From *Moving Image to Moving Architecture*

A discussion of the "space-time" phenomenon of the twentieth century, with particular reference to architecture, moving image, and music.

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Introduction

The twentieth century is marked by a shift in attitude towards the parameters of space and time. Previously, time was continuous and space defined by its physical boundaries, both were characterised by a stability of structure, closed systems encompassing universals independent of an individual's experience. The new experience of space-time became one of fragmentation, multiplicity, an open system devoid of universal continuity acknowledging the autonomy of the individuals viewpoint. The earliest works that exemplify this fundamental structural shift can be found across the art forms of the early twentieth century, ranging from the simultaneity represented in Cubism and Futurism, to the growing film industry, to the music of Stravinsky.

The idea that space and time are inherently, intimately linked presents us with the possibility of combining those art forms traditionally perceived as either temporal or spatial. The quality of a sound is directly affected by the space in which it is placed, the understanding of an image can only be realised over time. The moving image is the medium that inherently combines space and time through sound, image, motion. The moving image has the potential to present memories, simultaneous events, and expectations in a fragmentation of time and space that is not linear. Past, present and future can all be presented in any order as the new conception of time-space becomes firmly rooted in the present.

This essay attempts to trace the progression of the ideas of space-time over the course of the twentieth century through a selection of works from different disciplines. The rise of digital technology, the "information revolution", forces us into yet further domains where space and time are so firmly entangled that we must come to terms with a speed and disorientation of geographical distance that is beyond our previous experience. This presents us with the ability to create new multi-disciplinary architectures that combine data, light, sound, motion, sensor technology, structure and location into an entirely new environment, potentially a "moving architecture". In the year 2000 we have different tools from those available in 1900, yet the development towards a previously unknown fluidity can only be understood when firmly rooted in its early developments.

The New "Space-Time"

After Einstein's Special Theory of Relativity in 1905, space and time were revealed to be connected in a fundamental way, relative to the position of the individual observer. The theory opened up the conceptual possibility of multiple individual experiences of time and space and tied the two parameters firmly together in the concept of motion. It is interesting that the new "space-time", as coined by Siegfried Giedion in his book Space, Time and Architecture (1941) and discussed in relation to architecture and the arts in the early twentieth century, whether consciously related to Einstein's theory or not, can be distinguished by the same concepts. Two approaches can
be noted, firstly, the possibility of a discontinuous, overlapping space-time and secondly, a fascination with movement.

The supremacy of perspective in painting and the developmental structures of form in music were finally challenged around 1900 by the concept of a multi-layered, fragmented space-time. Cubism, generally considered to begin with Picasso's Les Demoiselles d'Avignon as pictured in fig. 1, in 1907 and end around 1914, is in retrospect considered as one of the most influential periods of painting this century. One of the Cubist claims is to bring across an awareness of four dimensions within the two dimensional plane of the canvas. This is achieved by the simultaneous presentation of different viewpoints which generates a fragmentation of the picture plane. In his book Les Peintres Cubistes, Guillaume Apollinaire (1913) describes the Cubists' rejection of the three dimensions of Euclidean geometry, advocating that "the fourth dimension endows objects with plasticity...it represents the immensity of space eternalizing itself in all directions at any given moment." This illustrates a desire for simultaneity and multiplicity in space and time.

Fig. 1, Les Demoiselles d'Avignon, by Pablo Picasso

Similarly, Stravinsky was composing music that broke with the formal conventions of developmental structure. In his Symphonies of Wind Instruments (1920) he juxtaposes diverse blocks of sound which have no relation to previous themes and do not generate the following blocks. The result is very much a collage of fragments that could refer to different spaces and different times, strung together like a chain of diverse beads. The implied reference to multiple spaces and times in Stravinsky's music illustrates a break from the "two dimensional" developmental structure to one akin to the four dimensions discussed by the cubists.
At about the same time Italian Futurism was concentrating on research into movement, speed and noise in a celebration of the new possibilities of technology. Although only short lived, from 1909 to 1914, Futurism was demanding an attitude towards life that was, although in many ways violent, intently looking to the future possibilities of the mechanical age. Their first manifesto, written by F.T.Marinetti, was published on the front page of the Paris newspaper *Le Figaro* in 1909 and demanded an aggressive release from the prevailing apathy towards the conventions of painting. The second manifesto, 'Futurist Painting: Technical Manifesto' (1910), describes their attitude towards presenting movement in the image "a running horse has not four legs, but twenty, and their movements are triangular."

The multiplicity and dynamism can be seen as a direct manifestation of the more general attitudes to the new space-time. One could imagine a sympathy with Cubism, yet in a later statement 'The Exhibitors to the Public' (1912), the Cubist painters "of great worth" do not escape albeit respectful criticism from the Futurists. The complaint is that "They obstinately continue to paint objects motionless, frozen, and all static aspects of nature". The primary force of the Futurists was understanding from within the force fields that are the structure of movement, as Carlo Carrà writes, "to present the motion of any given moment, the currents and centres of the forces which constitute the individuality and synthesis of the movement itself" (1913) (Fig. 2)

Fig. 2, *Bottle Evolving in Space*, by Boccioni, 1911-1912
It is a central argument of Siegfried Giedion that "the common background of space-time has been explored by the cubists through spatial representation and by the futurists through research into movement". Yet it is the influence of cubism on architecture, rather than futurism, that he more fully explores, from which, he argues, develops the predominance of the plane and slab. The fragmentation of the picture plane developed into, amongst others, the paintings of De Stijl, the structural innovations in the bridges of Maillart such as shown in Fig. 3, the architecture of the Bauhaus and Le Corbusier. He argues that from these beginnings Modernist architects developed a new concept of space that was no longer about interior volumes but rather the interaction between inner and outer space. Le Corbusier's *Villa Savoie* (1928-1930) as shown in Fig. 4 is, in Giedion's view, one of the best examples of a construction in space-time. "A cross section at any point shows inner and outer space penetrating each other inextricably." Yet how important actually is time to this new concept of interpenetrating spaces? Giedion takes up neither movement nor time in any radical way throughout his book, even after laying the foundations with his discussion of futurism.
At the beginning of the twentieth century, the inventions of the train, telephone, and cinema all contributed to a general awareness and acceptance of a different reality of time-space. Jaques Aumont, in his essay 'The Variable Eye, or The Mobilzation of the Gaze' (1989), discusses the extent to which the invention of rail travel opened a new mass experience of viewing. The seated passenger watches the landscape pass by at speed, framed by the windows, and learns to view in an almost cinematic way. This must have been an experience that inspired the futurists into celebrating the speed and capturing the movement of objects like the train in a static sculpture or painting. But where the futurists argue from the standpoint of creators, Aumont talks of the influence on the viewer. The experience of a view from the train is described thus, "A mobile eye in an immobile body...handicapped...but at the same time gifted with the omnipresence as well as the omnivoyance also characteristic of the cinematic spectator."

The moving pictures at the start of the century demonstrated the possibility of juxtaposing different spaces, locations and times in a smooth-running sequence where the viewer experiences a kind of moving space as the eye associates with the camera, is manipulated by the editing, and is taken into the movement presented on screen. Erwin Panofsky, in his essay 'Style and Medium in the Motion Pictures' (1947), speaking of the movies of 1900 to 1930, describes how the cinema has the capacity to make space move. "The spectator occupies a fixed seat, but...aesthetically, he is in permanent motion....Not only bodies move in space, but space itself does, approaching, receding, turning, dissolving and recrystallizing..." The moving pictures can be seen as a temporal extension of the issues addressed in a combination of cubism and futurism, in that time as well as space is fragmented, compressed and recomposed in a way that highlights movement.
The combination of music and visual imagery in the cinema is perhaps the most prominent example of the new space-time. Audio - time - and visual - space - combine to create the new medium. The silent movies had music, either improvised or composed, played live alongside the film, as a support and comment on the action. With the invention of the 'talkies' in the 1920's sound became a prominent conveyor of specific content. Atmospheric sounds could be added, engines, car horns, footsteps, to describe the spaces and feelings of the images presented on the screen. Panofsky's comment of "the law of time-charged space and space-bound time" describes the increasingly intimate relationship between sound and image, time and space, in the moving pictures at the time of the intervention of sound.

However, as the form and pace is more often dictated by image and narrative structure rather than musical sense, the medium of the moving image in general demands a new approach to musical composition. An example is the music by Carl Stalling in the 1940's and 1950's for the Warner Brothers cartoons in which the music rapidly jumps styles with great virtuosity following the events of the characters. The result is a kaleidoscopic string of disparate musical styles, superficially reminiscent of Stravinsky. Yet unlike Stravinsky, when played without the images there seems little musical sense. It is as if, in cinema, the role of music is changed. It is not "listened" to as a concert piece in its own right, in fact it is often only subconsciously heard as the attention is focused on the imagery and story. But the music is essential to creating the illusion and acts as the underlying structure to the piece without which the whole skillful employment of moving image rhetoric would be useless.

Like Giedion's approach to space-time in architecture, where he clearly favours space, the moving pictures, in general, predominantly favour image and story. It makes one think of what new possibilities a balanced audio-visual approach could bring to potentials inherent in the moving image medium. And, stepping sideways across parallel disciplines, what new possibilities could a balanced space-time approach bring to potentials inherent in the architectural medium? Like a "moving picture", is a "moving architecture" a possible or inherently flawed concept? In order to start to answer this question in any depth it is necessary to more fully understand what "space-time" may actually mean and how, judging by the early developments described above, we can discover the present trends and the possible directions enabled by its multi-dimensionality.

Two Theories of "Space-Time"

Writing during his years at the Bauhaus in the 1920's and early 1930's, Paul Klee famously describes how a line has an inherent temporal value as it is a point "taken for a walk". The line is both time and space, "A linear figure takes time, and one must travel receptively the same road as one has taken productively...the longer the line the more of the time element it contains." Klee's foundations are that anything living is in movement, genesis (of nature, of art) is movement, and that movement is nothing more than the combination of space and time. In his Creative Credo, first
published in 1920, he demonstrates that space and time cannot be separated, by reaching to a far more fundamental level than Giedion does, as illustrated by the following passage.

"All becoming is based on movement. In Lessing's *Laocoon*, on which we wasted a certain amount of intellectual effort in our younger days, a good deal of fuss is made about the difference between temporal and spatial art. But on closer scrutiny the fuss turns out to be mere learned foolishness. For space itself is a temporal concept. When a point turns into movement and line - that takes time. Or when a line is displaced to form a plane. And the same is true of the movement of planes into spaces."

Is this what Giedion assumes but does not describe when discussing the use of the plane in architecture? Klee invests an apparently static "space" with movement. Whereas Giedion's only explanation as to the temporality of a plane is through an historical connection with cubist painting, Klee describes the inherent temporal value in a plane and a space by a system of diagrams of forces and movement. This is clearly illustrated in the diagram and notes (Fig. 5) taken from 'Towards a theory of Form Production'. The *House* by Klee, (Fig. 6) is a painting that uses these ideas to produce a two dimensional canvas of the "interpenetration of inside and outside", the very claim Giedion makes of modernist architecture, such as the *Villa Savoie*.  

![Diagram](image_url)

Fig. 5, Towards a theory of Form Production, by Paul Klee
In a paper entitled 'Music, Mind and Meaning' (1981), Marvin Minsky, one of the founders of the discipline Artificial Intelligence, describes how the mind understands space and time in fundamentally similar ways. He describes the mind as consisting of societies of "agents", each agent with its own specialised capability, that work together in chains. In his analysis of vision he gives the basic example:

"suppose that a certain mind-agent called Feature-Finder sends messages (about features it finds on the retina) to another agent, Scene-Analyzer. Scene-Analyzer draws conclusions from the messages it gets and sends its own, in turn, to other mind-parts."

The inter-agent communication happens at enormous speed and is constantly updated as every flick of the eye presents a new image to be analyzed. This results in a process analogous to the cinema's use of sequences of still frames creating the illusion of motion. In his cinema analogy Minsky asks "What "hides the seams" to make great films so much less than the sum of their parts - so that we do not see them as a mere sequence of scenes? What makes us feel that we are there and part of it when we are in fact immobile in our chairs?" Our illusion of the stability and smooth motion of both space and time, Minsky argues, is built up in a similar way. It takes time to read a text, see a painting, orientate oneself in a room, just as it takes space for sound to exist. He comments, "That totally compelling sense that we are conscious of seeing everything in the room instantly and immediately is totally the strangest of our "optical" illusions." Minsky's argument that the processes of inter-agent coordination in our understanding of space and music are very similar is illustrated in the following comparison:
"How do both music and vision build things in our minds? ... Hearing a theme is like seeing a thing in a room, a section or movement is like a room, and a whole sonata is like an entire building. I do not mean to say that music builds the sorts of things that Space-Builder does. (That is too naive a comparison of sound and place.) I do mean to say that composers stimulate coherency by engaging the same sorts of inter-agent coordinations that vision uses to produce its illusion of a stable world using, of course, different agents."

There is nothing in common between these two theories except the general starting point of the intimate connections between space and time. The concept of "space-time" at the end of the century is radically different from its beginnings. Paul Klee is describing how solid, geometrical shapes are embedded with movement, by looking at the genesis of form through motion. Marvin Minsky is describing complex flows of information passing at high speed through networks in the brain. One is using the metaphors of the mechanical age, the other with those of the computer age of information. The period between these two is often characterised by an attitude of nihilism in the arts and architecture. Concept took precedence over production - architects discussed concepts but rarely built, as the gap between the two realities seemed unbridgeable. Composers wrote "concept" pieces, lists of ideas to be interpreted as music, or not.

Two Works in "Space-Time"

John Cage's 4'33" of 1952, for any instrument/s, consisting entirely of silence, the time frame not chosen but given to chance with the roll of dice, is potentially the ultimate signal of nihilism. Yet in reaching this point Cage in effect cleared the palette for a fresh start away from the priorities of previous generations. An entirely new flexibility in musical composition arose that concentrated on process rather than product which has implications beyond the discipline of music. Cage generated open structures, acknowledging the endless possibilities for variation within a composition where the process was described rather than the content.

The musical score Variations IV of 1963 consists of transparent sheets of graphics and minimal instructions. The score is to be cut up and the pieces dropped over a plan of the performance space (made prior to the performance) in chance configurations. This determines where in the space the performers are placed, where the audience are, and the relationship of the sounds in space. Cage allows the possibility that the performance may take place in a variety of spaces, theatres, multi-story spaces, outdoors, domestic spaces, even caves. The instructions, like many of Cage's works of this period, illustrate the extent to which process is given priority over content.

The multiplicity of disparate musical elements - content is left to the performers choice - often happening simultaneously, in various locations in space - discovered only during the laying of the score in performance - can be clearly understood in the context of the new "space-time". It is the performers that make sense of the score by actively constructing its spatial structure and content.
This piece illustrates a change from the absolute, closed structures of the cubists and futurists. In Cage space-time is transformed into open, flexible structures where time and space are not rigidly fixed but are allowed to be alive in their constantly transforming relationship to one another. Space-time is allowed to become fluid.

In film, Chris Marker's *La Jetee* of 1962, or Terry Gilliam's version of the same story *Twelve Monkeys* of 1996, take us backwards and forwards in time around a narrative structure based on the futuristic theme of time-travel. The plots in both films are very intricate and the directors are constantly keeping the viewers in as clear a position as possible as to the jumps in time. In contrast the Russian film director Andrei Tarkovsky explores the potential of a fragmentary space-time in film in a distinctive way. Tarkovsky's *Mirror* of 1974 is, rather than a time-travel narrative, an autobiographical story of childhood - a subject that could inherently be told in a linear way. Unlike Cage's work of 1963, where the fluidity arises out of the flexibility of indeterminate structures and live performance, Tarkovsky's carefully constructed masterpiece achieves fluidity through the ease of movement between past, present, future, dreams and memories. Yet both are open structures whether through Cage's process or Tarkovsky's provocation of the viewer's imagination. The jumps in narrative time are recognisable through the filmic techniques of long shots, slowing down, colour coding, repetition and sound and rely on the viewer's memory and imagination to make sense rather than feeding the viewer with the information. Tarkovsky is literally "sculpting in time".

In all its rigidity of duration - it lasts one hundred and two minutes - this film has the essence of an open structure where narrative information is sparse and different interpretations are possible after numerous viewings. In *Mirror* film has gone further than Panofsky's observation of moving space - Tarkovsky presents us with a non-linear path through time where we are asked to make sense of the fragmentation. And although "immobile in our chairs" we as viewers are invited to take an increasingly active role. There is a sign of the future in both Cage's music and Tarkovsky's film, that of the move from fulfilling passive expectations to provoking active explorations.

Towards the "Event Space"

There is a shift in architectural theory towards the end of the century that tackles the issues of space-time in their contemporary incarnation. Bernard Tschumi, in his article 'The Architectural Paradox' (1975), describes two positions, one the conceptual approach to space - represented in the Pyramid - the other the physical, or sensory approach to space - represented in the Labyrinth. He argues that space is no longer to be discussed in terms of the physical boundaries of Giedion, but rather in the gap between "ideal space (the product of mental processes) and real space (the product of social praxis)". His argument continues towards what he claims as the inevitable product of this gap - nihilism, silence. The transcendence of the nihilism of the architectural paradox lies in the bridge between the rational and the irrational, system and excess, "the architectural rule and the experience of pleasure". In a process that echoes Cage's approach, he proposes the solution to this state of silence, that of "experienced space" and the notion of event. How better can we describe
Cage's *Variations IV* with its compositional rules, its freedom, and the inevitable pleasure of performing? It is what we can consider as the original "event space". Through a combination of chance and rules the space is described by the placing and the actions - the "experience" - of the people within it. (Would Tschumi allow Cage to be called an architect?)

Where Tschumi arrives at the notion of *event* through a discussion of space, Ignasi de Solà-Morales does so through a discussion of time. In his article 'Weak Architecture' (1987), he describes contemporary time as "a diffracted explosion", fragmented, discontinuous, overlapping, in which there is no longer one single time as in its classical sense, but *times*. He makes clear that Giedion's discussion of modern architecture, despite its claims, is still working in the complete closed system of classical time and that "for the first generation of modern architects, time/space was defined as a continuity more than as a fragment or juxtaposition". It is as if de Solà-Morales acknowledges that architects are more likely to discuss issues of space than time, after all architecture has never occupied a serious position as a temporal entity. He is specific in describing that the new notion of times:

"was not fully understood by the masters of modern architecture, who in many cases thought that what was needed was a time divorced from the centralism of perspectival vision, but which might perfectly well be a time organised from the linear point of view, after the fashion of the cinematographic sequence."  

The momentary and multiple layers ("archaeology") of times is central to his concept of weak architecture, and the event. Again in an echo of Cage's work in the 1960's, de Solà-Morales says, "Temporality does not present itself as a system but as an aleatory instant that, responding above all to chance, is produced in an unforeseeable place and moment". In great contrast to Rem Koolhaas' (1994) concept of "Bigness" in architecture - "inflexible, immutable, definitive, forever there, generated through superhuman effort" - "weak" architecture is sympathetic to the momentary and speed of change that leaves only a resonance. We can draw a parallel with Tarkovsky's *Mirror* through his presentation of the resonance of memory that, although produced from recollections of the past, take place in the fleeting present. In the prophetic words of Saint Augustine's *Confessions*, writing in the third century AD, "there "are" three times, the present of the past (memory), the present of the present (conscious perception), the present of the future (expectation)". This is the resonance of the present in the "event" of space-time.

However, while these are valuable as theories of the direction of space-time development, we are never presented with a reality in the form of an example of the event space. Can architecture move from its stagnation of dematerialization (architecture as concept - Tschumi 1975) towards a fluidity of time-space in real terms - from theory to practice? Architecture as a discipline lacks the depth of a tradition of performance as found in dance, music or theatre, of live construction of time, of audience. Cage's event space is successful to an extent as it finds a way of describing a pre-existing space by mapping above it a level of "experience" by placing performers, audience, sounds within it. Architecture should have the advantage of being able to create the entire space as a unity of "experience" not just the level of mapping within it. However it seems that it is only in the
combination of disciplines, of those with temporal experience, those with light (the material of the moving image), those with technology, and those with construction, that a reality can come out of these theories.

**Conclusion**

In the last ten years space-time has accelerated into internet enabling communication and information exchange almost instantly from anywhere in the world. Our empirical understanding of space and time, distance and speed, multiplicity and simultaneity, has been expanded into a reality of on the one hand fragmentation and on the other fluidity. Peter Zellner in his new book *Hybrid Space: New Forms in digital Architecture* (1999) describes the climate:

"The globalized liquid of "soft architectures" of digital media flow over, under and through the local, concrete and "hard architectures" of our contemporary cities, creating an indeterminate, "floating" environment, an interface between public and private, collective and subjective, provincial and planetary."

Milan Kundera begins his novel *Slowness* (1996) with the notion of the ecstasy of speed as given to us by technology. In referring to the speed of a motorbike, he writes,

"when man delegates the faculty of speed to a machine...his own body is outside the process, and he gives over to a speed that is non-corporeal, non-material, pure speed, speed itself, ecstasy speed."

As with the futurists of 1910, it is not hard to imagine, in the year 2000, of being drawn in to the speed of digital technology in a similar way. Whereas we can associate slowness with remembering, the ecstasy of speed presents the image of escapism, forgetting. Kundera says slowness is memory, speed is forgetfulness. In accelerating towards a speed of access, information, communication and production the overall effect of space-time must inevitably transform itself again. It is clear that a new structure is demanded, one that allows, supports the multiplicity, and the speed. But it is not clear whether it will support forgetfulness or fluidity.
The rising trends in architecture, such as the work of Dutch architects Kas Oosterhuis (Fig. 7 and front page) and Lars Spuybroek (Fig. 8), show the potentials of a combination of disciplines within the architectural project. The Water Pavilion at Neeltje Jans, built in 1997, was designed in two halves by the above two architectural practices, and included the work of composers, visual artists and sensor technology experts. The aim was to create an environment on the theme of water, suitable to the wet area of Holland where it stands. The two halves, salt water and fresh water respectively, were designed to respond to the movements and actions of the visitors, with a complex array of water spouts, projections, light and sound. The result is a fluidity on the interior that is flexible to the human.

Fig. 7, the interior of the Salt Water Pavilion, by Kas Oosterhuis

Fig. 8, the Fresh Water Pavilion, by Lars Spuybroek
In contrast, the work of Santiago Calatrava, presents an example of a fluidity of structure on the exterior. The Kuwait Pavilion, (Fig. 9 and Fig. 10) built for the Expo'92 in Seville, is a kinetic building with a roof structure that reflects the organic shapes of palm fronds that can be moved to reflect the weather or time of day. The two approaches, if combined, could create an active, live environment that could reflect the potentials of the tools available in the twenty first century and create a reality from the theories of the contemporary space-time.

Fig. 9, The Kuwait Pavilion, by Santiago Calatrava

With a realization that the human, rather than the computer, is the centre of the speed development, the human becomes central to the notion of time-space and architecture is presented with the possibility of reflecting the fluidity of the individual. Time and space are then not separatable, and, in contrast to modernism, architecture need no longer be static. With the use of the moving image, which can also become a powerful tool away from its niche of story-telling, space can be described and constantly transformed through the movement of light and images. Architecture need not be an isolated shell of a space within which people move, but a live environment reflecting the organicism and fluidity of the natural world without working against it.

Fig. 10, The Kuwait Pavilion, by Santiago Calatrava
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