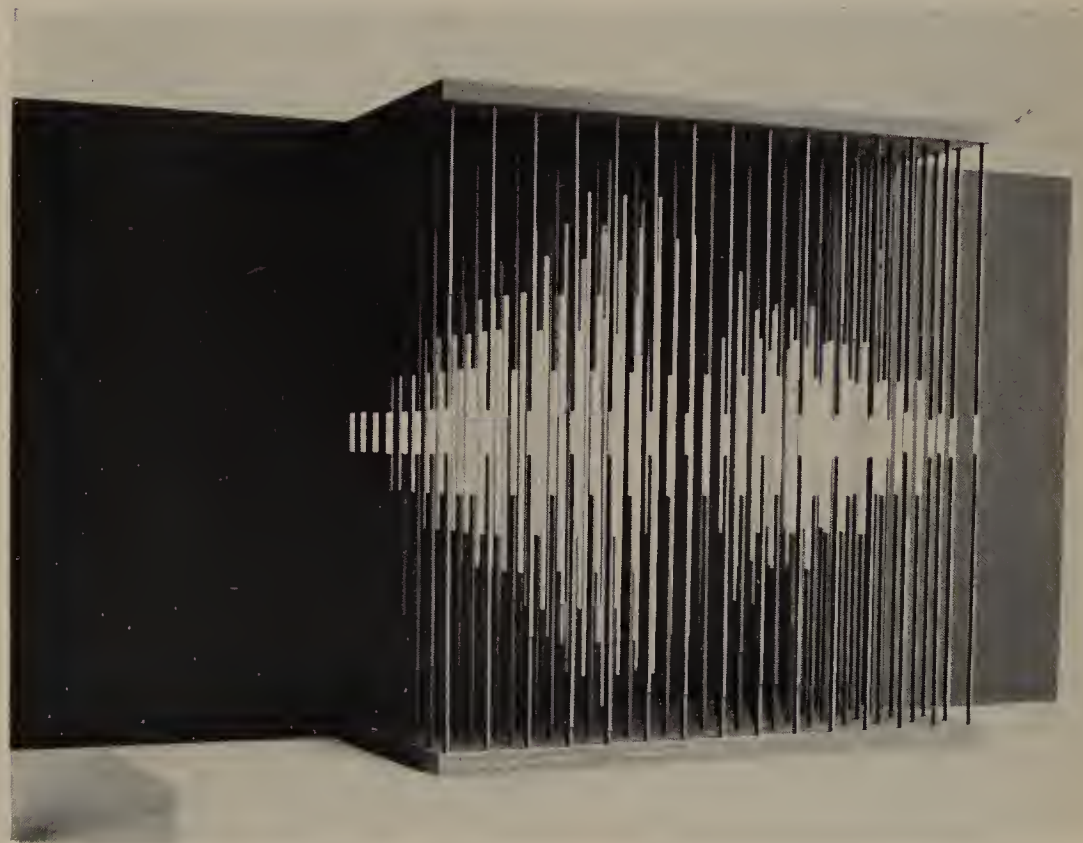
3 ASTONISHMENT

The marvellous aspects of movement feature particularly in the theatre and choreography of the seventeenth century. It has been suggested in this connection that 'the marvellous is in its essence dynamic.'

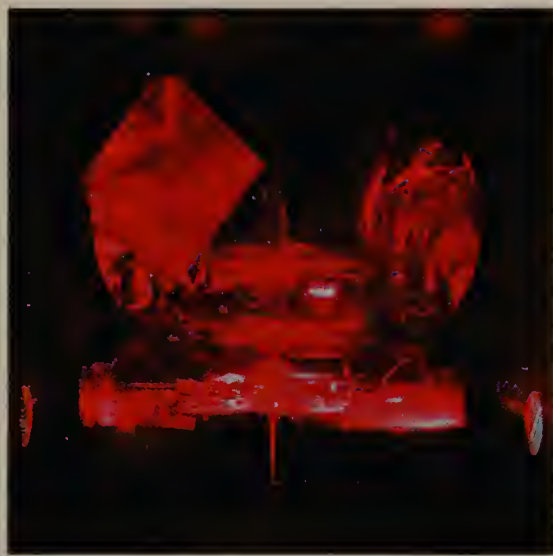
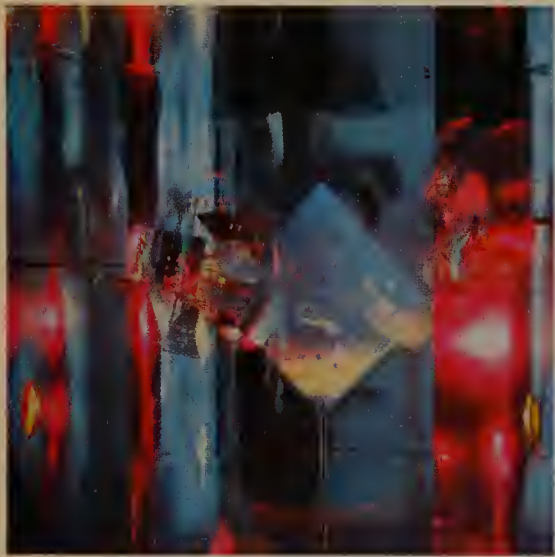
The demonstrations of Rosenstiehl aroused the astonishment of Robert Delaunay, who later made use of the same colour-scale in his 'turning disks'. In the same way, the experiments of Marey which involved human and animal movement studied on a black background without shadows, astonished painters like Seurat. This type of astonishment which is aroused by chromatic phenomena produced by movement has been recently exploited by various artists who make use of the still costly material of polaroid. The works of Olson require the spectator to move in front of the sheets of polaroid. Those of Munari, Dantu, Salvadori, Stein and Malina involve real movement, which is generally supplied by superimposed turning disks of polaroid.

4 LUDIC AMUSEMENT

This aesthetic category extends from the simple evocation of infancy by the use of movements reminiscent of games to the swift and alert responses induced by the ludic rhythms. There is no doubt that the increasing importance of the



121 Yvaral
Instabilité, 1963



element of movement in the plastic arts has reinforced the link between art and games, especially when this has facilitated the incorporation of music and the dance. It has been suggested that 'the fracturing, redoubling and multiplication of forms – the essential marks of inventions of this kind – provide the notion of the *total image*, that is to say, the image which is capable of responding to a situation or milieu that is defined entirely by its festive exaltation.'

Evocation of infancy with the aid of ludic movement is a frequent feature of the works of the Surrealists and their followers. The painting of Miró, for example, abounds with it. More recently, Agam, Stein and Cruz-Diez have devised various types of manipulable work, in which the artist's intention can only be realized through the ludic activity of the spectator. Roy Ascott has extended the same principle for a pedagogic purpose, giving the relationship between the spectator and the work an environmental scale.

Real movement has been used in the service of the game aesthetic in many of Calder's works. Von Graevenitz has relied on the same identification as the basis of his theoretical and practical activity. It is worth noting that the theories of Guyau and other sociologists who make a direct opposition between the categories of work and the game have no application in these cases. This is principally because of the distinctive association of art and technique, which also brings into question the whole problem of chance – the calculable and the incalculable.

5 THE UNEXPECTED

Artists are able to exploit the effects of chance in nature and in the work of art by means of the irregularities of movement, as well as through the choice of a particular obstacle – a fountain, firework display or garden – which will inevitably operate in an unpredictable way.

In the field of plastic art, the two artists who have done most to stress the qualities of unexpected movement are Arp and Michaux. The irregular movements of the oil lamp were the foundation of Kastner's research, while a number of mobiles by Calder and Kenneth Martin make use of both ludic amusement and the sense of the unexpected. Nicholas Schöffer introduced a mechanical element of 'indifference' or indeterminacy into his most elaborate work, the Tower at Liège, in order to provide a corrective to the sense of predictability which usually affects our reactions to mechanical and electronic movement.

Studies of mathematical probability have up to now been most influential in the field of music, but attempts are being made to apply them to the plastic arts especially in America. Meanwhile A. Moles and F. Molnar are using the same data to establish a theory of cybernetic art, to create works in which the tension between predictable and unpredictable movements plays an dominant part.

6 THE FANTASTIC

The entire range of imaginary movements – flight, levitation, falling etc. – can be used in the evocation of the fantastic, as can the sensations of strangeness and the extraordinary. Redon's *Balloons* and surrealist works such as the marine pictures of Tanguy are cases in point. In Schwitters' *Merzbau*, the surprising juxtapositions of materials yield to the impression of pure fantasy when the spectator moves. German artists of the younger generation, such as Hans Haacke, have recently allowed the element of fantasy to run riot.

7 THE IMPOSSIBLE

This is the dominant category in the so-called 'Theatre of the Marvellous'. The impossible may be evoked through the figuration or representation of movement – for instance, by the impression that physical laws like the law of gravity are being broken. The impossible can also be used, strangely enough, to reveal the internal structures of nature, the mechanisms of perception or the actual structure of the work of art. Certain works by Picabia, which suggest movement, were devised in a spirit of revolt with the aim of presenting the impossible in aesthetic terms. Picasso is not entirely foreign to this type of enterprise, at any rate in the early part of his Cubist period. Here it was a matter of imaginary movement around and through the object, with the aim of providing a close analysis of the object in itself. This movement becomes real in the case of Agam, when the spectator himself discovers the structure of the work, and experiences an intensified sense of temporality.

Archipenko was probably attempting to force the gates of the unknown in his sculptures *Medrano I*, *Medrano II* and particularly *Archipentura*. Kosice's use of the movement of water to contradict gravitational forces also puts us in the presence of the impossible.

● II Categories of the environment

8 IDENTIFICATION WITH NATURE

Movement like that of the wind and the sea have always inspired artists. Whistler, Victor Hugo, Monet, Maillol and Hokusai all attempted to represent the wave. In the case of Van Gogh, this concern with the forces of nature is combined with a desire for identification with the cosmos: the movements are charged with personal anguish and yet they convey this desire for communion with nature and the world. A number of Expressionists and Pre-expressionists like Munch, Nolde and Schmidt-Rottluff have followed the same direction, making use of various forms of natural and emotional movement. There is the same attempt to participate in natural and cosmic forces in the work of an abstract artist like Kupka.

Vasarely has often tried to translate the corpuscular and wave movements of the physical world into aesthetic terms. Takis insists on the spectator identifying himself with the forces of magnetism. Malina and Vardanega are both closely concerned with forces and movements in the cosmos, although their identification does not always disclose itself on the level of representation. Albrecht invites us to take part in the processes of vegetable growth, while Metzger makes use of destructive and constructive forces in an association of matter and time which is dependent on real movement.

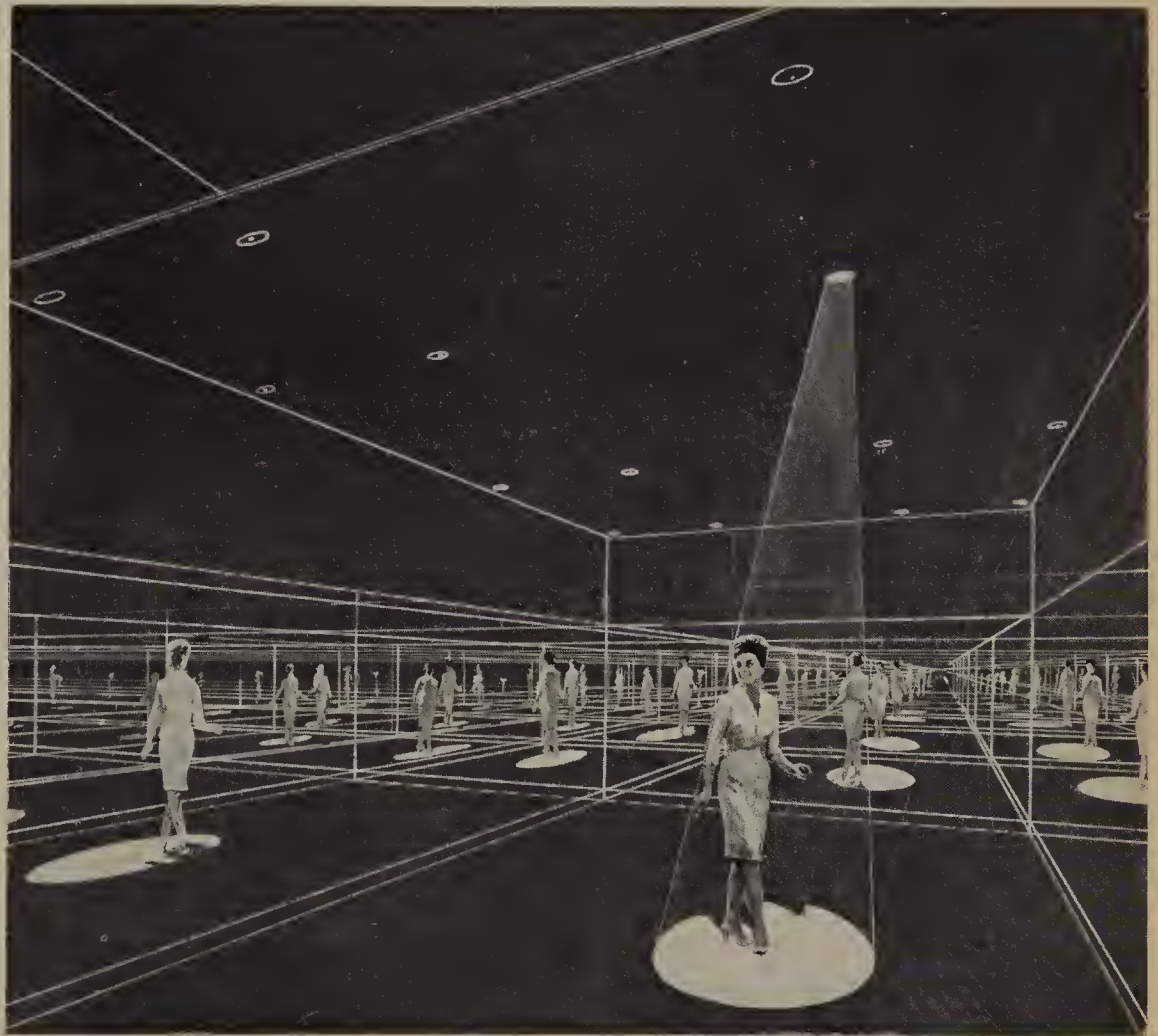
9 LIFE (and vitalism)

Movement in the works of Degas and Seurat often gives rise to an aesthetic sense of identification with life, which can be directly related to the preliminary experiments in the physiological and photographic fields by Marey and Muybridge. In the same way, there is often a suggestion of organic growth in the work of Klee. Expressionists, and in particular Marc, have tried to identify

themselves with nature and the cosmos through the introduction of animal movement. As far as virtual movement is concerned, the desire to integrate the work of art with the life of the city through the use of kinetic repetition and mimetic devices is a feature of the programme pursued by Vasarely and his disciples. Pol Bury uses real movement of a biological or organic type, while Medalla takes organic growth as the basis of his work.

10 THE MACHINE AESTHETIC

The introduction, suggestion and employment of machine movements in art can be equated with the idea of an identification with the industrial and mechanical universe that is as much within the field of magic as that of aesthetics. The artist can achieve this identification with the modern world in one of two ways. He can suggest or employ types of movement which present the technical world in terms of the beauty of the machine. Or he can attempt a commentary – more often than not ironical – on the technological aspects of movement. The aesthetic quality which arises can range from the vitalism which was discussed in the previous paragraph to a form of aggressivity which calls for psychoanalytic commentary.



123 Group T (Borjani, Anceschi)
Maquette for 'Kunst Licht Kunst'
exhibition, Eindhoven, 1966

A special place must be given to trains, cars, aeroplanes etc., which figured in the works of the Impressionists and the Futurists, in general, and those of the Delaunays and Léger in particular. Marcel Duchamp began by confining himself to the purely formal aspects of machine movement, and later intensified the spectator's feeling of identification with the mechanical process by the use of optical devices. Tinguely has developed a wide range of types of real movement in his machines and small assemblages, which are intended to conjure up the anguish of the industrial universe. Schöffer, on the other hand, attempts an integration with the modern world by the use of types of real movement that are technically very advanced.

● III Categories of the sensibility

11 HYPNOSIS

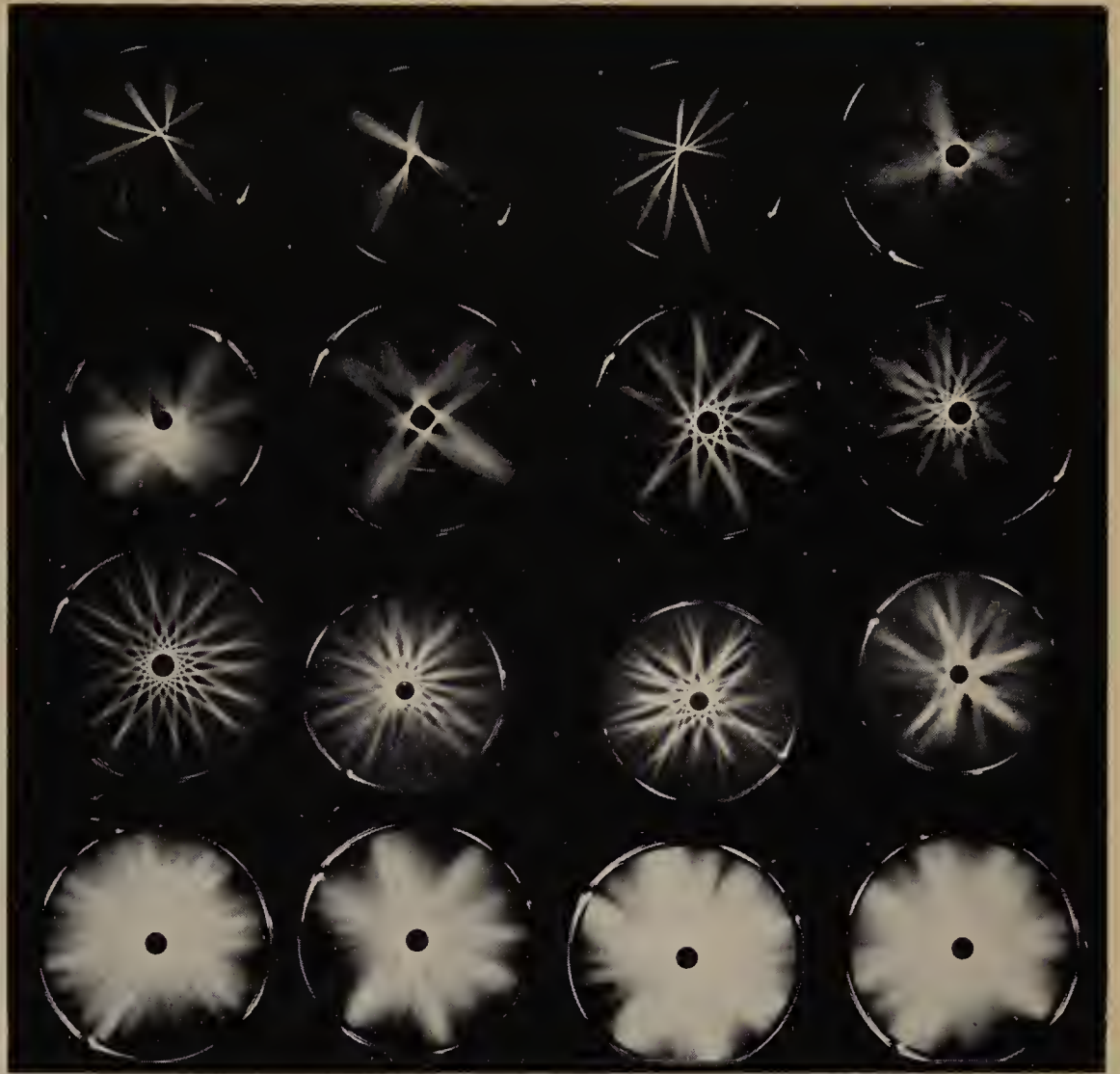
The sheer repetition of certain well selected stimuli can give rise to a hypnotic state. Mention has already been made of the hypnotic effects induced by the representation of successive scenes in biblical episodes, effects which gain added strength from the fact that the stained-glass window, with its luminous intensity, is often the chosen medium. The repetition of figures which is found in Hodler and the 'combinatory' use of unhappy faces in Jawlensky recall this phenomenon.

A number of artists achieve hypnotic effects of unusual intensity. Asis does so with the help of optical effects and repetitions, Morellet by the use of light stimuli, and Martha Boto through repetition of formal elements. The notion of repetition lies at the centre of the doctrine of the *Nouvelle Tendance*.

The technique of producing successive light stimuli in motion has also been employed for projections on walls and screens. Soriano's *synfilmies* give rise to marked hypnotic effects, which recur in the *Anamorphoses* and *Microtemps* of Schöffer and have, in his case, been developed for medical purposes.

12 THE IRRATIONAL FACTOR

The subconscious – or unconscious – is a field which provides much evidence for the existence of irrational movements, and particularly those which occur in dreams. The daydream, for instance, is of unusual interest to us since it relies upon the idea and the image of movement. Dadaists, Surrealists, naive painters and the so-called 'petits maîtres de la folie' have made more or less conscious use of movements that were irrational in their implications, as have Redon (in his 'Noirs'), Michaux, Pollock, Bridget Riley and Giacometti (in his 'suspended' objects). Quite a large number of works involving light and movement succeed in evoking the world of dream or delirium, although they may be calculated and sometimes executed with the greatest degree of logic and precision. Castel, Kastner, Moholy-Nagy, Schöffer and Hans-Walter Müller come to mind in this connection. The line of research which is being pursued by P. K. Hoenich involves a combination of light projections from the sun and wind movement. These come together in the 'robot-painter'.



13 ANGUISH

Such phenomena as the violent transformation of colour, the appearance and disappearance of rainbows, cloudy skies, impressions of vacuity and all forms of menacing movement, which relate to an actual or potential danger, lend themselves particularly well to this category. In the work of Pre-expressionist and Expressionist painters like Munch and Nolde, these effects can be given unusual power by a violent use of colour and gesture. Later Nordic artists in the expressionist tradition, such as Appel, carry on this tradition. The artists belonging to the Dutch group *Nul* try to disconcert the spectator by introducing faint vibrations and almost imperceptible movements into works which are entirely concerned with creating a sensation of emptiness. The monsters of Robert Müller and the creations of Foldes fall within the field of real movement, while the destructive choreographic movements of the Japanese group Gutai create an aesthetic response that is dependent on the disturbing combination of beauty and destruction.

14 DISPLEASURE

This feeling can become valid in aesthetic terms if the spectator's participation on the psychological level is adequately secured. Effects of light and colour interference and of continually changing forms have been used with this end in view.

In a picture like Nolde's *Kerzentänzerinnen*, the movement is deliberately ugly in character, and gives the sensitive spectator a feeling of revulsion which he may transform into feelings of a deeper and more passionate kind. Alechinsky uses non-figurative methods and, in particular, expressive gestural movements to force the spectator into the same aesthetic process.

In Cruz-Diez' *Physichromies*, the spectator's vision is deliberately assaulted by unpleasant plastic effects so that he can achieve a new appreciation of colour. Through the sensation of displeasure, his attention is awakened. Several of the Nouvelle Tendance artists have been willing to go beyond this point where optical effects become positively disagreeable in order to stimulate a more active form of vision. Bridget Riley holds a similar point of view. And an artist like Metzger, who uses real movement for auto-destructive ends, begins by creating unfavourable reactions in the spectator and is then able to interest him in the auto-creative process which follows.

15 NOSTALGIA

'Nostalgia', writes Marian Winter, 'is absolutely necessary in the Theatre of the Marvellous, as are the desire to make journeys, a simple morality, spiritual uncertainty and aesthetic curiosity.'

Cut-out forms and arabesques in the work of Gauguin – even more so in the Art Nouveau of Gallé in the Nancy school, and the style of Klimt – share this nostalgic quality. In non-figurative painting, it is the musical associations of nostalgia and sentimentality that predominate. Kupka and, to an even greater degree, Kandinsky make ample use of parallels between plastic and musical rhythm, and are at the same time prone to a nostalgia for the past, the ideal or experiences that are irrecoverable.

16 PURE SENSATION

This modern attitude towards movement, which consists in reaching the senses of the spectator without any intermediary, can easily be traced back to the Impressionists, and to Monet in particular. The method of suggesting light and movement by vibrations was taken up by the Neo-impressionists, Cézanne and eventually painters and constructors like Malevich who had abandoned the figurative basis.

The immediate aim of virtual kinetic art is to reach the spectator's perception and so to encourage his participation. South American artists like Soto, Asis and Cruxent use the moiré effect with this aim in view, while the artists of the Nouvelle Tendance (in particular those belonging to the Groupe de Recherche d'Art Visuel of Paris) and Tomasello, with his chromatic shadows, pursue the same ideal of pure and direct sensation.

A whole series of types of research that lie on the periphery of art – starting with such optical spectacles as Baker's *Panorama* (1787) and Daguerre's *Diorama*

(1822) – can be identified with this line of research. It is also exemplified in the machines of von Graevenitz, the suspended mobiles of Kenneth Martin, and the supported mobiles of George Rickey, which arouse immediate sensations through their variety of movement.

● IV Categories of action

17 THE AGOGIC

Since the time of the Futurists, speed has been one of the most favoured themes of modern art. Since the First World War, however, a new generation, with a new attitude to this phenomenon, has grown to maturity. Kinetic artists who have had a scientific education, such as Malina, are aware of the speed of light as an absolute limit.

From a purely artistic point of view, the types of movement used in the field of the agogic – whether by mere suggestion or by effective movements – are liable to vary from the extremely rapid (Balla's *Turbine* and *Orbite celesti*) to the almost imperceptible (Bury). In the work of Delaunay, movement is steadier in pace, but the Groupe de Recherche d'Art Visuel have made an intelligent use of optical acceleration in their *Labyrinths*. Len Lye has also used *tempo* in an intelligent way in his *Tangible Motion Sculptures*, which involve a varied programme of vibrations. Schöffer has succeeded in programming a complex sequence of slow and fast movements, which are visible both directly and through reflection and distortion: the period when the work stops moving altogether is also part of the programme.

18 SEXUALITY

The movement of the figures in Watteau's *L'Embarquement pour Cythère* has been interpreted as an illustration of the progress of love. A more or less concealed symbolism of sexual movement can be found in Picabia's *La Parade amoureuse*, Duchamp's *Nu descendant l'escalier*, and *Le Roi et la Reine entourés par des nus vites*, as well as in Max Ernst and Salvador Dali. Obviously the Surrealists were eager to make their own interpretation of the theories of Freud.

As far as real or virtual kinetic works are concerned, Duchamp's major work – *La Mariée mise à nu par les célibataires, même* – remains the earliest usage. But there is clearly an erotic intention in the constructions which Giacometti made around 1930–32. More recently, Van Thienen has taken his inspiration directly from sexual movement, although his constructions in real movement remain above all else those of a musician. Malina and Schöffer both make use of types of movement bordering upon this category, but their intentions are cosmic and spiritual.

19 GRACE

Castiglione writes in the first book of his *Perfect Courtier*: 'Grace should be the accompaniment of all the actions, gestures and conduct – in fact all the movements – of the courtier.' Guyau writes, with reference to Spencer: 'What kind of movement gives us the impression of grace, when we ourselves are performing

it or when we are watching it? It is the kind of movement in which all muscular effort seems to have disappeared and the limbs work freely, as if supported by air. Hence the supremacy of curvilinear movement. . . .’

This element of grace in movement is present in many manifestations of Art Nouveau. It can also be found in the works of Soto, where the movement is of the virtual type, and in the mobiles of Kenneth Martin, which are the epitome of this particular category in the field of virtual movement. Works such as these aspire to a kind of mathematical infinity through the grace and complexity of their operations.

20 BALLET, ACROBATICS, SPORT

There is a very distinctive flavour about the way in which artists have given expression to choreographic movements ever since prehistoric times. The wide range of movements of this type exploited by Degas and Toulouse-Lautrec underline the importance and distinctiveness of the category. Cubists and Vorticists continued in the same tradition, while Delaunay transposed the movement into the realm of sport, in his *Coureurs* and *Equipe de Cardiff*. Mention has already been made of the influence which Loie Fuller’s illuminated veils exerted on the art of her times.

In the case of Kramer, we have the personal experience of a dancer being adapted to the world of machines. With Metzger, the auto-destructive spectacle is accompanied quite consciously by gestures and movements that seem to evoke a strange dance. Schöffer has actually devised a number of cybernetic sculptures which can themselves take part in choreographic spectacles.

● V Categories of transcendence

21 TIME AND ETERNITY

A large number of the artists who are featured here have intentionally tried to incorporate time or space-time into their works. The sense of time and eternity was a frequent topic with Rodin. In the modern field of virtual kinetic movement, Agam makes frequent allusions to the irreversibility of time, as a means of disclosing the unity and simultaneity of natural phenomena. Calos uses the real movement of light to evoke a kind of religious feeling which is close to his personal preoccupations, while Schöffer – whose spiritual concerns are of quite a different order – seeks to impress time and ‘micro-time’ on our sensibility through movements that are minutely programmed.

22 FREEDOM AND CONSTRAINT

Movements that suggest freedom are usually connected with the artist’s desire to emphasize the need for escape. By contrast, the impression of constraint in the work of such artists as Rodin is the result of rigidly disciplined movements or themes of capture. These two forms of movement are complementary, and suggest the same area of aesthetic meditation.

Pollock tried to express a sense of liberty in a period which was characterized by constraint through his use of drip and gesture. Kandinsky aimed to convey the same sense through a rigorous abstraction of forms, lines and colours which

give the impression of movement. In the case of Agam, the sense of freedom is closely linked to the way in which the spectator develops the plastic statements implicit in the work in terms of his own free movement. One might say that Bury uses real movement to convey a sense of liberation from physical forces and so to attain the transcendental.

23 EVOLUTION (progress)

This category is connected with the idea of modernity and the myth of *modernolatria*. The use of movement in the work of the Impressionists – especially that of Monet – already contains this element, which is taken up by the Neo-impressionists and especially by Seurat, whose vocabulary of themes includes the Eiffel Tower as an expression of modern life. Delaunay and the Futurists took the notion one stage further, and Léger provided a more sober equivalent. At the present day, the artists of the Nouvelle Tendance put strong emphasis on the use of new materials as one of the methods of demystifying art. Both Wilfred and Darié are concerned with the poetic reinterpretation of modernity in a number of their works.

24 RUPTURE

This category would include all linear or cyclic movements which involve a period of interruption or a sudden change in direction. It is often to be equated with the notion of progress taking place through a series of revolutions.

This is the quality which is apparent in the crowd movements of Ensor, and, to some extent, in the disconnected brush-strokes of a precursor of Expressionism like Van Gogh. More recently, the members of the Groupe de Recherche d'Art Visuel of Paris have experimented with the idea of rupture brought about by brusque movements.

Tatlin, Gabo and their friends were involved in projects which brought into clear relief the correlation between brusque movements on the plastic plane and the notion of rupture or revolution in society. In the case of Duchamp, the same impulse corresponds to an anarchical interpretation of the world, the feelings and the intellect. Moholy-Nagy and, in particular, Schöffer have often made use of sudden interruption in plastic movement.

25 SPIRITUAL ENERGY

The concept of *spiritual energy*, in its accepted sense deriving from Bergson, resembles the 'energy of the spirit' celebrated by the Vorticists, being based on the association of ideas between movement as a force and the figurative representation of movement. Among the Vorticists, Wyndham Lewis and Gaudier-Brzeska made use of 'formalized' movements in order to stress the element of pure intellect – the energy of the spirit. It could also be said that the entire work of Kandinsky depends upon an identification between movement and the image of movement, on the one hand, and the intellectual and spiritual character of art. The element of movement which is understood in Brancusi's work depends on much the same identification, while Takis and Kosice go far beyond this stage in visualizing the hidden forces of the universe.

One of the most well-attested features of movement in art is its tendency towards the *spectacle*. We have already referred to the series of theatrical and choreographic presentations at the Bauhaus, which are associated with the names of Schlemmer, Kandinsky, Moholy-Nagy and Farkas Molnar. The reflected light compositions of Hirschfeld-Mack and Schwerdtfeger were conceived in the same spirit. The ideas of Appia and, in particular, Edward Gordon Craig lie behind these various manifestations, while the 'synaesthetic' experiments of Scriabin belong to the same tradition. Several of the colour-organs created over a long period of time can be related to this rather occult field of research involving movement and synaesthesia: that of Rimington is a case in point.

The reference to 'chromatic', 'skiachromatic' and 'anamorphic' movements in several of the manifestoes of Nicholas Schöffer and Siegfried Albrecht also suggests the presence of this category. The Italian groups make use of cinematographic projections and slides while pursuing at the same time their purely plastic lines of research. The Groupe de Recherche d'Art Visuel attempts to activate the spectator with a whole range of kinetic devices. But the group has not yet brought out a satisfactory theoretical statement dealing with the wider implications of their 'total' experiences.

27 THE SUBLIME

In the West, the notion of the sublime is mainly associated with the physical and psychological universe, while in the East a philosophy such as that of the Rasa relates the sublime to aesthetic movement. It is probably because of the widespread influence of oriental thought on the Western artists of today that movement is often associated with an evocation of the sublime and the absolute. For instance, the abstraction of both Malevich and Mondrian is directed towards attaining the sublime through a dynamic treatment of forms. The metaphysical atmosphere of the work of Chirico and Magritte, which suggests an attempt to evoke an ulterior reality, turns upon the *absence* of movement. In the work of Tobey, movements, strokes and signs are used to create an impression of emptiness – the Nirvana of oriental thought – and to encourage the spectator to contemplation.

The Nul Group in Holland and the Zero Group in Germany have tried to convey the slightest vibrations in light, and the most insignificant types of movement and change that are still perceptible to the spectator, in a metaphysical atmosphere of absolute emptiness and purity: works by Uecker, Henk Peeters, Reinhardt and Sommerrock are relevant to this point. It is also worth remembering that Wilfred's pure art of light, a radical departure from the tradition of Castel and Scriabin, was dedicated to the achievement of the sublime through contemplation, and that Wilfred's disciples have not abandoned his principles.

Although it is very probable that all or at least some of the categories mentioned above might be found in a single work, if it was observed for long periods and on several occasions, this does not invalidate the attempt to discover the *pre-dominant* categories in the works which are most interesting from the point of view of movement. The path of future research on this subject lies in a more intensive study of the correlations between the aesthetic categories of movement,

the intentions of the artist (whether expressed or not), the different *genres* of movement employed or suggested in the works, the critical opinions expressed by qualified spectators (aestheticians, critics and art historians), the perception and assessment of the element of movement by the public at large (to be discovered through experiment and verified by tests), the procedures and techniques utilised by artists, the stylistics of movement and finally the study of a select number of important works. There is reason to hope that this synthesis will one day be made.



Conclusion

It has been established that the idea and the image of movement – taken in a fairly wide sense with relation to the plastic arts – converge in an extremely characteristic way after 1860. Obviously movement as a theme or, in a more concealed way, as a plastic dimension was at the centre of the artist's concern in various other periods. But it is only from the time of the Impressionists that it has played such an important role. By placing movement in the forefront, these artists and their successors contributed towards its ultimate liberation, which was to be the outcome of a dialectical process involving at the same time the disappearance of the subject and the multiplication of images in art.

We have been able to follow the development of artistic mechanisms and images – in the widest sense of the word – in terms of the opposition between objective and subjective movement which recurs within every generation. Objective movement – or movement perceived directly in nature – could be identified with the Impressionists, while subjective movement or movement of an expressive type could be seen as a feature of the works of Redon and Rodin. At a later stage, the objective movement of the Neo-impressionists, which was partly influenced by photography and scientific theory, could be juxtaposed with the subjective movement in the work of Van Gogh, Gauguin, Ensor, Munch, Hodler, and Bourdelle. Contemporary with the period of the 'Tragic generation' were the first signs of abstraction in the graphic movement of Art Nouveau. Around 1912, in the next generation, an element of intellectual movement that lay between objective and subjective forms of movement became operative. But this was the last time that the thematic treatment of movement acquired an importance equal to that of the plastic expression of movement. Meanwhile the objective movement of Delaunay and the Cubists could co-exist with the intellectually conceived movement of the Futurists, Picabia, Duchamp, the Vorticists, Rayonnists, Suprematists and Constructivists, as well as with the 'felt' movement of the Fauves, Expressionists and artists such as Kandinsky and Klee.

To the generation active around 1930, objective movement – especially that which arose from abstract visual effects – could be related to psycho-physiological preoccupations, whilst the intellectual movement of Surrealism drew deeply on psychoanalysis, the dream world and techniques such as automatic writing. The subjective movement of the Expressionists, both abstract and figurative, was to lead to a new emphasis on gesture and a tradition of animating the picture through free rhythms that was to end with the Action Painters. At this stage, sculpture

also achieved a greater degree of animation as a result of the use of new materials such as wire and perspex.

In the course of these four generations, we can see the faint signs of the birth of a new art, based on the use of movement as a real and independent element. But the origins of this art must be pursued much further, into technological and natural as well as plastic and intellectual fields. The influence of the other arts is also of vital importance, while half-artistic and half-technical constructions – such as hydraulic machines, automata and the cinematograph – also occupy a significant place.

The kinetic art of the present day includes works in virtual and in actual movement, in two or three dimensions. Each of these four divisions reflects a very different tradition. The source of virtual movement can be traced back to the exploitation of *trompe-l'oeil* and anamorphoses in Antiquity, the Renaissance and the Baroque. In more recent times, it falls naturally into several branches of activity, which are all based upon the possibilities of abstract designs but differ according to whether the emphasis is placed on the plastic element of colour, luminosity, volume etc. Among the artists who have contributed a great deal to this development are Delaunay, Herbin, Albers and other masters from the Bauhaus.

We have been able to follow the various stages of this tradition in its most recent phase through the works of Vasarely, Agam and Soto, who are at present the dominant figures. We have also seen that, on many occasions, the purely optical preoccupations of these artists have given rise to kinetic research of other types. A sense of movement has been established through the active participation of the spectator – principally by his movement in front of the work or by his manipulation of the elements involved in the work. In this way a ludic and pedagogic dimension has been introduced, and a new relationship between the artist, the work of art and the spectator has arisen.

In the case of three-dimensional works in real movement, there is an important division between machines and mobiles, which depends upon their greater or less degree of predictability. This particular trend has been strongly marked by the so-called machine aesthetic, and has retained the antinomy between Constructivism and Dada which developed in the years 1910–20. The *modernolatria* of the Futurists was also converted into the realist and surrealist works of Duchamp, Tatlin, Gabo, Archipenko and Moholy-Nagy – works which are central to the understanding of that branch of kinetic art which expresses the *Zeitgeist* either in technological or in purely artistic terms. Theoretical pronouncements like the manifestoes of Gabo and Pevsner, Moholy-Nagy and Kemeny, played an important part in this development.

The emphasis in this study has been on the forces which activate the works, at least as far as this category is concerned. The majority of the machines move in response to electro-magnetic forces. But human forces, hydraulic and magnetic forces, even solar forces and cybernetic devices also play their part. In the field of the unpredictable, the mobile work is set in motion either by random currents of air or by direct manipulation.

The movement of mobiles has not, in general, kept the attention of artists for very long. However the mobile has its place in the development of kinetic

art. Calder's mobile constructions succeeded a series of 'counter-reliefs', constructions and suspended objects in the Dada vein. In the years that followed various light materials such as wood, wire and perspex were exploited to an increasing degree in the construction of mobiles which derived from a simple geometrical elements: perspex was particularly useful in giving rise to effects of transparency. Other forces of the physical universe were also being used in the creation of works of art that featured unpredictable movement. Water, fire and various acids made a somewhat unexpected entry into the field of movement in art.

The last group of important works within the overall field of kinetic art is concerned with light and movement. Works of this kind can be traced back to three distinct sources: the colour-organs, the cinema and the mobile theatre set. Luminous movement is displayed, almost universally, on a surface such as a screen or wall, and may be accompanied by music. It was effectively around 1920 that the changes in colour and form in various types of work were summed up in what was a genuinely new art. The construction of the Clavilux by Wilfred and the concerts which he and other inventors gave on instruments of this kind marked the birth of a particular trend in kinetic art. Around 1950, this means of expression had a dramatic renewal, which resulted in the construction of a large number of important works differing from each other principally on the level of scale. On a relatively small scale there were the 'cinechromatic apparatuses', the luminous pictures, the 'chromokinetic' works and light mobiles, which were in effect the equivalent of traditional paintings in motion. On the scale of the public sign, there were similar works which suggested immediate functional applications. On the scale of the public spectacle, there were works such as those of Schöffer and Darié, which belonged to the context of public performance just as much as Valensi's 'cinépeinture' – an art lying on the boundaries between the cinema and the plastic arts.

In making a systematic grouping of the various techniques and processes used to indicate movement – and in sketching an aesthetic of movement which derives from the aesthetic categories of the intellect, the environment, the sensibility and the transcendental world – our aim has been to indicate the future progress of the element of movement in the visual arts, in addition to the obvious function of giving a scientific basis to the research which has been undertaken in this study. Consideration of the way in which each procedure and each aesthetic category has evolved has helped to demonstrate the possible applications of movement in the other arts. Synchronized movement, for example, points towards the development of new forms of the art of spectacle. Plastic works in motion can be used with particular relevance in architecture, industry and town planning.

But apart from this speculation about the future there is one fact which appears to be securely established – that, through various well-defined stages from 1860 to the present day, the innovators in the plastic arts have exploited an ever-increasing range of new materials and techniques, and that through a series of aesthetic investigations which have led them to the very highest categories, they have transformed the image of movement in art into a genuine art of movement.



Appendices





The generations of artists

* Names of artists associated with the succeeding generation have been put in brackets. The forerunners of kinetic art, mentioned in chapters 5 to 8, are in italics in the lists for the first four generations.

1. Generation born c. 1840

- 1830 Pissarro
- 1832 Manet
- 1834 Degas
- Whistler
- 1839 Sisley
- Cézanne
- 1840 Redon
- Rodin
- 1841 Bazille
- Guillaumin
- Berthe Morisot
- Renoir
- 1844 Rousseau, H.
- 1848 (Gauguin)

2. Generation born c. 1860

- 1848 Gauguin
- 1853 Hodler
- Van Gogh
- 1856 Cross
- 1858 Luce
- Segantini
- 1859 Seurat
- 1860 Ensor
- Sickert
- 1861 Bourdelle
- Maillol
- 1862 Klimt
- Van Rysselberghe
- 1863 Munch
- Sérusier
- Signac
- Stuck
- Van de Velde
- 1864 Jawlensky
- Séraphine
- Toulouse-Lautrec
- 1865 Vallotton
- 1866 (Kandinsky)
- 1867 (Nolde)
- Bonnard
- Valadon
- 1868 Bernard
- Vuillard
- 1869 (Matisse)
- 1870 Denis, M.,

3. Generation born c. 1880

- 1866 Kandinsky
- 1867 Nolde
- 1869 Matisse

- 1871 Balla
- Feininger
- Kupka
- Rouault
- Scriabine*
- 1872 Mondrian
- 1874 Meyerhold
- Schönberg
- Uhde
- 1875 Marquet
- 1876 Brancusi
- Duchamp-Villon, R.
- Gonzales
- 1877 Desmet
- Dufy
- Kubin
- Van Dongen
- 1878 Freundlich
- Malevich
- Picabia
- 1879 Klee
- Survage*
- 1880 Derain
- Eggeling
- Epstein
- Hartwig*
- Kirchner
- Marc
- 1881 Carrà
- Gargallo
- Gontcharova
- Larionov
- Lehmbruck
- Léger
- Pechstein
- Picasso
- 1882 Boccioni
- Braque
- Herbin
- Lewis, W.
- Wouters
- 1883 Gropius
- Heckel
- Metzinger
- Orozco
- Valensi*
- Severini
- Van Doesburg
- Utrillo
- 1884 Modigliani
- Schmidt-Rottluff
- 1885 De La Fresnaye
- Delaunay, R.
- Delaunay, S.
- Lhote
- Russolo
- Tairov
- Tatlin*
- 1886 Kokoschka
- Ozenfant

- Permeke
- Pevsner
- Rivera
- Vantongerloo
- 1887 *Archipenko*
- Chagall
- Le Corbusier
- Duchamp, M.*
- Gris
- Macke
- Schwitters
- 1888 Albers
- Arp
- Baranoff-Rossiné*
- Bissière
- Charchoune
- Chirico
- Magnelli
- Richter, H.
- Ruttmann, W.
- Schlemmer
- 1889 Baumeister
- Täuber-Arp, S.
- Wilfred, Th.*

4. Generation born c. 1900

- 1890 Bragaglia, A. G.
- Gabo*
- MacDonald Wright
- Man Ray*
- Morandi
- El Lissitzky
- Tobey
- Zadkine
- 1891 Ernst, M.
- Rodchenko*
- 1892 Kiesler
- 1893 *Hirschfeld-Mack*
- Miró
- 1894 Annenkoff
- Berlewi
- Healey*
- Nicholson, B.
- Prampolini
- Soutine
- 1895 Janco
- Laszlo, Alex.*
- Moholy-Nagy, L.*
- Van Velde, B.
- 1896 Bloc
- Masson
- Schneider, G.
- 1897 Béothy
- Delvaux
- Schwerdtfeger*
- Sevrancx
- Vertov



Classification of kinetic art





Movement in art

This table merely indicates the main lines of development and makes no claim to cover the entire range of work which has been realized or to reproduce an exact chronological order

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) | |
| 1900 | Objective movement (Neo-impressionism) | Cinema, theatre projections |
| | Subjective movement (Pre-expressionism) | |
| | Art Nouveau | |

| | <i>Theme</i> | <i>Graphic effects in composition or materials</i> | <i>Interaction of colour</i> | <i>Three-dimensional effects</i> | <i>Light and movement</i> | <i>Spectacle</i> |
|------|--|--|--|---|--|------------------|
| 1910 | Bl. Reiter Futurism Rayonnism Picabia M. Duchamp | Cubism Vorticism Tatlin Kandinsky Klee Schwitters | Kupka Delaunay Malevich Mondrian V. Docsburg | Tatlin Archipenko Boccioni Duchamp Vantongerloo | Survage Valensi Rimington Hallock-Greenewalt Balla Depero Baranoff-Rossine | |

1920 BIRTH OF KINETIC ART

| <i>Abstract visual inducements</i> | <i>Movement or intervention by the spectator</i> | <i>Machines</i> | <i>Mobiles</i> | <i>Light and movement</i> | <i>Spectacle and environment</i> |
|------------------------------------|--|-----------------|----------------|---------------------------|----------------------------------|
|------------------------------------|--|-----------------|----------------|---------------------------|----------------------------------|

| | | | | | |
|---------------------------------|--|--------------------------------|--------------------------------|--------------------------------|---------------------|
| 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. | Vasarely Schöffner Agam Valensi Lassus Darié H. W. Müller Jaulmes Durante etc. |
|--|--|---|--|--|---|



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