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THE CHRONOTOPE AS A MODEL FOR HYPERMEDIA
IN ARCHITECTURE EDUCATION

Anna Louise Soutar

ABSTRACT

The thesis is a retrospective reporting and a critical examination of *HyperSteel*. This is a hypermedia application for architectural education intended to function as a learning bridge between structural knowledge-acquisition and intuitive use. It is one of many parallel developments in software design that have occurred around the world in the last decade (Mitchell 1995).

Hypermedia is a set of procedures applied to computer aided learning that is based upon interactive software, typically Apple Computer’s Hypercard®, and its successors. How can this medium with its strongly cinematographic characteristics best be used in the imaginative and intuitive processes of an architectural education? The term cinema - whether it means the discipline and industry of film making or whether it is the architecture of a place of entertainment - evokes diverse concepts and images. These include illusions of time and space, the sense of seeing more than one reality at the same time; and of existing at the intersection of art and technology. This thesis argues that these related concepts and images can be distilled from cinema and other established disciplines, and adapted into a common aesthetic for hypermedia.

The thesis posits a chronotopic theory with respect to the computer-human interface, whose integral imaginative mechanism is the click-jump of the user interface device. Mikhail Bakhtin's chronotopic event is borrowed from literary theory to describe the progression and development of time and space as they intersect (Bakhtin 1937). It is argued that this moment of the man-machine coordinated action is the act which puts imaginative control of the learning process into the hands of the learner and thus becomes the central vehicle of knowledge delivery.

The theoretical underpinning for this argument refers to depictions of architecture as a space-time experience used by historian Sigfried Giedion (1941). The perception of the intuition as tacit knowledge is developed from Michael Polanyi (1969), and the conclusions of cognitive psychologist Allan Paivio and others provide an educational principle of dual processing as a model for learning by hypermedia (Paivio 1986). The writings of Paul Ricoeur (1988) on the nature of a meaning for narrative which encompasses both time and space along one horizon in which the traveller - in this case the student architect - arrives at perceptive understanding in their learning...
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proces6, will also inform this theoretical perspective.

The intention of the thesis is to identify, and theorise digital chronotopicity as it functions in architecture education. My conclusion is that there is a role for the media practitioner and theorist in making interactive software tools effective in the context of computer technologies and architecture education.
The progress of my working life has brought opportunities, from schoolteacher and broadcasting journalist to technology manager, media producer and finally student, to participate in successive waves of new presentation media. In 1989 I was managing a media production unit in the school of architecture, University of Auckland when I attended an inaugural conference into the uses of ‘multimedia’ in higher education at Massey University, Palmerston North. We had already been using multiple media including son é lumiere, video and live performance in order to enliven and illustrate architecture. Digital coding promised further versatility, and was to almost eclipse the use of the previous expressive forms, although we were not to know it then.

In the decade which followed I realised that while my personal career background had prepared me for technological developments, the creative and intellectual potential of the students would be an ongoing inspiration. I was called upon to use the ‘collective’ medium emerging in the computer, to contrive a teaching program for the subject area of structures theory. Despite confidence in both cinematography and teaching, I can honestly say I was not so sure about either the content or the medium of HyperSteel, the software program which resulted. This is the result of following that uncertainty as I tracked the mutuality between architecture and the moving image.

As I sought to identify certain philosophical bases on which to set an understanding, I had to consider the metaphor of ‘cyberspace’ and how one should teach in it. Ultimately I consider it to be an act of design.

Thanks are due to my supervisors Dr M. Linzey (Architecture) and Dr R. Hamilton (Education); and academic adviser Professor R. Horrocks (Film, Television and Media Studies). I am grateful to Judith Cockeram, Barbara Grant, Tim Hall, Lynne Logan, and Wong Liu Sheung for technical and collegial support. I was also fortunate to be granted research access to the British Library.
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1. INTRODUCTION

The thesis explores the contribution a film-oriented software designer may make to architecture education, by presenting an example of a learning tool developed in hypermedia for the curriculum subject, architectural science. It proposes that it is the media director whose film-based expertise puts control into the hands of the user/learner. By identifying and designating this moment of control in literary terms, it is possible to make a small but significant contribution to the theory of architectural computation, and one derived from the self directed intersection of space and time.

Original research in the form of a qualitative survey of architecture students and teachers who were users of this work of hypermedia, HyperSteel, which was designed and produced in the Auckland School of Architecture provides empirical support for this theoretical standpoint, together with a review of the educational processes which it serves and out of which it was developed.

By means of a series of integrated explanations, I identify the imaginative phenomenon which distinguishes hypermedia from other modes of representation and teaching delivery. The phenomenon is characterised by an
CHAPTER 1

intersecting axis of time and space that I am calling the 'chronotope', which in hypermedia is controlled not by the original creator/author of the work, but by the user/learner/viewer. This nomenclature is loosely borrowed from the literary writings of Mikhail Bakhtin (1895 - 1975) and developed in this study to apply to the new digital medium. As Bakhtin says of the novel, chronotopes “are the organising centres for the fundamental narrative events ... The chronotope is the place where the knots of narrative are tied and untied...” (1935/1981:250). As Bakhtin extended the chronotope beyond its original roots in science, then so I argue it is also reasonable to extend its usefulness to applications beyond the analysis of the novel. Bakhtin himself set the stage for this form of loose extension when he universalised the chronotope beyond literature, stating that the image of man is always essentially chronotopic, and that “chance is but one form of the principle of necessity” (ibid. pg 97). It is on his description at its simplest that this thesis turns; it being my proposition that the user of HyperSteel, facing the alternative routes offered on the computer screen, feels a need to make the next space-time change; the mouse-click at this vital moment is not the random chance event it might appear, to any disinterested observer. It is the principle of necessity for learning, that precisely at that moment the learner engages imaginatively with the software; and following this necessity, continues a personal narrative through that hypermedia experience.

Naming the result of this action of the user interface function (or mouse-click, which is the most-used form today) as a chronotope, may be thought of as somewhat reductionist. On the contrary, it is argued, that the growth of knowledge can proceed if we accept that at the simplest level there is an occurrence of such a strong similarity between two disciplines, that it is the same thing. In literature, the intersection of a spatial dimension and a temporal event, produces a chronotope. In hypermedia, where the place in hyperspace seen on the screen of a computer is changed by the click-jump of the viewer, then the narrative has moved on, and a chronotope has occurred. For this to happen on a computer screen is to say what would occur at this time in history at the start of the 21st century: in the future technology may have delivered something quite different, like holographs or monitor-like
wallpaper or "electronic facades", as architect Bernard Tschumi has encountered (1994:22).

The more drastically the comparison is reduced to its simplest elements - here, the intersection of time and space - the more necessary it is to tie it in with related concepts, which are readily agreed upon, so that one thing in our understanding is seen to relate to another. For this reason, the thesis is concerned with laying out understandings about cinema both as architecture and film; about learning in higher education and the profession of architecture; and philosophical strands in the fields of literature and pedagogy.

The thesis draws on material from across several disciplines, notably architecture, education, philosophy, film studies and computer science in order to give a sense of the woven fabric out of which HyperSteel is also composed. This has necessitated more of a descriptive than a discursive approach to the issues around this act of specialised education, than an in-depth study of a single key question could elicit in any one subject. I have been at pains to keep the presentation balanced across the subjects, all the while regretting that further research from literature, art history, and social anthropology might also have been included.

The cinematographer and the architect share the similar occupational obligations, of engaging with the many interests of their different clients in order to internalise the clients' needs. This in small measure is what is offered here, three carefully chosen, utilitarian models from the fields examined: building, film and interactive software, as illustration and demonstration of practice management.

I will return to an examination of the concept of chronotope after an explanation of the particular biases taken in this thesis, for after all, no knowledge is neutral, and one's partisanship should be available to the reader. There are three participants in the development of software for use as a learning tool. These people are first, the author, or what may be thought of as content editor or knowledge source (in this case the architect/engineer
teachers); second, there is a requirement for a computer programmer with technical expertise; and thirdly, the media director. This last and the central concern of the present study, is akin to both a film director or building project manager, to blend the skills and creativity of the other people’s talents together with the raw material of the content, so that within the limitations and possibilities of the medium, they may be converted into interactive images, text and sound.

Combining these differing interests, the media director or ‘cinematographer’ - the term preferred in this thesis to distinguish it from ‘architect’ and ‘computer programmer’ - will defer to the underlying discipline. In the case under study, the engineering and architecture science of steel structures provides the base material for *HyperSteel*. Rather than creative, this is an interpretive and educative responsibility.

Since its inception as a separate delivery platform, multi media in education (there have been many names used: hypermedia, computer-aided learning, interactive and digital games, are some), has featured people with a cinematography background. Apple Computer Inc. in collaboration with Lucasfilms Ltd., was an early disseminator of educational materials, workshops and discussions in the late 1980s and established a base level of understandings grounded in film theory and practice (Hooper, 1988). As development has continued and the technology and the range of uses into World Wide Web and digital games has incrementally grown, the producers of hypermedia have also become more specialised. It is my argument, however, that these new specialists owe much to the three areas of expertise included in the thesis: the architect, the film maker and the computer programmer. Indeed as the computer itself becomes ever more powerful, the software more versatile, it is the first two who have emerged as some of the strongest creative proponents in terms of digital design, while the need for a specialist programmer has receded.

One descriptor in common use for digital media is not, however, part of this study: it is important here to state that the adjective ‘non-linear’ is not useful
CHAPTER 1

nor accurate to describe hypermedia software. Firstly, such terminology is pejorative, implying by its negative form, that hypermedia should be linear, that this is a quality that is somehow missing. In fact, and secondly as many explanations in Chapter 3 will show, it is very linear, linked by the intuitive imagination of the user which is then enhanced by the material in the program.

Apparent non-linearity is what may be observed by a third party, since the choices of interrupt may be illogical to an on-looker, but since self-directed choice is the new feature of this medium the clicks or chronotopic jumps are following the user's thought processes or internal narrative and are consequently, entirely 'linear'.

This and other aspects of narrative are important threads to this discussion of hypermedia and its comparative position in regard to film and architecture. They are to be examined further in the thesis, informed by the writings of Paul Ricoeur and will extend the idea of the chronotope in the architectural imagination.

1.1 The intersecting association of film and architecture

Due respect and awareness is paid to the history of the relationship between architecture and film, since it is also a large part of the pre-history of hypermedia in architecture. It is a history which explains acceptance of the theoretical position that time and space are linked in some way, a position that was signposted for architecture educators in the 1940s when historian Sigfried Giedion (1888 – 1968) in Space, Time and Architecture (1941) defined a concept he termed 'space-time' and made a break away from Renaissance ideas of space with its three dimensional dependence on perspective requiring a motionless, fixed and static point of view by the observer.
The following short history of the intersecting association of film and architecture provides a starting point for a discussion of theory. Since continuous moving pictures were first photographed in 1896, authors from both disciplines have described buildings as ‘actors’ with dramatic abilities and the power to express emotion; it is commonplace, if metaphorical, to say that buildings move, some as part of their constructed function, and some by their manner of layout or appearance.

Whatever their similarities, however, cinematography and architecture are distinct disciplines in their own right, and in discussing the dimensions of space and time, each has its own predominance: architecture is an activity concerned with space, with the invention and manipulation of built spaces within the greater environment of physical existence. To the extent that once the projector is turned on the image changes at 24 frames a second and vanishes a moment after being seen, film is ephemeral, and depends on the passage of time for its existence.

Conversely though, as Kester Rattenbury points out, any one film remains the same and may be seen again and again on several copies over the years, while a work of architecture always exists under singular conditions of change: "leaky, intransigent, alterable, endlessly subject to total shifts of context, meaning, form, understanding ..." (1994:35).

Film and architecture can become inextricably tangled; for instance, when films are used as representations of architecture; and then by developing their own iconic status, become more famous than the architecture on which they were based. Fritz Lang’s *Metropolis* (Universum Film, 1927) for instance, then influenced Ridley Scott’s *Blade Runner* (The Ladd Company 1982). Both engage a “futuristic vision of a city transformed into a kind of hell … reducing its inhabitants to disempowered underscaled functionaries,” a common modernist platform for both architects and film writers (Rattenbury 2002:85). Indeed, *Metropolis* has fed the iconography of popular media far beyond its first anti-Semitic, men-as-victims intentions, its design - the responsibility of architect Hans Poelzig - a compelling vision of the grotesque
city which was later to influence Chaplin’s *Modern Times* (1936), Gilliam’s *Brazil*, (1985), Stallone’s *Judge Dredd* (1995), and Ridley Scott’s *12 Monkeys* (1995). The avatar constructed by the obsessed Jew (itself an echo of the earlier *The Golem*) went on to be a model for game heroine Lara Croft of *Tomb Raider* (1996), and for the clothes and on-stage persona of 1990s rock star Madonna.

Our response to the architectural images in film can, over time, change, however. Taking one example from those mentioned above, the images and the sentiment in the 1980s *Blade Runner* portrayed 20th century architecture as having a ‘heroic’ quality, as Rattenbury says, one which “permits bitter but luxurious enjoyment of (its) essential heroic ambiguity (2002:85)”. Now, thanks to the mass popularity of film, and the in-built comfort of their local cinemas or home entertainment systems, people can vicariously contemplate this former ‘hell’ from a safe perspective.

Historically, film is by far the junior partner in this parade of virtual spaces, since cinematography developed in the late 19th century amid the burgeoning industrial developments of the *fin de siecle* era. From the start, film was the product of converging technologies, not only photography, theatre and the inventions of continuous film, projectors, and movie cameras, as might be expected, but the technology of the stage magician: Albrecht’s *Designing Dreams: Modern Architecture in the Movies* describes Georges Méliès’ first movie studio built near Paris in 1897, “with all the paraphernalia of the illusionist theatre. Including the trapdoor, chutes and revolving panels that would allow actors and props suddenly to appear and disappear.” (1987:28)

The path of creative forces and the architectural imagination in the first half of the century, charted by Sigfried Giedion, was immersed in the technology of film and celebrated by both film makers and architects. The Modernist movement for film started with Méliès’ many films of industrial machines, most famously *A Trip to the Moon* (1902), with its fantasy laboratories, launching pads and even the pockmarked moon itself (Albrecht, 1987:28).
In what would become the first book on film theory in the United States, poet and university lecturer Vachel Lindsay presented an impassioned polemic about the architectural nature of film. He postulated that should architects be given control of the film industry, its power and influence would result in a more 'civilised' America:

One of the enticing future Americas, is that of the architect. Let the Architect appropriate the photo-play as his means of propaganda ...

(Lindsay 1970, first edition 1915:273)

Lindsay drew his idea for using the creative influence of architects that he saw at many World Fairs and Exhibitions which were being held to celebrate the turn of the 20th century. Ironically, however this was a time of relative disjuncture between architecture and artistic imagination, a time when historians of the generation of Sigfried Giedion often preferred to turn to engineers for exemplars of creative passion, as witnessed in his lyrical commentary on the Eiffel Tower (1889) which evoked movement and the layered planes of the cubist painters:

The interpenetration of continuously changing viewpoints creates in the eyes of the moving spectator a glimpse into four dimensional experience (Giedion 1967:282)

After the First World War, architects in Europe were looking for an egalitarian utopia where good design would be available to everyone. Sadly as Albrecht wrote, the movie makers' version of utopia was different: L'Inhumane (Cinegraphic. Dir. Marcel L'Herbier 1924) an early film production employing an architect, Robert Mallet-Stevens as film designer, showed modern architecture as the exclusive setting for the wealthy and the privileged. This portrayal of the profession persisted through the twentieth century, casting modernism as synonymous with glamour and affluent consumption. Although the utopia did not eventuate, it certainly publicised art deco and modernist architecture, as Lindsay had predicted, and when it eventuated it was at a somewhat less rarefied level. "The Versailles of the modern movement is the nightclub of the Hollywood musical; its Gothic cathedral is the skyscraper of the futurist epic," as Albrecht wrote (1987:174).
When designers like Viennese Joseph Urban had a portfolio including skyscrapers for William Randolph Hearst and at the same time, extravagant sets for dancing entrepreneur Florenz Ziegfield; when ‘streamlining’ became the motif word for ocean liners, night clubs and hotels in which Fred Astaire danced in films like Top Hat (1935), Swing Time (1936), and Top of the Town (1937), Le Corbusier made a documentary film, L’Architecture D’Aujourd’hui in which he declared that movement was a major theme of his work, using an automobile ‘a machine for driving’, an aeroplane ‘a machine for flying’ and his Villa Savoye ‘a machine for living’ as complementary images.

Sigfried Giedion, described Le Corbusier’s civic centre at St Die as a building that ‘moves’:

The area is perforated by volumes of widely different shapes that continually fill in, or hollow out the space like contemporary sculptures. People walking around or sitting in at the cafe that forms a corner of the square would have a continuously changing spatial experience... (Giedion 1941:532)

Theorists and critics described living spaces in terms of movement, and used moving images and architecture interchangeably to make the imaginative moves for them. In 1928 when Le Corbusier visited Russia he commented of Eisenstein: “I seem to think as M. Eisenstein does when he makes his films,” (Cohen 1992:49). As if in response Eisenstein applied the monumental images in built form to a montage of scenes set in narrative sequence for the Acropolis “a series of carefully disposed phenomena... diverse impressions passing in front of an immobile spectator” (cited in Vidler, 1993:56). Le Corbusier used the same images of the Acropolis to demonstrate what he called the promenade architecturale, which Eisenstein himself had called, “a montage sequence... that our legs create by walking among the buildings of the Acropolis” (published in Assemblage 10, 1989:117).

Meaning an assembling of images, ‘montage’ is the term Eisenstein used for his method of editing film to tell his stories, first, but more significantly, to layer meaning by means of images, “… a calculated transition from purely
visual elements to an interweaving of them with aural elements ...” is how he described the technique (Eisenstein 1944). Since editing in hypermedia software is done at the user/viewer’s own pace and interest, this is not a direct concern for the thesis, but his place in a history of film is important because he is “credited with being the first and possibly the most important theorist of the cinema,” as Wollen says. (1998:3)

Giedion’s approach to architectural critique was to apply what he called his ‘perceptive apparatus’, a technique by which he photographed the moving view influenced by an emotional impulse. At the time he was judged critically, this mix of science and artistry being out of favour; but he persisted, in one instance using photography to demonstrate how cubist art, especially that of Picasso was like photographs taken at speed, “the conception of space-time, in short...” He selects the Bauhaus of Walter Gropius for particular attention:

The Bauhaus (a 1926 complex of buildings designed for a factory in the Wiemar) is an arrangement of cubes ... juxtaposed and interrelated ... there is a hovering, vertical grouping of planes which satisfies our feeling for a relational space, and there is the extensive transparency that permits interior and exterior to be seen simultaneously en face and en profile. (1928:389)

By shifting the observer into the centre of events - as if in filmic terms, in extreme close up - he or she cannot actually make out the compositional geometry of the complete project. Giedion achieves this in still photography by shifting the gaze constantly, adjusting perspective. “Static pictures do not provide any clarity,” he says. By this means the ‘perceptive apparatus’ then becomes independent of the object itself.

We have to be able to follow the transformation of our own gaze. Only film can make sense of the new architecture (Giedion’s italics) (ibid. pg 92),

so explaining the cubist interest in seeing the same object from many views simultaneously, taking a fluctuating point of observation and divorcing movement from geometry.
Giedion’s photographs and descriptions of ‘transparent and hovering planes’ evoke a dramatic sense of the tension of a moment of expectation between two movements. Considered architecturally, there is a tautness in fabric held by its own materiality, and it becomes a kind of visual pun on architecture-in-motion. This notion of the ‘intersecting time-space’ developed in the mid twentieth century by Sigfried Giedion establishes for architecture a simultaneous perception of two views of a form, and is extended by discussion later in this thesis.

Two of the more ‘architectural’ feats of set design occurred half a century apart but provide strong examples of a drama in which the built environment itself takes on a ‘role’. They are Wagener’s *The Golem* (1920) and Tati’s *Play Time* (1968) and in both it can be said that “... architecture in film can undergo a transformation from static set to anthropomorphic participant in the lives of the characters,” as Heathcote (2002:16) puts it. Commonly, the sets for a film are designed and constructed as a collection of facades and three-sided rooms but occasionally a film company builds the settings as one would for a liveable space, despite the resulting costs. For *The Golem* Hans Poelzig (1869 - 1936) city architect in Dresden, constructed a tangible expression of confinement and social pressure to realise the spiritual city with no less than 54 separate 3-dimensional buildings surrounded by a ghetto wall (Dillman 2002:16); while the 1960s urban set for *Play Time* was built on a huge location outside Paris described by Heathcote with skyscrapers, working escalators, automatic glass doors, authentic street with traffic lights, expressing “not only the mood but the existential emptiness of an uncaring technocratic society”. In both cases the buildings interacted with the actors to echo or emphasis the dramatic narrative: Dillman describes the rabbi’s staircase which he ascends to carry out his occult ritual as “opening like an ear to the sky” (ibid. pg 16) while the privacy panels in Tati’s office blocks are seen to create “a ludicrous balletic vision of legs and feet robbed of their bodies, dancing around gaps in the architecture.” (Heathcote 2002:20)

These are extreme - and extremely expensive - instances of film being approached like a working project in architecture. More recently, in the
reverse of this ‘borrowing’, the film form attracted contemporary French architect, Jean Nouvel to the map-like films of German Wim Wenders (Paris, Texas, 20th Century Fox, 1984) as inspiration for his bar for the Theatre at Belfort completed in 1983: "... with wet asphalt, red neon light, a stainless-steel counter and Coca Cola crates ..." Nouvel recounts to journalist Odile Fillon how similar he finds the working conditions of architects and film makers, with the same team of specialists in lighting, sound, acoustic, colour and engineering. It also influences his personal philosophy of architecture:

... he started to contemplate the notion of movement in architecture ... as a series of sequences. "Cinema ... has taught us to see images in relations to time. A town is now read through motion, travel. Today, architectural composition refers to sequences ... the notion of the journey is a new way of composing architecture" (Fillion 1997:119)

Postmodernist theorists also choose subjective language to discuss architecture, like "... wrapping back - self-referencing - on itself ...", buildings which have movement-like qualities that are complex, inter-textual, and particularly, folding. Charles Jencks for example, relates the Guggenheim museum in Bilbao designed by Frank Gehry to postmodern issues, "the supple, pliant, moving quality of the one and the notions of self-organising systems and the fractal order of the other" he says, "epitomises both the folding and complexity theories without explicitly being based on either. Gehry is aware of the writings of both and respects them but is led more by his intuitive concerns" (Jencks 2002:191). At times, Gehry identifies so strongly with the cinematographer who is his client, that his buildings appear to work like pieces of film. His commissions for entertainment production companies allow him to put into form his interest in the illusory nature of cinema. He is very aware that many city exteriors will only be seen when the spectator is travelling, as if, for example, on the freeways of California:

... the rigorously regular facade (of the Disney administration offices) was designed to be seen at high speed, ... the colour of Gehry’s quilted, stainless steel cladding shimmers ambiguously between blue, green, magenta and navy. Movement alters the perception of the building, yielding an architectural version of a motion picture (Giovannini 1996:63)
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The thesis will address the matter of architectural representation by moving picture in later chapters, particularly in its context as a subject in architecture school. This short summary of significant historical relationships between film and architecture has been included in this introductory chapter, since it is considered useful background, but as it is not central to the discussion, it will not be extended further. More thorough will be consideration of the theoretical basis of the chronotope placed in an extended close reading of an example each of a film, *Vertigo* (Paramount Pictures 1958) and a building, the Civic cinema, Auckland, examples which will re-occur to illustrate later discussion.

1.2 The literacy convention of the chronotope

The term chronotope was introduced as a literary device in the 1920s to describe a 'bringing together' of space and time in literature, specifically in the novel. As a term to describe the hypermedia imagination, a chronotope is the act of intersection which takes place when the time-based control of the user connects with the virtual time-space of the computer program.

I have taken it from the literary study of the novel as a useful starting point. M.M. Bakhtin's writings appeared spasmodically after 1925, perhaps because of the vagaries of the Russian political system and its apparent repression of intellectuals. He was perhaps of most influence to writers of different academic disciplines during the 1980s. Bakhtin adopted the term 'chronotope' originally, he said, from the natural sciences, "This term (space-time) is employed in mathematics and was introduced as part of Einstein's Theory of Relativity," he explained in *Forms of Time and of the Chronotope in the Novel*, a paper written in the 1930s, added to in 1973, published in 1975 and again in 1981:

The special meaning it has in relativity theory is not important for our purposes; we are borrowing it for literary criticism almost as a metaphor (almost but not entirely). What counts for us is the fact that it expresses the inseparability of space and time,
and in turn, "... in the intrinsic connectedness of temporal and spatial relationships that are artistically expressed in architecture," in an attempt to find a sense in which temporal notions and spatial form co-existed, where "... space becomes charged and responsive to the movements of time and history ... " (Bakhtin 1937/1981:84). The present use of Bakhtin's terminology in this study of hypermedia in architecture secures for the new medium, an authority of interdisciplinary critique and an impression of historical continuity.

Bakhtin did not foresee the technical world of digital literature, but his description of time-space as a "living, tension-filled interaction" (ibid. pg 279), signals a universality based on the innate conflict of events in human narrative. This understanding is also very clear in the undramatic user-interface click-jump and the resulting movement of the hypermedia imagination through temporal and spatial dimensions.

Bakhtin's description of the novel's dramatic narrative, being altered and enriched by chronotopic events in the grip of the author's imagination, is, I suggest, equivalent to the way that an enriched learning experience may provide tension and drama for a student studying via hypermedia. A glimpse of this tension and drama was observed during the survey (see Chapter 5), an example of learning-by-hypermedia. I will also argue that there is an element of the chronotope's 'living tension' engaged with the use of multi-layered teaching material, known as 'dual-coding' (Paivio and Sadoski 2001).

In hypermedia a new form of confrontation occurs between an author of a text and a user/learner/viewer. The two are separated from each other in time and space, yet the confrontation is instantaneously renewed and represented in every chronotopic encounter. As Stuart says, these vital moments of participation, whether in newspapers, legal testimony, television soap operas and many other texts which like hypermedia, are image and sound based rather than print dominated, can be "credited not only to the author but to the reader who, in the recreative act of reading, renews the text." (Stuart 1994:209)
1.3 The cinema as chronotope

The shared understanding of ‘cinema’ as both a real architectural place, a heterotopia, and an unreal virtual or filmic experience, brings together the two projects, architecture and film. What there is between these two moving representations can only be associated in the imaginative experience of the film goer. In the past architecture and film were clearly separate, both in terms of the technical demarcations and in terms of their images: film was moving and illusory, architecture was static and tangible. But today with computers and contemporary modes of representation their characteristics seem to be converging.

The term cinema can refer both to the activity of film making and to the building in which patrons view films. For both it is the perceptions of the film goer which are at the centre of concern here. For example, what is the patron’s particular experience when visiting the Civic Theatre, Queen Street, the building chosen here to illustrate this mutuality? The 2500-seat auditorium set diagonally on Auckland’s main street is one of the few remaining examples of the American ‘picture palace’ designed like a theatre set, with gilded columns, exotic plaster animals, and a star-studded sky-like ceiling which defies any precept of practicality. Its survival is the result of civic sentimentality, because, owned by the city, popular opposition to its removal has consistently foiled any attempts at a more financially promising replacement.

Or, on viewing a film by Alfred Hitchcock, can a patron’s personal experiential narrative, separate from the plot but prepared by the film maker, be observed? Can this question also be asked about the imagination of the student architect who manipulatively triggers a learning environment? These questions relating to the cinematic imagination may be answered not so much from studying the nature of film or architecture, but from ‘cinema’: from the intuitive absorption and application of knowledge and imagination that occurs in the interaction, the dual processing of both. For in ‘cinema’ as opposed to either film or architecture alone we see something like the action of the
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chronotope.

The specific choice of the Civic and Vertigo from a seemingly infinite array of examples of movie-as-cinema and building-as-cinema is also influenced by issues of the here-and-now reality of sourcing material in Auckland New Zealand. Despite there being excellent library facilities and personal experience, a teacher in this country is constrained by geographical isolation. There is an under-current of nostalgic identification for a nationally loved building, which New Zealanders recognise as similar to the feeling Californians have for the city of San Francisco, which is very similar to Auckland, with its harbour position, its multi-cultural antecedents, its colonial past. I make no direct comparisons, but rather recognise a certain sense of familiarity, the sharing of a life.

In terms of cultural identification in cinema I have placed New Zealand past experience firmly at the door of Hollywood; the ‘atmospheric’ cinema was invented in the United States and exported throughout the world, arriving for Auckland via Australia, and although he had an earlier career in England before moving to Hollywood, Hitchcock belongs to the mainstream commercially-driven popular film market of America. This is not to say artistic quality is compromised, a proviso needed, because as Peter Wollen says, “... the initial reaction as we well know (is) to damn Hollywood completely, to see it as a threat to civilised values and sensibilities.” However, he continues,

... all cinemas are commercial, producers and financiers act from the same motives everywhere. The main difference about America films is that they have succeeded in capturing the foreign as well at the home market. (1998:6)

These two examples of cinema also co-exist by extension in the cultural memory of their public; the existence of knowledge held in the memory is another of the themes in this thesis, taken up again in a discussion of architecture education and the importance of tacit knowledge, or that knowledge which is held near-forgotten in the memory of a student.
Most important among the threads of discourse here, however, is the intersection of the spatial with the temporal. Discussion of the example in which the spatial dominates, must include contemplation of its temporal nature. A building such as the Civic may doubly work on a user’s experience of time; one, as a building specifically designed for viewing movies; and two, in its use of the atmospheric design devices of John Eberson, which by engrossing the patron in a dislocating, fantastical experience may be said to give people an experience of altered or escape from ‘real’ time. To leave the city street one moment and the next, to be sitting among an audience apparently under a starry night sky, among the shadowy three-dimensional buildings and vegetation of what could be a middle eastern village gives on immediate sense of having ‘snapped’ into another time. This spectator experience is described by Elliott and reflected upon in her study of cinema attendance in wartime Auckland (Elliott 1989). In both, the narrativity depends on an interlocking chronotopicity that is impossible to ignore; it is the very stuff of the drama in each case.

The narrative of time itself, says Paul Ricoeur, whose writings on the nature of narrative inform this thesis, is to recognise the future on the horizon of expectation, the past under the traces of tradition and the present within the moment of the untimely (Ricoeur 1985:103). Nowhere is this sense of an illusion as narrative, better understood than in a movie house. A cinema is a building designed to construct the temporal experience for the patron: to stretch it, distort and enhance it; moving the patron along both literally and in an emotional sense.

The Civic Theatre, Queen Street, was the work of Australian architect Charles Bohringer, in the style of John Eberson, a style which is so distinctive that to cinema historians the phrase ‘an Eberson atmospheric’ has the same resonance as ‘a Hitchcock thriller’ to film scholars. The Civic like all atmospheric cinemas provided the patron with an emotional path to escape the ‘everyday’, cued by glimpses of Java, India, Egypt, or Morocco. The patron would step through the knots of an ideological narrative constructed out of plaster and
gold paint, and in their imagination would make the interaction with a time-any time-of fantasy. There is little published work about the Civic, and only one major academic survey of the theatre, the Auckland sub-thesis *The Civic Theatre: A Conservation Plan* (Boyd, 1987).

My view of the Civic is that of the building as it was designed in 1929, rather than the newly restored one, which differs in small but important ways especially in the interior layout, where modifications took place in 1999 to better cater for a theatre-going public in the 21st century. Done for economic reasons, this process altered some of its original logic, altering features which belonged to the evocations of fantasy, and effectively changed its day to day timetable removing the pattern of life as a seven-day-a-week cinema.

Its history is reflective of the society it served at the time it was constructed. New Zealand in 1929 was a British colony emerging from the isolation of distance, and beginning to feel the effects of the Great Depression. It was one of hundreds of movie houses, providing for the public's favourite low-cost outing. The Civic in Auckland was the most glamorous of them all. It belonged to the family of atmospheric movie palaces like Graumann's Chinese in Hollywood in which its main auditorium was decorated like some outdoor faraway location. It was "... as much on show as the performance on the screen. The 'palaces' provided luxury, light, colour and space," as Elliott explained in her history of the Queen Street cinemas (Elliott, 1989).

The human act of engagement—an interaction—with the Civic is a convenient conduit by which to understand Ricoeur's theory that narrative architecture is not told, rather, it is em-plotted. His literary theory of emplotment concords here with its usage for architecture as being spatial (the piece of land for building on), and for film, temporal (the sequence of events). In the Civic, as Ricoeur would say "recounted time and constructed space ... can no longer be thought of separately." Rather, together they create "places of memory" which Ricoeur entitles "itinerance, halfway between wandering and the stay-at-home spirit." (Ricoeur 1996:72)
Itinerance relies for its meaning on intertextuality, and those cultural borrowings and innovation are what the Civic leans heavily on for its impact. Any construction built for mass entertainment has a layered existence for the people who go there, like a film in that it is entangled both in their fantasies, and with the occasions of their visits. In both senses it has the power to move them, physically and emotionally. The choice of the John Eberson ‘picture palace’, is as the flip-side to the reason Vertigo was chosen: Alfred Hitchcock used architecture to intimidate innocent people and show how they become victims; Eberson gave ordinary, innocent people access to fantastical architecture in a low-cost way to enhance their lives. He used his buildings in a conscious way to transfigure for a short time the lives of those who came there. The two ‘cinemas’ are, if you like, a matched set.

The principle chronotope that is played out at the Civic - its power to manipulate people’s simultaneous perception of space and time – can be charted both from the narrative of patron use and from its historical existence. This occurs in two senses of the word ‘time’, chronological (durational) and cosmological (historical). To visitors, especially those in the first decades of its existence, the entrance and foyer were the start of a magical outing. At the (cosmological) time of the Civic’s designing, the world’s most romantic and thrilling locations were those connected with the non-English speaking, the non-Christian world. At the time the public was titillated by a post-Victorian age of prudery, so to arrive in a foyer staged as a retreat for turbaned Hindu aristocracy paying homage in the legendary ‘stupa’ of Borobudur in Java, was a seductive experience.

There was bestowed on the most ordinary of citizens of any age and status, a sense of being ‘special’ for a short (chronological) time. The incorporation of cabaret and tea rooms further ensured this democratisation process, enabling anybody – from grandparents taking children to ‘afternoon tea’ while watching a film, to the American servicemen in wartime dancing and dining until the early hours of the morning - to have this inexpensive taste of visiting a fantasy land. The people portrayed by the filmstars in Hitchcock’s drama might be doomed to become victims, but every one of Bohringer’s people
would feel like a star.

For all the differences which set architecture and film apart, it is their common ground which extends the relationship. The addition of moving images to representation in the architectural world is discussed in the rest of this thesis, from the methods of production, to its effects on the learning patterns of architecture students. One significant task for the film maker is to design and bring together, usually with the collaboration of many specialised workers, the ‘mise-en-scene’ or, the elements which together present the look and sound of the film: its settings, costumes, and style of camerawork in particular. The cinematographic technique of mise-en-scene closely echoes the design techniques of the architect, shown by the extent certain film makers who favour the authorial, or ‘auteur’ approach, identify with the architectural. It is evident in the films of Alfred Hitchcock, noted for his concern for every detail of the settings, use of urban buildings, and cinematic treatment of depth of field and other spatial matters. A close reading of Vertigo follows as an illustration of architecture/film mutuality.

Vertigo consists of a complex set of chronotopic moments, with a bias towards that of the spatial dimension. One sample camera shot sums up both the drama and the technique in the work; it is a 360° zoom twist seen vertically down the shaft of a stairwell and used at a crisis moment in the drama, when the acrophobia sufferer must climb through a twisting stair well to rescue his lover or certainly lose her. This shot is from his eye’s view as vertigo overcomes him. It encapsulates the themes being discussed here and in the following chapters in this moment of time and space intersecting, at the dizzying distress of the vertigo sufferer and the personal agony of an unavoidable compulsion to fall. The entire film’s chronotopic situation is given dramatic form in one shot.

The choice of this film over others which centre architecture or architects in their drama is drawn from several levels. At this point several other possible choices for study are reviewed: themes of human folly as a counterpoint to the
solidarity, and reliability of built architecture are tempting to use in the design of teaching material for architects, and in this regard, Peter Greenaway, offers a body of work, for his films arise from his own design education and a fascination with the point of view of an architect. Greenaway has explained (Walker 1993:129) that “the subject matter of architecture appealed to him as an analogy for film making. In both professions, for every project which comes to fruition, there are a dozen which fail.”

His *Belly of an Architect* (1986) balances the concerns of an architect with giving honour to monumental buildings, not as in *Vertigo*, San Francisco, but in this case, Rome. It is clearly a film about architecture: an ego-ridden architect travels to the grand buildings of Rome to celebrate his own personal hero, Boullee (1728-99) an architect who did actually exist, but who rarely had a design built, since his engineering vision has yet to be answered by possible construction practice. (Boullee’s proposed spherical cenotaph designed for Isaac Newton is featured both in this film and in *HyperSteel* in the model essay answer section - possibly an inadvertent reference both to the importance of designing futuristic dream-buildings, and to this important film!).

Greenaway took pains to present the film as if shot by an architect - so, many scenes are symmetrical or in their composition, reminiscent of elevations and plans. *The Belly of an Architect* is also incidentally about reproduction, and multiple images are a frequent device used - here, the architect-hero photocopies dozens of male bellies found on statues all over Rome. With its complex human story and thoughtful intellectual situations, it is definitely an art house movie, not intended to attract mass audiences. *The Belly of an Architect* is about human concerns set out among architecture and humans failing architecture in different ways, but *Vertigo* is about architecture subjecting humans to its existence - it dizzying height, its overpowering gloom and darkness, or its twisting, disorienting form.

If this research had been solely about ‘situated learning’ methods of design studio pedagogy, in which student architects study with established
practitioners in a kind of master-class for architecture, which is one model of learning discussed in this study in Chapter 2, *The Fountainhead* (King Vidor, Warner Brothers 1949) would provide a filmic basis for study. It plays out a theme on creative ego versus the dynamics of cooperative team designing. Its plot concerns the artistic individualism of a central figure, meeting the collective reality of architecture practice. The villain of the piece is an architecture critic! (Walker 1992:95) Needless to say the genre is tragedy.

Or, should a researcher want to provide, via the use of film within the general curriculum to play out in fictional form a likely building occupancy scenario, one would suggest the use of *The Towering Inferno* (Irwin Allen, John Guillerman, Warner Brothers, 1974). This disaster movie of the blockbuster tradition shows an architect and a builder facing the results when a multi-storey San Francisco building burns down. It is a cautionary tale regarding the importance of paying attention to small details like safe wiring and ensuring the stairwells are open and accessible, and then, of facing the consequences if these things are not attended to.

However the purpose in selecting a case study for the thesis was less about architects and more about architecture and people's relationship to it. One key to how we experience both buildings and films is to acknowledge the human habit of visiting and moving around places for their function, rarely because we are attracted to the way they look - the public is an examiner of buildings, but an unconscious one; a visit to the cinema is not usually in order to view the building, but to view a film. Conscious of this or not, however, what is important is that we are affected by the building when we visit it, and take part in its treatment of us, as it carefully prepares us for the film by means of its extravagant foyer and auditorium. Our conscious minds are elsewhere - with our problems, but gradually as the experience distracts us, we ‘put them into the back of our minds’. Benjamin says in his essay on the *Work of Art in the Age of Mechanical Reproduction*, “The public is an examiner, but an absent-minded one.” (1955:693)
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Auckland during and after the war was heavily affected by Hollywood cinema, (an effect that was recognised by Hollywood itself when it granted the 1942 world premiere of Casablanca to the Civic, as a rest-and-recreation treat for the troops then on leave in Auckland). Thanks to the publicity process of the Hollywood film industry, the lack of any other entertainment, and the deliberately enticing design of the cinema itself - Vertigo and the Civic acting together - it is more than likely that in the Auckland of the late fifties, most of the adult population would have seen this film, perhaps at several screenings. Therefore its influence would have been a lot wider than an art house film of the same era.

As Benjamin says, by exploring the world around us in close-up detail in a film, “Our taverns and our metropolitan streets, our offices and furnished rooms, our railroad stations and our factories (which) appear to have us locked up hopelessly... on the one hand extends our comprehension of the necessities which rule our lives .... (and on the other, can) burst this prison-world asunder”. It is like the prison-world the characters in the story of Vertigo find themselves. “The camera introduces us to unconscious optics as does psychoanalysis to unconscious impulses.” (ibid. pg 690)

We gain escape from day-to-day ordinariness by way of watching fictional people trapped in their own lives. Both the stories of the Civic and Vertigo represent facets of the habit of seeking escape which we ascribe to architecture; we habitually turn to the cinema to find distraction, at the Civic for its over-the-top pretensions and theatrical-ness which gives us that in plenty; we see the humans in Vertigo seeking answers and ultimately to the last one of life’s problems in the architecture of the San Francisco Bay area. Benjamin notices that “buildings can be appropriated in a twofold manner; by use and by perception - or rather, by touch and sight.” The contemplation of a building by sight alone is merely the gaze of the tourist; he says that to really understand life’s “turning points of history” buildings should be “mastered gradually by habit, under the guidance of tactile appropriation.” (ibid. pg 692) How much more useful then will the slow tactile senses be brought into play when the viewer is a student, and the means of learning is at their own pace,
by means of hand-held user interface device and led by the sights and sounds on the screen of a computer?

*Vertigo* is among many films of Alfred Hitchcock which use the dramatic potential of architecture in tension with the human condition. His urban stories include *Rear Window* (Paramount, 1954) and *To Catch a Thief* (Paramount, 1956), one entirely set in the enclosed courtyard at the rear of an apartment block, the other using the rooftops of Monaco as they provide shelter and access to a cat burglar preying on rich victims. Outside of the city, Hitchcock also turned to the built environment in *Rebecca* (Selznick International Pictures, 1940) in the forbidden bedroom in an isolated manor house or in *Lifeboat* (20th Century Fox, 1944) which has as its only set a large rowboat, and even among the Presidential statues of Mt Rushmore in *North by Northwest* (M.G.M., 1959).

These described physical structures are not mere settings, as Wollen explains, Hitchcock frequently uses certain buildings for startling episodes in the intrigues of his chaos-world: “their use universalises the chaos” (Wollen 1998:140). Their ‘parts’ in the films are integral to each plot and they have been ‘cast’ for their appearance, for the likely prompts they make to cultural preconceptions in the minds of the audience and their ability to interact with the other – human - protagonists: what O’Brien calls being enlisted, “as a virtual character,” in his review of the restored print of *Vertigo* released in 1996 (1996:54). All the accoutrements of surroundings the film makers call ‘mise-en-scene’, including costumes, environments, dominant colours and other design features are what together play out what Ricoeur says is “tangled up in tales ... (an) entanglement that is called narrative.” (1996:65), or an event requiring more than its physical, technical structure.

The film medium might follow rules, sense and grammar – impeccably in Hitchcock’s case - but it feeds on pre-conditions and by interpretation expands the extent of meaning. He particularly privileges the metaphor above all figures, every metaphor altering the discourse, and moving the discussion into new realms. *Vertigo* uses vertigo (the condition) as an over-arching metaphor
for the method of victimisation being carried out on the human players, and several other metaphorical devices flow from this one. Ultimately it is a chronotope on the dramatic intersection of time and space, of the condition of vertigo.

What follows is my summary of the *Vertigo* mise-en-scene, together with the action of the drama. For a start, its title was not chosen lightly. A symptom of acrophobia (a fear of heights) is called ‘vertigo’ and it can only be experienced on a structure by a human being: it is an architectural condition. The film was not named *Bitterness*, or *Usurped* or *Deceit* which are all appropriate to the plot and are all human-to-human conditions. The title of this film reflects the director’s interest in the tensions of power which buildings levy upon people as victims: he uses shifts of space and time as controlling agents over both actors and audience.

He places the film in its physical location of San Francisco, a picturesque coastal city whose buildings reflect layers of immigration and the rise and fall of fortune. It is hilly and its jumble of houses, office blocks, and shops crowd among the steep streets. In the city the buildings vie for air space, but there is not far to go before one is walking at the water edge or under the great sequoia forest. It is culturally, and like our own city of Auckland, held in affectionate regard by its inhabitants. It is part of Hitchcock’s power to horrify people that he uses this sense of audience warmth against them in *Vertigo*, turning San Francisco into a frightening place. A dramatic sequence at the start of the film sets the scene for the entire drama: on the city roofs a policeman (Scottie) is seen chasing a criminal; after increasing exhaustion and an endless landscape of uneven rooftops, he trips and falls. He is invalided out of the Police Force and the plot revolves around his personal struggle with the resulting acrophobia and its symptom, vertigo. The moment of his fall provides the chronotope on which the resulting drama unfolds.

In the dramatic action, the female protagonist is a woman supposedly moving in and out of a dream state when she relives her great-grandmother’s experience. It is actually an elaborate hoax using Scottie’s acrophobia to
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contrive the death of a rich heiress by falling from one of the Spanish towers which feature on Californian architecture. At the end Scottie himself (perhaps - we are left to wonder) and the woman with the double identity both fall from the tower. During the film the visually beautiful city becomes sinister, brooding and finally, murderous.

The idea of a controlling force or identity behind the style of a film is evident in Vertigo; and it is in this sense that I use ‘auteur’ for the work of Alfred Hitchcock. A noted exponent of a particular genre, auteur is a “critical theoretical term that comes from the French meaning ‘author’ “ (Bordwell and Thompson 1993:32). An auteur is marked by the recognisable directorial decisions in which their identity evokes an entire set of understandings – and a single work by them a ‘signature’. (It also has a monetary value in the market place in which their work is bought and sold, but this issue is not relevant in this study).

Films may be studied according to style, genre or auteur. Style refers to the film maker’s “individualistic response to the treatment of the idea” (Beaver 1994). Genre is a term for a group of motion pictures which follow the same theme: most films by Alfred Hitchcock are in the thriller genre.

For the purpose of this study, my close reading of Hitchcock's text is as an auteur-constructed chronotope. Both plot and mise-en-scene in Vertigo involve twisted threads of time and place, intricately criss-crossing each other. The camera watches as events and the places where they occur are played out in a sequential but distorted narrative. Experimental film maker Chris Marker pays visual credit to Vertigo by re-staging the chronotope in a moment when the actress points to the rings on a sequoia tree and says softly “Here I was born. And here I died” in both his films La Jetee and Sunless, giving his text a layered reference to both his work and that of Hitchcock which, in turn, enhances his own esteem by the association.

The villain in Vertigo, for his criminal reasons, invents - and Scottie the hero, believes - an existence that consists of dual personalities, who each lived at
different times in history. At each turn of the distortion the director contrives some physical element of the story, what Marker calls in his own referential voice-over, “so carefully coded in the spiral” (of both the action and the images) to emphasise to the audience and to the main protagonists that this is a drama in which the architecture triumphs (Sunless, 1982). It is malevolent from the first moments of the film in the disastrous chase on the San Francisco rooftops, to the Greco-columns of an art museum behind which he shadows the woman with the confused identity, to the giant trees of the redwood forest of Big Sur. She moves from a flowered cave-like posy-shop, to an overgrown cemetery, then to the hollow suicide-leap under the Golden Gate bridge, and his confusion grows, and the locations bewilder him at each stop.

Because film making is such a complex activity and involves so many different skills and technologies, it is difficult in the present day, to isolate the one genius whose personal impulse was responsible for every detail seen. However, thanks to Hitchcock’s meticulous preparation, we know the levels of care he put into these details of the mise-en-scene. He

...went to great lengths to get all the little details in the film just right, from the flowers in the florist shop to the size, shape and colour of each individual car and truck passing along he road. And for the brief scene of the museum, he and the crew took special care to get the luminous effect he was after through a delicate combination of artificial lighting with the natural light shining through the glass ceiling. (Finler 1992:121)

To select the Civic and Vertigo as subjects for study is to take sides theoretically in a challenge which has been on-going for most of the history of film: both of them are solidly part of the American movie-going culture, that of capitalism and mass appeal, as opposed to the avant garde of the French and Italian New Wave which flourished at about the same time. While intellectual filmmakers like the French Truffaut, Resnais and Renoir, and Italians Visconti, Antonioni, and Fellini were exploring innovative approaches to abstract and poetic themes, the American model was one of commercial popular appeal rather than a “... Marxist romanticism,” is how philosopher Gilles Deleuze, who used these New Wave directors extensively in a two-
volume study of film (1986, 1989) described Visconti’s *Rocco and His Brothers*,

... Visconti’s visionary aesthetism ... depends less on a struggle with nature and between men than on a grand vision of man and nature, of their perceptible and sensual unity, from which the ‘rich’ are excluded and which constitutes the hope of the revolution, beyond the setbacks of the floating action ... (1989:4)

The approach of this thesis is to describe theory and case studies as a piece of commercial media craft, and to do that I choose the popular, mass audience products of a Hitchcock thriller and a main street cinema. The original aim in constructing both these works was to get the job done, with a minimum of time and money, in as efficient and business-like way as possible on behalf of a financial investor. In the fiscal reality of the market place, Eberson and his followers who envisaged the Civic drew on his knowledge of the shortcuts and devices of the theatre to get his design-and-build carried out - and the Civic was built in 10 months from March to December 1929 (Boyd 1987). For all his fastidious preparation, Alfred Hitchcock completed a feature film project almost every year between 1929 and 1976 (Finler 1992:166). That said, he is considered to be masterly - a master of the technical skills of film craft. He continues to provide new generations of film makers with iconic scenes: Chris Marker’s fringe art films *La Jetee*, and *Sunless*, Terry Gilliam’s *12 Monkeys*, and Brian de Palma’s *Obsession* are some of those which have included tributes to *Vertigo* Before he made *Basic Instinct*, Paul Verhoeven said in an interview “for weeks I went to the cinema every two or three days to see it again,” (Wise, 2002:62), and in a book-long interview with Hitchcock, French film maker Francois Truffaut sums him up as “universally acknowledged to be the world’s foremost technician” (Truffaut 1984:7).

To step back, for the time being, from the named examples, although both will be considered again in later chapters, when we may mark their similarities and differences, their points of convergence and the way in which they employ the chronotopic form: among the skills and knowledge the practitioner of each craft must refine is what we know as the mind’s eye. The architect sees two
views simultaneously; whether it is by imagining the three dimensional space when looking at the two dimensional one; or by immediately visualising the section when shown a plan. These dual images have no need of a subjective point of view, which is perhaps why perspectives and fly-throughs, which reveal the viewer’s location are, I suggest, relegated to secondary importance by architects.

By contrast, the film maker is acutely aware of the position - and implication - of the camera’s eye view. In a film the greatest concern is continuity: what is the next shot looking at and how will it progress the narrative? Every step of its construction is directed towards the sequential nature of a film, from the written script in which every word is chosen to fit backwards and forwards, to the actors’ characterisations which, from the opening scene carry the seeds of an impending climax, and include the believability of sets and locations, right to the extent of their ‘out-of-frame’ authenticity or what would be there if we could see around the framed scene.

The point of convergence is the extent to which they enact a chronotope. My thesis reappraises a theory of time and space in so far as it takes form as moving image in digital media. It is aligned with the Bakhtinian reading of chronotope, that concept of the inter-relationship of time/space at the point of its merging.

The central concerns of architecture are shelter, safety and the expression of identity; its constructions are usually intended to last, so it has an awareness of the future in a spatial sense. Film by contrast, speaks in the present tense over a duration of time and has no other tangible presence than at the moment of its screening. Within its illusory worlds it contains spatial forms which are always at the mercy of temporal rules. In hypermedia both are in the hands of the user, as the user click-jumps from moment-to-moment and place-to-place on the screen in front of them.

It could be said that both time and space really only exist as something we understand intuitively not consciously. Immanuel Kant (1724 - 1804)
described them as states of mind, time as the 'inner' form, an *a priori* form of intuition for everything that moves or changes; and space is an 'outer' form - or anything that is independent of oneself (Meredith translation 1973:107-8). It was his contention that time and space did not exist as categories of thought, or fundamental concepts, since we have no thought that does not exist in a temporal form, and we cannot exist within anything that does not have spatial form.

They belong in the innate part of our knowledge, that concerned with the senses, to be described further in this thesis as the intuition. And they are inseparable, although sometimes the temporal dimension is dominant and at others the spatial. However, this inseparability is not seen as in some form of parallel unity like railway lines. More, they are in a state of tension. - Kant's translators often use the word 'conflict' (Crowther 1989:107) and at the point they intersect, lies the phenomenon Bakhtin took from the physicists, applied to literature, and which I describe as the critical feature which defines hypermedia from other representations.

Centrally, the chronotope - re-defined in this thesis beyond the literary - provides an understanding of space and time converging. This will continue to be the pivotal concept applied to both the theory and the practice of media making in this thesis.

### 1.4 Chapter summaries

Chapter 2 discusses the empirical context of this study; setting out the educational framework of architecture within which one example of hypermedia as a learning aid was developed. It provides a review of the history and intentions of architecture education in order to situate *HyperSteel* in its developmental environment. *HyperSteel*, is a suite of teaching materials developed in the School of Architecture in the University of Auckland, New Zealand, between 1993 and 1999.
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This digital software was intended for a particular purpose, that of attempting a bridge between one kind of learning and its eventual application. More precisely, it had been observed that structures theory, taught in lectures and tutorials as in the traditional university model of education, was not being usefully applied in the practicum taking place in the architecture design studios. In order to examine this identified schism, I outline the practice of teaching architecture in apprenticeships and in universities, concluding that design studio offers a hybrid form of 'situated learning' which approximates professional practice. This experiential emphasis, with its strong reliance on images and drawing could be heightened, it was felt, with the new computer-borne medium. The development of *HyperSteel* was proposed to be a bridge between rote learned theory, and intuitive design knowledge. By combining the skills of academic content authors, computer programmers and designers, and media producer (see Appendix I for a full list of the *HyperSteel* development team), a software package comprising seven data-bases was developed (Appendix II).

New forms of electronic images were quickly mastered by architecture students once computers gave them easy access, and they joined innumerable other forms of expression. Hypermedia is an accumulation of many representational forms seen in the architecture classroom. In recent years, photography, film and video have provided media for extending these forms, the still camera in particular becoming a powerful interpretive and recording tool for the architect. Movie cameras have been less so, as they and their associated equipment have been expensive to buy, and the techniques for their effective use more sophisticated. Now these restrictions have lessened, and representations may range into extremes of distortion and mobility, avoiding parameters even of gravity and atmosphere, should the design require. The opening for this architectural escape from circumscribed limitation has been, as architect-educator W. Mitchell puts it, via the computer:

... constructed virtually by software instead of physically from stones and timbers and they will be connected by logical linkages rather than by doors passageways and streets ... (Mitchell 1999: 24)
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The movement from one location to another impacts on the human inter-actor, as the click-jump - or digital user-interrupt - occurs, linking two screens apparently randomly yet at the bidding of the user. The designer/cinematographer preparing this material, knowing that the learner prefers moving from the familiar to the unknown, places the zoom and the click-jump as envoys, to lead from the known to the new and thus to the extension of that student's personal 'bank' of knowledge.

The summary above touches on the arrival of computer-based imagery into architecture education. It does not answer the question about their value as a learning vehicle, which I will address in its pedagogical context in Chapter 3, placing the narrative of learning within the cognitive theories of dual processing as outlined by Allan Paivio (Paivio 1986).

This moment of learning is explored further in my argument, drawing on the theories of cognitive scientists, and discussion of the human processes whereby effective learning can take place. Chapter 3 contains a description of intuitive learning metaphorically as 'banking'. The phenomenon called 'tacit knowledge' by Polanyi (Polanyi 1967) is the forgotten knowledge which is available as a deeply stored resource to call on by, in this case, the architect. I extend the model of an intuitive reservoir, or bank of knowledge, where knowledge may be lodged to be ready as a kind of credit for investment towards design problems. It is towards this level of memory that hypermedia in education is directed.

Theoretical underpinning is first, extended through narrative theory expressed by Paul Ricoeur who envisages three levels to a narrative from the purely temporal telling of a beginning middle and end; to the elaboration of this through the enrichment of the participants' own perceptions; to the extension of narrative where catharsis takes place. Elaboration of his theories extends this to the architectural narrative as "a horizon of meaning". To all intents and purposes, time is unrepresentable. Certainly as Ricoeur says, we are unable to "think time" (Ricoeur 1985:261). However, a form of metaphorical language has allowed us to apply certain spatial qualities to time. We say that
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everything is in time, as if it exists in some sort of mythological landscape where there are many movements, but only one time. If we were to consider the landscape as memory: memories flow together continuously from the living present in such numbers and such variety that only in their simultaneity do they have a 'one-ness' – it is the one-ness of time.

To assist in my ordering of a concept of time, I use Ricoeur’s notion of a narrative kept in order by a proposed order of composition, together with the nature of the Bakhtin chronotopic forms. These are extensive and have their counterparts in film form and architecture.

Chapter 4 documents how a hypermedia designer may contribute to the learning process and details the working methods, design issues and decisions in its making. These are extensive and have their counterparts in filmic form. It separates those techniques which are primarily temporal, from those which are spatial, and describes the processes which thread them together. At each step the designer aims to provide chronotopic opportunities from which the students will gain beneficial learning.

It is detailed further in this study by Appendix II which is a summary of the seven separate groups of databases included in HyperSteel. It takes as its starting point the basic techniques of film production methods and technology, relating these to architecture and to hypermedia.

The qualitative survey reported in Chapter 5 summarises the interviews with students and staff in an original research study made in preparing for this thesis. It was carried out to assess the contribution made by the filmic components of HyperSteel, and the extent to which chronotopic events enhanced and thus improved the learning process. This survey yields not only the personal responses of those taking part, but marks the development of digital introduction into architecture education, which has gone through several identified stages. These stages in which the computer passes from an object of study to a tool for creative expression have been indicated in broad terms in Chapter 2, following Papert (1980), Heppell (1993), and in higher
education which today contains both the traditional lecture-based learning and interactive hypermedia such as HyperSteel.

A common outcome from qualitative research is that in its turn, it contributes to the subject under study. In this case, the subject interviews contained several suggestions about improvements to hypermedia and their learning practices, particularly emphasising the importance to them of improving their 'architectural intuition'.

HyperSteel both served and benefited from the architecture community, with its heavily weighted interest in representation: architects think in images; they communicate through them; at times they may not develop designs beyond the representation stage, but they will have used a wide range of expressive forms to create a virtual design; and it will be understood to be architectural.

This research project marks an example of cinematography entering the learning areas of architectural science education, specifically structural theory, the intention to improve intuitive knowledge in order to apply it in design studio projects.

Digital authorship is rapidly becoming commonplace in architecture. Identifying and examining the central event which marks it apart from its antecedents is the contribution of this study to the development of new media. Figure 1 summarises the point of departure from the two examples of earlier media forms: the exchange of narrative control which has passed from the media producer to that of the user (page 35).

In a) the architect is in control: showing a short connecting balcony between two entrances to the auditorium in the Civic Theatre, we can see how the foreshortened height of the ceiling, subtle lighting and the thick imposingly decorated columns give the theatre patron a sense of taking a long promenade along an elegant walkway. In, b) the film maker is in control: placing the actress in Vertigo among the huge trunks of redwood trees makes her seem small and frail, at the mercy of Nature itself.
Figure 1.
Narrative control:

a) in the Civic the architect placed
overheating columns and subtle
lighting to distort the scale on this
relatively short walkway and make it
appear imposing to the cinema patrons.

b) The director of Vertigo chose these giant
ancient sequoias to dwarf the woman
pretending to have lived for several
generations.

c) The user in hypermedia has control over
its movement, Here in HyperSize the hand
may grip and move the column above and
below ground.
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Then, c) demonstrates the way in which control over the computer makes an animated diagram of a wall section available to the user, who may now zoom in, move to the right or left, over, and even underground to show the techniques of foundation construction. Or, if it is of no interest, leave to jump-click elsewhere.

Students today belong in an era with particular resonance for time based images; it is understood that just as people learn more successfully from text seen together with images, so they learn even better when those images move and are interactive; this is known as dual processing (Paivio 2001). The chronotopic events in HyperSteel mean that students experience shifting realities of time and narrative which are already identified in films like Vertigo and architecture like the Civic movie-house. The importance of giving the everyday user-interface action a literary identity provides for hypermedia an avenue into a literature of its own. For the click-jump and the action of non-authorial control it heralds, is the point of difference between this new medium and other written narratives in history.
2. **THE HYPERSTEEL PROJECT IN CONTEXT**

In Chapter 1 the relationship between two manifestations of cinema as a complement to each other, is described: the Civic movie house is a place for spectator fantasy and delight, the thriller film *Vertigo* is a story in which a malevolent architecture is wreaking disaster on flawed examples of humanity. In this chapter a third example of cinematographic media, also one in which people's imaginative senses are affected, is set out; in this medium there is an important difference, in that its narrative control lies not with the cinematographer, content author, or technical director, although all three hope to influence the outcome and provide material and skill to do so: control is in the hands of the audience/user/student/spectator, and each narrative experience is different. This third medium is hypermedia, the example here, *HyperSteel*.

All three concern themselves with risk-taking; the plot in *Vertigo* involves a protagonist burdened with the condition acrophobia and even to save the woman he loves, is unable to take the risk of saving her as she jumps from the tower; everything in the film is constructed around this crisis, the *mise-en-scene*, the camera shots, the pace of voices and editing. Or in the second example, when the entering the Civic with its exotic décor, its darkened
staircase into the auditorium, the cinema-goer must make a leap of faith of a
different kind - to stay outside on the ordinary pavement and unimpressive
surroundings of the city, or to move inside to 'give themselves over' as we
say, to the place and story it offers: not to do so means staying safe, to take the
risk means gambling on a pleasant or unpleasant memory. The click of a
mouse on a link in hypermedia is like that - a tiny join in a huge narrative; at a
small scale, it is a point of chronotopic decision, to choose a moment to cross
the threshold, or as Bakhtin would say, to tie a knot in the narrative, which
means it will never be the same again. Hypermedia shows us that these many
acts of risk engage the user in a new form of learning experience.

The intention in this chapter is to describe the pedagogical context and the
technical developments which led to the introduction of *HyperSteel*. The
account is taken from the point of view of the cinematographer, one of three
occupations whose skills combine to develop hypermedia. It acts as a setting
out of the brief, much as an architect is provided with a site and a client's
requirements in readiness for the temporal interaction which result in material
architecture. This brief includes setting the context of the project, explaining
the particular task that was intended for it and a summary of recent
developments in computer hardware and software which affected *HyperSteel*.

The present chapter explains how the Auckland school of architecture offers a
curriculum which is similar to many others internationally, and describes its
antecedents and traditional approaches to education. It focuses on the central
aspect of the design studio, reporting on a perceived limitation in students'
ability to apply structures theory to practice in design projects. I highlight this
one issue in design because this is the educational task the development of
*HyperSteel* was initiated to address.

I argue that several features of this history of architecture education suggest a
readiness for the idea that was to lead to the eventual development of the
medium that was to become learning hypermedia. This is partly as a result of
the timely invention of the computer, but there are more factors: the 'situated'
nature of architecture education with its emphasis on hands-on experiential
CHAPTER 2

projects; architects' strong dependence on images as a means of expression; and as well there is the habitual architectural working ability to see two views at once - the section and the plan, and be able to move intuitively between them. All of these are features which emerge in the medium that is multimedia software. This is significant for it also goes along with the way new intentions in educational theory are being brought into practice in higher education generally - which once used to consist of traditional lectures, essays and examinations - and are currently moving closer to the practice of the architecture design studio.

Keeping to its centrality of design tutelage, the history of architecture education is one of constant change, the result of a climate of vigorous debate, into which extreme critics, conservative traditionalists and revolutionaries all pool their feelings. In general and in architecture particularly, education is a matter of personally held issues and values: it is a dynamic, but never a neutral field. Generally the dominant thread of the system as seen in New Zealand derived from the ‘situated learning’ model, by which experienced practicing architects supervise and guide groups of students in project work - a master class model. This design studio model followed from the French \( L' \ École des Beaux Arts \) teaching practice, and forms the central contribution to the culture and is outlined below. A subject-based curriculum is taught in parallel to design studio, influenced partly from the university-based education of Germany and the United States, and partly from that of the apprenticeship system in Great Britain.

My description is necessarily truncated into a partial history, limited to explaining those factors which affected the eventual design of \textit{HyperSteel,} while how \textit{HyperSteel} affected learning is the subject of Chapter 5, that too limited by history since it can only draw on six years of use. \textit{HyperSteel} is employed here as the denotation for the proposition that it is the cinematographer whose skills give the user control of the chronotope; and that it is the chronotope which is the essential moment in time and space which sets hypermedia apart from other media. Conjecture on how hypermedia will change or modify the education of architects in the future will be attempted in
CHAPTER 2

the Chapter 6, the Conclusion.

2.1 Educational context

2.1.1 Higher education

The first premise of education for an architect is that of the life needs of the young adult, for these usually make up the student population, who for the most part have just completed a western school education. A general picture of university education is described below, containing as it does, the antecedents of architecture education as it has become the model followed at Auckland. It is noteworthy that the central architectural emphasis on practical three-dimensional projects (including the interpretation and production of moving images) is not common currency for traditional university research and thus must be constantly defended within academia.

The accepted picture of the western research university is of an institution where the ideals of scientific enquiry and high intellectual endeavour - sourced from, and recorded in print-based texts - take precedence. Although occupations alter and philosophical opinions change this central belief continues to hold sway despite critique. The working reality of this teaching regime is one of lectures, and tutorials, backed up by library resources, given cyclical shape during the year by a sequence of tests, essays and examinations. Indeed this is the source for all New Zealand universities: the German model of a research university devoted to the advancement of science, the teaching of advanced knowledge and service to society being the one which influenced conservative mainstream academic planning after World War II. Its influence straddled the Atlantic and formed the dominant pattern for universities in Australasia to follow. One may observe many traces of its conservatism in the principles and practice of higher education in this country. Explanations below will show how modern architecture schooling differs from this model, particularly in its
attitude to pure research.

In the last twenty years, tertiary level teachers in western nations have begun to re-think this task-oriented approach. They are making their starting point the student, rather than the research as the basis for pedagogy, supported by a cognitive psychology which has implications for the architecture student and is taken further in Chapter 3 of this study, general explanations which are borne out by the students' own commentary contained in the conversations of the survey reported in Chapter 5. Educational theorists include those who say that educational practices should be malleable (Jacobs 1992), allow for adaptation and reflection (Laurillard 1993:203), be student-centred (Rogers 1983), and inter-related (Knowles 1984:173). Malcolm Knowles an educational psychologist, goes further to say that delivering lectures, tutorials and workshops arbitrarily, is relatively inefficient. To illustrate his argument he has analysed certain characteristics of adults as students: that they identify strongly with their own life's experiences; they need the chance to apply learned skills quickly; they tend to be self directing; and they respond well if the tasks which form the learning experience are seen as relevant to their eventual occupational and professional roles.

He suggests identifying times that are teachable moments in the educative process for adults, and if at these peak times, information, statistics, formulae and processes are made available, then these will be easily retained. At other times of lesser interest, relatively little will be absorbed. As he summarises, successful learning is "natural, relevant, doing, self initiated, self driven, holistic." (Knowles 1984:40)

The requirement of higher education is for it to be interrelated and self directed, as Knowles says:
... people tend to feel committed to a decision or activity in direct proportion to their participation in or influence on its planning and decision making ... The reverse is even more relevant: people tend to feel uncommitted to any decision or activity that they feel is being imposed on them without their having a chance to influence it. (ibid. pg 123)

Other education theorists extend this emphasis on the learner in higher education in order to diagnose successful and unsuccessful study habits. Ramsden distinguishes between deep and surface learning, both of which have their uses: surface learning suffices if the knowledge is to be memorised, then reproduced in say, examinations. But if the knowledge has been absorbed so well that the learner can apply the learned phenomenon to another qualitatively different situation, then a deep level of learning has occurred (Ramsden, 1992:36). This admits a distinction between undertaking the act of learning as one of acquisition, and learning as a way of changing oneself and one’s world view (Marton et al, 1996:11), a position examined in Chapter 3 when considering the nature of intuition as a repository for learned but "banked" architectural knowledge.

In his research, Marton examined this distinction, concluding that students often chose to study something at a surface level – not because they could not understand – but because they considered no need existed. They would deliberately only rote-memorise in order to meet, say, examination requirements. Variations in student response were affected by the earlier life experience of the subject, as were differences in individual intelligence and character. (ibid. pg 39 – 44)

An educational bias which centres on the learner adjusts any discrepancies between what the teachers want in terms of evidence of problem solving skills and what the student is able to achieve. The Marton view of learning is that it is:

... best conceptualised as change in the way in which people understand the world around them, rather than as a quantitative accretion of facts and procedures. (ibid. pg 82)
This cognitive approach to learning theory embraces such processes as perception, memory, attention, problem-solving, language, thinking and imagining. The value of this view in terms of architectural education is discussed in Chapter 3 and elsewhere in this study for its holistic, ecological ways to represent and study learning practices. However, while cognitive theorists advocate a process participated in by students, with strong relevance to their (students') life requirements, the modern university remains one where rigid scientific patterns of study follow long-held beliefs in the primacy of exposition by academics and task-directed activity by students. Within the system, the education of architects has its own traditions and controversy.

2.1.2 Architecture education

As the cinematographer working within education for architects I view the hybrid, pluralistic situation of design studios, with their blend of teaching styles and the inclusion of practitioners with their real-life duality in the market place, as central to the life of architecture and therefore important to understand in order to be of service to it. While its location within the university system demands the research disciplines of academia, its distinctive emphasis on a buildable response to issues in design studio are what makes it appealing to a film practitioner.

These are the historical roots of architecture education taught in Auckland University. It takes place in an apparently ambivalent situation of a professional education which owes loyalty to both the university process of scientific inquiry and the requirements of a practical business reality and its predominant feature is a long enculturation process which happens over the course of a five-year undergraduate degree.

The major influences for this model come from France, Germany, and the Anglo-American culture, although the oldest writing on the subject was the Roman Vitruvius, during the reign of the Emperor Augustus.
(27B.C. – A.D.14). Vitruvius laid down a comprehensive framework for the education of an architect. Darlene Brady of Ball State University, Cincinnati lists the elements of his holistic curriculum of study:

... drawing, geometry, history, philosophy, music, medicine, law, and astronomy; the principles of order, arrangement, eurhythmy, symmetry, propriety, and economy; and the art of building.

The art of building was in itself a detailed and exhaustive study, involving:

... issues of interior, exterior, and site; colour, light, and wind; structure, materials and building; durability, inhabitability and delight as integral aspects of what constitutes the education of an architect. (Brady 1996:32)

In France the State-supported L' École des Beaux Arts' was an elite school for architects which advised the government in all architectural matters. Set up in the early 19th century, it controlled a hierarchy of 'ateliers' where students worked for many years around one master architect, entering carefully structured competitions, became loyal to rich patrons and hoped to be invited to become one of the eight members of the illustrious Académie. (Stevens 1998)

Attendance at the École was not the only means to become a practising architect but without it one would never gain the best status. Garry Stevens describes the power of the École and its Académie as a 'priesthood', with an institutionalised control over all things architectural (ibid. pg 159). There were few academics among the teachers and the lectures were voluntary. The currently acceptable idea of research was not part of the programme of studies. At the same time, the German model of professional education located its education firmly in the pursuit of scholarly research, in the universities, providing for most professions other than architecture. There,
however, architecture education took place in technical institutes and until recent times, was not research-driven (Davey 1989).

So it can be seen that neither of these two strong threads of inherited teaching - the French and the German - handed on a tradition for research as such. This was also the case for the British model for architectural education which was almost entirely in apprenticeships - as it was for lawyers, and accountants - the professions in England developing as associations with training in the hands of a system called ‘articled pupillage’ (Stevens 1998:156). During the 19th century this system declined and universities formed schools of architecture, but the profession continues to control itself by examination and registration. Currently there is an initiative among some craft and engineering workplaces in Great Britain to re-introduce a form of apprenticeship, called Modern Apprenticeship. This scheme includes many of the features which exist as part of the architecture school design studio practice, to be described later in this overview.

The pre-19th century model of apprenticeship carried many master-novice obligations like personal behaviour, literacy, living conditions and ultimately a guaranteed job (Snell 1996). While institutionalised education separated this set of social, cultural and state responsibilities, the contemporary school-located architecture design studio with its daily involvement of practitioners continues to provide in an informal way, a similar service.

America and in its turn Australasia inherited elements of each approach. According to Stevens, who is a Marxist sociologist researching architectural history at the University of Sydney, it was capitalist market-forces which drove some new American universities such as MIT, Cornell to offer architecture in the 1860s for the first time in an effort to ‘corner the market’, and from that time the universities have dominated the provision of architecture education in the United States.
German academics escaping to the US before the Second World War, true to the Germanic tradition, established research as a serious motive for study. Walter Gropius, in particular, at the Harvard Graduate School of Design introduced: "... a new program of professional education that was destined to powerfully influence the practice of architecture in our time." (Cobb 1985:43) Atelier-style design studios after the French tradition also arrived, and the practice of apprenticeship devolved into a professional involvement in the delivery of the teaching from within the university. Lectures, and mainstream theory were seen to be of secondary value to the demands of design studio. Professor Cobb describes how his Graduate School of Architecture sits within the wider University at Harvard,

... with its curious studio-based teaching methods, its paucity of scholarly research, and its dedication to serving the highly "contaminated" professions of architecture must appear ... disreputable and more or less useless, but to be tolerated with appropriate condescension and frequent expressions of dismay, (ibid. pg 47)

from the wider parent university. These are the interconnected threads of inheritance for the design studio as it operates in the University of Auckland today.

It can be seen that it is in the cross-over zone between university-based higher education and applied design practice that the education system is tested. It is important for the acceptance of any form of representation within the discipline, of which the moving image is only the latest; it is even more important for the transfer of knowledge gained in architectural science, which was the content material for the hypermedia learning software HyperSteel, into practical design projects.

This summary does not include discussion of any qualification (like a Master's or Bachelor's degree) because it is not necessary to have a degree to practice architecture, only to become registered as a
practitioner and this varies in different countries. In order to qualify in architecture however, it is conventional to enter a university-based architecture school. A long and exhaustive process has always marked architecture education wherever it has been carried out, under both state and private patronage.

2.1.3 Situated learning in the architecture context

Two perspectives to the psychology of learning which share some issues and are in opposition in others are cognitive learning and situated learning. There are some clear divisions in their positions which inform the method of learning found in architecture education and through it the development context for HyperSteel.

'Situated learning' has been identified by psychologists and teachers who turn to psychology to better understand the processes they use in teaching. I offer it as a useful way to consider teaching practice in design studio. It is:

... a process of enculturating that is supported in part through social interaction ... Salient features of group learning include ... collective problem solving ... displaying multiple roles ... confronting ineffective strategies and misconceptions (and) providing collaborative work skills ... (Brown, Collins et al. 1989:40)

Activity, concepts and culture are interdependent in the learning process and furthermore, say situated learning theorists, authentic activity has advantages that abstractions learned in isolation do not. The extreme situated learning position states that knowledge cannot be transferred between tasks. Whether this occurs or not however, I concur with Knowles that knowledge may be successfully adapted to different situations - and this is the important point - that the need to transfer it, must be understood by the learner and the knowledge seen to be relevant to that person's life and work (Knowles 1984:83).
There are some proponents of a return to the apprenticeship model of learning: situated learning is attractive to those people who argue that action is grounded in the context in which it occurs (Anderson, Reder et al. 1996, and Brown, et al., 1989). This implies further that training by abstraction is of little use, that knowledge does not transfer between tasks, and importantly, instruction must be done in complex social environments. These three implications are not – or cannot be – acted upon in the university context, especially the teaching of the science of structures within Architecture. It is considered unrealistic, given the constraints of class size and resources, but more important is the typically tangled nature of the ‘real’ situation. Although the curriculum for all architecture subjects is deeply grounded in its context – that of the design profession - its delivery is still that of the class, in lectures, tutorials, workshops and written examinations.

As Brown says, in the past, didactic teaching assumed a separation between the ‘know what’ and the ‘know how’ although pure situated learning theorists claiming there is no difference between what is learned and the social context in which it is learned. However, often the real situation is confusing and embedded in a suite of other business and social pressures which require explanation and understanding at the same time. Simplification by abstraction as can happen in the university allows for piecemeal build-up of fundamental understandings. Wherever they meet in either situation, it is fair to say that:

... communities of practitioners are connected by more than their ostensible tasks. They are bound by intricate socially constructed webs of belief which are essential to understanding (their lives) ... In a significant way learning is a process of enculturation (Brown 1989:33).

Abstractions are a reality of study in a school such as Auckland, as is the need to transfer understanding from abstractions to other tasks. The cognitive theorists’ position on ‘learning-by-doing’ then, is more akin to architecture study by university than those who would prefer
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'situated learning'. Abstractions and analogous situations are presented in non-design programmes and 'something like' real design is addressed in studio.

2.1.4 Design studies

The Auckland school follows the accepted manner of teaching design that most institutions in the world practice in which group projects centre on some design problem, sometimes a 'real' task brought to the school by a client or practising architect; sometimes the expression in architectural terms of an abstract notion; sometimes the development of a solution to a specific site. The teaching staff is supplemented by a visiting group of practising architects, and inasmuch as the design studio resembles the actual surroundings of an architect's workplace, the progress of the project continues like that of the profession the students are intending to join. It is a 'situated learning' context, a definition while not totally applicable is close to a description of design studio in terms of cognitive theorists.

This is the method of teaching deriving from the French L'École des Beaux Arts. Jean Paul Carlhian who attended the École in Paris before WWII describes how in a competitive atmosphere the students would go through a series of "... enormously varied and frequent exercises, carefully devised, appropriately weighted," aimed not only at demonstrating "... natural gifts and testing acquired skills but at revealing potential talent." (Carlhian 1979:7)

To the outsider, this process can appear baffling. A diary entry made by the French novelist Emile Zola describes a visit he made:

... to the studio of a "pompier" (a pompous pretender) at the L'École des Beaux Arts in 1885. During one precarious pin-up the student architects seem like strange human animals. (Architecture d'Aujourd'hui 1988: Summer: pg 24)
One outsider who has ‘made sense’ out of the design studio is sociologist Donald A. Schon who observed the MIT School of Architecture in the 1980s:

Architecture is an established profession charged with important social functions, but it is also a fine art; and the arts tend to sit uneasily in the contemporary research university ... I have become convinced that architectural designing is a prototype of the kind of artistry that other professionals need most to acquire (Schon 1987:18).

This ‘artistry’ is fostered in the design studio which facilitates ‘learning-by-doing’ in a manner similar to coaching or the master class in other professions, or as Schon calls it, “... a reflective conversation with the materials of a situation.” In this ‘reflective practicum’ he sees:

"... designing as a kind of making ... Beginning with situations that are at least in part uncertain, ill defined, complex and incoherent, designers construct and impose a coherence of their own ... (ibid. pg 42)

Architects (Franz 1994), teachers (Dinham 1989), and other construction professionals, like engineers (Valkenburg and Dorst 1998) refer to Schon and have carried out their own analyses of studio teaching, frequently the architects arriving at far more critical positions than the non--architects, for all the studios’ reputation outside of architecture for being ‘deviant’ (Schon 1987:18). Steven Hurtt talks about two opposing thought processes: “... one that is decisive and productive, the other questioning and reflective.” (Hurtt 1985:53) The consensus is that the duality of the visual and the conceptual in studio, results in a distinctive method of thinking, of ‘reflection in action’ as Schon puts it, and “designerly thinking”. (Oxman 1999)

It is not universally liked, however. Within the profession, Amos Rapoport (Rapoport 1984) joins with other theorists reading the left wing cultural theorist Pierre Bourdieu (Ward 1991; Crysler 1995; Stevens 1995) in their political opposition to the dominance of the
studio system. The existence in studio critique of an opposition identified as Marxist is a valid one to note, because the invisible political stance of the architecture profession is typically that of the educated affluent conservative middle class; it is invisible because most people belong to it. The opposition represented by Rapoport and others explains that the capitalist bourgeois class imposes its world view on the majority, by a hegemonic influence which is based on its perceived elitism. They contend that there is a pervasive subconscious effort in design studio to impose this elitism on the profession. Their argument is largely based on the negative effects of the referred-to 'enculturation' process which happens when practitioners teach and assess junior members of the same profession. It ensures the reproduction of a shared world view, cultural capital and social milieu, together with patterns of power and control of resources, which not all critics approve. Rapoport of the University of Wisconsin-Milwaukee is particularly strong in his concern about what he terms the "weakest link" in the pedagogical circle:

... it isolates students from the rest of the university, from the library and from reading and writing ... Most studios certainly do not deal formally with priorities, trade-offs, integration and synthesis among the full range of variables (including for example, those related to man-environment interaction). (Rapoport 1984:103)

Despite the lively debate caused by criticism, most schools attempt to use the hybrid benefits of both situated learning and traditional university-style didactic teaching. This was part of the intention of designing the studio-plus-HyperSteel model. An extra ingredient is a supportive social context, provided in HyperSteel's case by local content from the structures staff and wider, by the contemporary social milieu of computer based communication.

One implication of situated learning mentioned above is that for it to be 'real', instruction must take place in complex social environments. In architecture terms this is very complex indeed, with all the interests
of client, budget, site, materials and regulations to consider. The working life of an architect is often in a team, which implies a number of personalities and their experiences, biases and so on, as well. To consider a single discrete matter of structural theory in this context is doubtfully realistic, when in the ‘real’ situation it would be swamped in a maze of site and management tasks. The hope is that studio in architecture school presents a near-real design situation, with many of these complexities removed, so that the students focus on the design itself.

The delivery of structures theory (and that of architecture law, history and construction) is carried on apart from studio in lectures and tutorials, and by HyperSteel, the hypermedia software developed to bridge the difference between the ‘real’ design of studio, and the theoretical events of the lectures which are not being adequately absorbed. Thus the ‘real’ is supported by theory and now, the ‘virtual’. By incorporating case studies, histories and general background information alongside practice exercises in structural theory and placing interactive links between all elements, it is intended that the virtual will blend with the theory and be seen as valid to ‘real’ case studies.

A central metaphor for cognitive learning theorists is one of transfer or transportation, a model which reflects my own evocation in Chapter 3 of the intuition as a ‘bank’ where knowledge may be stored, carried almost unknowingly, until needed for application to a design problem (Polanyi 1967). Establishing a relationship between theory and instructional practice - to observe the same individual instructors in both contexts, to learn from theory applied to familiar architecture, to be reminded of the theory during a design exercise - is the visible evidence of this act of transportation. The transfer required at architecture school is from one part of the programme to another. However although this is the design area of study it is still far from removed from the business of architecture. Also, there is a danger in
looking for the results of transfer where it is most likely not to be: in other words looking for structural intuition in the earlier student levels. It is more observable at the later levels, or in the graduate student as I discovered in the Survey answers recorded in Chapter 5.

Whilst much can be made of the interesting social implications of the architectural design studio, of which Anthony's is one study (Anthony 1991), it is Rapoport's position that the scope of skills is reduced by the time and narrow focus of studio, that is of importance to the present study: it was to answer the apparent lack of structural knowledge being shown in design that the hypermedia production, *HyperSteel* described in the following Chapters, was initiated.

Electronic media, while not dominating yet, have steadily colonised studios and threaten to overtake traditional forms of presentation. In reporting this, Dana Cuff of UCLA, California predicts change to the studio methods and even the fundamental correlation between wisdom and years of experience that has always held sway: "...the younger the student the more proficient in current software," is her observation. Studio is:

... ripe for change ... digital studios create 'moments' in the life of a project rather than solutions that once appeared fixed and stable ... with budding powers of observation, teams of students using advanced imaging techniques tweak designs in process and wait for something worthwhile to appear. (Cuff 2000:149)

This reversal of roles in studio may be considered merely the latest change in a system which is always undergoing evolution, or it may signal as Cuff suggests, a revolution in Oxman's "designerly thinking." (Oxman 1999:105)
2.1.5 The Auckland school

A ‘snapshot’ of the way in which the Auckland school marries design studio with structures theory is provided in the ‘Self appraisal’ statement made to the 1999 Joint Visiting Board of the Commonwealth Association of Architects, the New Zealand Institute of Architects and the Architects’ Education and Registration Board. Written by Head of School Professor John Hunt, the School’s course philosophy outlines how the school approaches the “... synthesis of design with other areas of the architectural discipline (and in particular the areas of building technology and building performance)”:

The first relies upon a formal integration of the curriculum, while the second relies upon an informal process (a kind of osmosis) in which students’ awareness and knowledge of building technology and performance issues from lecture based subjects is subsequently expected to influence design decision making (Hunt 1999).

The statement describes the final design paper in the undergraduate degrees (BAS = three year, and BArch = 5 year), detailing how each is planned so that the student may demonstrate architectural science understandings and skills. Summarised, the design papers’ guidelines include demonstrating the diverse set of awareness, knowledge and skills acquired previously; relating these various intuitive understandings to each other in a way that reflects the interdependent nature of such knowledge and skill in both the discipline of architecture and its practice; and employing the notions of theoretical/thematic, programmatic, contextual and architectonic as key distinctions to be drawn in addressing the complexity of design situations and tasks and the requisite areas of awareness and knowledge. (ibid. Appendix 3)

Moreover, the statement does not accept that each design paper progresses the student “towards increasing awareness of construction and environmental science”, since this “runs counter to the philosophy of architectural teaching in the School”, merely that a “technical
The aim of technology teaching, "... to make students active learners," is more generally seen as "... a skill that will follow them from education into the profession, recognising that it is impossible to cover all aspects of architectural technology within the brief time span of an architectural education" (ibid. pg 11). This statement sums up the tensions of science education within architecture and at the same time it opens up wider opportunities for education. Donald Schon admits the design studio is an:

... anomaly within the contemporary research university. Its underlying theories of professional knowledge and teaching are at odds with those of other university-based professional schools. This represents an opportunity ... to teach other professional schools ... (Schon 1988:4).

The local example of this 'anomaly', the Auckland design studio presented a chance to carry out a project: to introduce and reflect on the usefulness of the hypermedia as a vehicle for learning, one containing architectural scientific knowledge. Thus it represented a bridge for the perceived gap between the university's text based theoretical subjects and the artistry of the 'reflective practicum' of studio.

2.2 The computational context

2.2.1 Integration of structures theory into studio

The first intention of HyperSteel was to support the branch of architectural science concerned with steel: its mathematical properties, construction requirements, and to stimulate student use of it in design. The bulk of the interactive content carries more than 125 game-like drills to enliven the process of acquiring the personal intuitive ability to calculate how steel will behave when designed into a building. This
is the sort of pragmatic reality the novice will devote years of study towards and which practicing architects spend their working life addressing. HyperSteel was not intended to be a studio activity, but it was directed deliberately towards the needs of studio design.

The preceding description is of the teaching programme and philosophy at Auckland within which HyperSteel was introduced, as observed by a non-architect practitioner working within the environment to provide learning aids for structures theory. There were already considerable resources provided for the subject area of structures science in Auckland at the time of HyperSteel development, including two papers which are lectures-based. They are compulsory and include tutorials and workshops, occurring in the first and second years. A third paper in advanced structures is not compulsory but is offered in Year Three and is also supplemented by tutorial material. As well, there are lecture-based papers in other building science areas including environmental control subjects.

Despite this level of provision in architecture schools, teachers remain critical, many arguing that graduates are leaving architecture schools without sufficient technical skills to adequately design a building (Rapoport 1984; Crosbie 1995; Gutman 1996; Kroloff 1996). It is not a new critique. Since Sigfried Giedion signalled the separation in thought of art and science in his teaching of architecture history in the 1940s, writers in architecture education have expressed in various ways their regrets over the lack of a flow-on effect between the science learned in formal lectures and the student use of this knowledge in design projects (Hurtt 1985; Hayman 1993; Crosbie 1995; Cuff 1996; Stevens 1993, 1995 and 1998).

One response to this anxiety is the holistic one, that construction and structure will arise out of the needs of studio. Those who take a sustainable approach to design, like Brady, argue that designing architecture to endure requires a strong understanding of structure, and
quote ancient architecture pedagogy:

Vitruvius discusses construction and economy in the context of the intertwined issues of visual delight, meaning and inhabitation. Something that is not built well will not last... sustainability must be a philosophy that informs the education of an architect at every level – not subject matter for another course requirement for the professional degree. (Brady, 1996)

She argues that having a separate lecture course does not help integration of the theory into design activities. She advocates a multi-disciplinary approach and expansion of studio to include: "... the signified and significance, reflection and creation, an integrated design process and the experience of the built reality. (ibid. pg 48). Others, however, acknowledge the sometimes weak teaching skills of the teachers, and whether they understand how to follow the progression from one skill to the next (Cairns and Chrisp 1996); or that with no teacher training, they resort to the methods by which they themselves were taught (Eastman, Newstetter et al. 1999); or by simply not being architects, command less interest in studio: “One gets the impression that at many schools the technology instructors are the (night club entertainers) of the faculty. They get no respect.” (Crosbie 1995:93)

In L’ École des Beaux Arts, by most accounts a most gruelling of architecture educations, the most difficult course according to ex-student Jean Paul Carlhian, was in construction. It consisted of: "... a strenuous series of lectures culminating in lengthy oral examinations accompanied by the presentation of an elaborate construction project.” The École was determined to inculcate both the thorough-going practical skills it would have passed on in the ‘apprenticeship’ days, as well as the competitive creative design skills of the design studio, “featuring structural drawings, working-drawing type details, accurate dimensioning and appropriate computations presented on several panels.” But the process was difficult and could take as long as a decade to complete, as in Carlhian’s case. (Carlhian 1979:9)
However difficult, a return to the École method of teaching science courses in a studio-like manner, is endorsed by Simon Hayman of the University of Sydney. He sees that ‘design awareness’ with its conscious concern for aesthetic underpinnings, for fostering creativity and intuitiveness, could be as healthy for specific knowledge areas as for the practice of design. Writing at the beginning of the 1990s he firmly places architecture in the debt of technology:

... the full effects on form owing to developments in current work technologies e.g. digital communication, are still to be experienced ... it would seem to support the stance that architecture is purely a sub-set of technology and that technologists have the dubious honour of being the ‘true’ designers of buildings. (Hayman 1993:322)

Steven Hurtt of the University of Notre Dame is more defensive. He admits he is angry at criticisms of the inadequacy of architecture teaching. On the contrary, he says, architects’ education prepares them to adapt to many of the new and innovative areas of work:

Architecture has mated with numerous new fields of discovery and inquiry, and has spawned landscape architecture; engineering (or at least the civil, structural, and military varieties); archaeology; architectural history and what in its vernacular form is being called material culture; city, urban and regional planning; and most currently the various forms of environmental studies. (Hurtt 1985:53)

Throughout, the debate itself is a result of the architecture penchant for self-assessment. It stimulates in students and practicing architects alike what Dana Cuff of the U.C.L.A. School of Architecture calls “a creative tension, (provoking confrontational discussion so that) ... studio, theory and practice learning (are) not isolated into un-related courses but connected in a way that sparks would begin to fly.” She defends priorities which rate pragmatic courses lower than theory and design excellence. Without this climate of debate we would:

... produce a generation devoid of utopian thinking, unclear about quality, and without opportunities to develop aspirations to act upon. (Cuff 1996:95)
2.2.2 Computers in higher education

The impetus for the development of a work of hypermedia to take its place in the education of the architect was, as mentioned in other chapters, a matter of convergence. On the one hand there was a perceived gap in building science in the design studio education and on the other a method of using computers had become available, of particular interest to educators. The history of the arrival of interactive multimedia computers into higher education is part of the story of HyperSteel.

During the 1990s as computers came to be widely used in education, Stephen Heppell at the University of Anglia, U.K., narrowed his observation of this process to three stages, which then suggested a fourth (Heppell 1993). This guide from outside architecture provides a disinterested position to observe computer applications in architecture education. The first three are typified as ‘topicality’, ‘surrogacy’, and ‘progression’, while the fourth evolves out of a participatory stage in which students’ own knowledge and cultural competence derived from the information age itself and is acknowledged, he describes as ‘pedagogical evolution’. All four are applied to Auckland school of Architecture as follows, below.

The first multimedia workstations as elsewhere, were seen in Auckland in the general ‘audio-visual’ suites, along with slide projectors, stereo sound systems and video equipment; this technology contributed to, but was not part of the design studio; together with a few word processors using the computer as a topic was “a discrete and appropriate learning outcome of its own ... and a sensible use of very scarce resources” (Heppell 1993:231)

Just as if these devices were, as they appeared to be, entertainment zones, or surrogate teachers, it was noticed, as Heppell says, that “... the computer based environment was intrinsically motivating.” To take advantage of them, a few teachers across many disciplines began to
develop task-specific computer programs for their own students and the predominant manufacturer of desk top computers responded to the new interest. What was to become HyperSteel was among them.

In the late 1980s Apple Macintosh Inc. introduced computers with icon-ordered screens which resembled horizontal work spaces. These desk-top environments and the electronics behind them were to become publishing platforms, musicians' switch-panels, drawing boards, laboratories – or any location for the collection, manipulation and presentation of communications. The common characteristic of all these functions from that time onwards was that they were 'computer centred'. Almost any electro-magnetic or electronic device can be used as an input, and output devices can include the internet, telephones, fax, projection systems, videotape machines, speakers or printers, and the potential for teaching is infinite. Any knowledge which may be illustrated better with images, sounds, moving components, text of any size or font, was soon observed to improve a lesson, memo, report, or assignment. The Macintosh retailer in 1988 was Apple Computers Inc, of California, which devoted an experimental Multimedia Laboratory to researching and promoting the use of computer-aided learning, or 'CAL':

Intelligent Pictures, Pictorial Conversations and Full Spectrum Learning. This provision of tools for "making" multimedia presentations as well as viewing them reflects our basic pedagogical assumption that visual and auditory tools can be critical for thinking. ... we suggest that the act of creating visual and auditory presentations in addition to textual presentations is important for deep understanding (Hooper, 1988:7).

The two revolutionary features of the computer software being made available for education were interactivity and user control, often referred to as 'non-linearity'. These concepts were not new: oral storytelling has always included the possibility for the teller to adapt elements, re-ordering sequences and encouraging listeners to participate. It was the printing press which had solidified text into a
fixed mass-produced, linear form. The contemporary revolution was the invention of technology which allowed hard copy text to return to the fluid changeable narrative of the story teller. The first well-known idea for such a device was Vannevar Bush’s ‘memex’ which he proposed in a 1945 issue of *Atlantic Monthly*, but he could not put it into reality because he did not have the technology. His important proposition was the idea of ‘nodes’ in a network, which would be connected by associative links, which is how he thought people’s minds worked. (Bush 1945)

The most common computer-based software for this function was HyperCard® and it rapidly became an internationally accepted tool for CAL. Since HyperCard became – and remained – a favourite interface for teaching material, it should be described:

HyperCard is based on the concept of index cards. The basic unit of information in HyperCard is called a card and sets of related and interlinked HyperCard cards form stacks. Cards can contain text, graphics and buttons, which produce a designated action such as going to another card, cuing a visual effect, or even dialling a phone. HyperCard buttons enable you to create links between related cards, connections that let you organise information as you do in your mind – by association and context (taken from a 1988 Apple Technology Guide).

Experimentation with CAL teaching had been taking place in other centres, in Xerox Park, California (Kay 1987), and at M.I.T., Massachusetts (Papert 1980), during the previous two decades. This included the invention of computer graphics by Ivan Sutherland in 1962 and the mouse in 1984 by Douglas Engelbart. Engelbart was also the first to successfully implement hypertext, and applied the principles of ergonomic design to his hand-held inventions. (Kay 1987)

In 1968 Kay reported certain metaphors evolving: that of the mouse as a pencil, the computer as a medium instead of a vehicle, and icons for the different ‘trays’ on a work desk. At the same time Seymour Papert was teaching children mathematics by applying the metaphor of the
computer as a foreign country – by learning to 'speak' (or program) that country’s language they would get along there better. By programming software the children became builders of their own intellectual structures. (Papert 1980:7) Papert and his students thus made the progression through stage two of Heppell’s levels by relating one activity to something easily understood in another context by the children.

This pedagogic evolution brought about by the arrival of computers in education has been observed by other commentators, including “... impacts on the structure and organisation of the lesson” (Fischer 1996), “... shifts from factual knowledge to the acquisition of cognitive abilities” (Issing 1994), and “... transforms an entire course into a more image-centred, interactive and non-linear group experience.” (Miniutti and Klue 1998:7)

It also served to provide a working opportunity for a group of staff and students to learn how to take a content-free computer program (first, HyperCard and then, Macromedia Director®) and use it in a very complex way. Thus HyperSteel answered two of the stages identified by Heppell. First it provided a surrogate tutor to large classes needing a variety of teaching techniques and drill-and-practice routines for individual study. The third use became his transitional stage of ‘progression’ where individual members of the architecture community joined the HyperSteel development team and moved to colonise the computer themselves, in:

... the participative mode, supporting the learner with generic tools in the originating, representing and authoring of multimedia resources ... (Hepell 1993:232)

Reports from other similar populations to Auckland architects provided with multimedia software, echo this interest in participatory use. They include the physics department at the University of Auckland, where students wanted the software to give only partial
clues to problem-solving (Dhillon 1997:67); the landscape architecture course at Connecticut University which uses real-time drawing during on-line tutorials (Miniutti and Klue 1998:5); and the Visible Language Workshop, Media Laboratory, Massachusetts Institute of Technology, which carried out research into the requirements for expert systems in architectural design, deciding such software needed various media including graphics, video graphics and computational video. (Purcell 1988:149)

HyperSteel development fitted into the third of Heppell’s stages as it exploited more and more computing power and versatility. What Heppell describes as “the cottage industry of teachers coding useful little programs" disappeared under an avalanche of new, diverse, content-free software including desk-top publishing, databases, spread sheets and - very attractive to architecture students - image and graphics tools. This characterised his ‘progression’ stage and was marked in architecture by the slow move into design studios of powerful computers with intranet and internet capabilities. At first their function was to provide another medium for drawing, modelling and movie making, however a few individuals with particular interests edged them further towards design itself.

The digital design studio has not displaced the other strands of design teaching, but it is clear that the experience is quite different. From the general education world Heppell observes “we have successfully harnessed computers to offer a technological awareness, problem solving progression and continuity. Significant pedagogic evolution lies beyond.” The students who were his research subjects - from before 1993 - are now at the level of mid-university years. Those individuals who were then “... literally the first children of the information age ... typically rich in media resources ... of aural, textual, visual and graphical complexity” (1993:233) are the same age as those in the digital studios of architecture schools now. By comparison, their teachers are distinctly mono-media consumers. A
cultural experience of complex broadcast media and computer games has resulted in a population of students with hitherto unobserved information skills who Heppell describes as "... sophisticated managers of complex information forms" (ibid. pg 234)

Heppell’s four stages continue to be valid in this new context of research, more and more educators foreseeing the potential of the last one, when the medium of representation brings about changes to the practice of the profession. All stages may be observed in progress in the Auckland School of Architecture and will be discussed in Chapter 4 in the development of the HyperSteel software.

2.2.3 Architectural representation in higher education

Until this century architecture was customarily represented by a circumscribed method of drawing led by the Renaissance artists and architects in the 15th century. The method is exemplified by the static two dimensional perspective seen from eye height towards a central point. Representation was equally formalised in the French L’École des Beaux Arts. Remembering his École studies, Carlhian recalls the rigid requirements for presentation there in the 1920s: although freehand sketching was greatly admired, the mandatory drawing requirements included plans, sections and elevations, and a single hardline perspective in the final presentation. Final presentation of a six week project involved a team of student-renderers working together and was often inaccurate as a result. There were no collages, nor photographs. Perspective drawing was taught in a separate course, the shadow-casting carefully done (always at 45° from the upper left corner), and was never part of a final design project. (Carlhian 1979:9)

By contrast with the narrowly structured schedule described above, the curriculum at the Auckland school contains four core papers with wide parameters of expression. Architectural drawing is taught in two papers and contains an introduction to freehand architectural drawing
including basic perspective, sketching, and conceptual design drawing. Various media are explored and there is a basic introduction to the critical analysis of drawing.

Architectural computing starts with a theoretical overview and practical introduction to current and future computing practices in architecture, with an emphasis on the use of digital media to aid conceptual design, while computer aided design and information processing techniques include three dimensional modelling and the extraction of two dimensional drawings. The management and utilisation of computers in the production of working drawings together with generic and specific software is also taught (information taken from the School Handbook, 1999).

In addition, elective courses include papers in freehand, measured, and life drawing, as well as video and photography techniques. It is notable how close architectural representation at the student level at least, has come to some film makers’ work: Peter Greenaway’s work *Prospero’s Books* (1990) employs all these techniques.

2.2.4 Computers in architecture design education

To return to Heppell’s suggestion of three familiarisation stages of computer take-up followed by a fourth participatory level, and apply it in design studio: this is indeed the pattern of use.

At first, at the topicality stage, the computer itself was the centre of attention: technologists were said to give instruction ‘in the computer’ and machines were locked up in special rooms for rationed usage. Next, teachers loaded data into software programs and made machines available for student practice: this was nearly akin to ‘babysitting by machine’ or surrogacy and to some extent, *HyperSteel* with its revision exercises and background data exists at this stage of development. With its self-drive tutorials and draw-on diagrams *HyperSteel* progresses beyond this, and for the architects involved in its design, it
enters the fourth or participatory stage which is characterised by the originating and authoring of software. This stage is one where the usefulness of the software is recognised as ‘tools’ and exploited for their capabilities; it is also at this level that an acknowledgement occurs that computers not only bring something new to the activity they serve, but they change it and the practitioners who use it. (Heppell 1993)

In studio when computers are involved, the traditional balance of master class style becomes dislodged, and the teachers’ role in setting problems, the substance of the investigation and directing the solution-gathering has now become “... teams of students using advanced imaging techniques, (who) tweak designs in progress and wait for something to appear ... This is a new generation of empiricists.” (Cuff 2000:76) She observes the discomfort of traditionalists among the teachers when confronted with a screen rather than paper on which to review work. “The younger the student the more proficient in current software, thus reversing the fundamental correlation between wisdom and years of experience.”

In its short history, there have been many projects, both small and ambitious, incorporating computers in aspects of architecture education. In 1980 Raymond McCall at the University of Colorado, began to work on MIKROPLIS, a hypertext software for handling textual information representing designers’ reasoning. He called his content material ‘a landscape of ideas’. This description conveyed the nature of hypertext as a field of information to explore, re-order, add to, browse in. McColl is an environmental designer and included research literature, handbooks, catalogues, precedents, sketches, renderings, construction drawings, and project documentation in MIKROPOLIS (McCall 1989).

Since then a ‘language lab’ approach at Cornell University (Mackenzie, et al., 1986), multimedia teaching architectural science in
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Australia (Murthy 1993), the use of web sites to share sustainability ideas (Mitgang 1998), an experiment in collaborative designing (Favela, et al., 1994) and in Hong Kong a comprehensive networking, administration, assessment and delivery system to cater for large numbers of widespread, highly technologised students (Scott and Mak 1998), have occurred. One of the most recent is eifForm, created by Kristina Shea at Cambridge University in Great Britain that introduces new computational techniques to carry out rapid analysis of architecture form using geometry, geology, topology and principles of structural engineering (2000:43).

Virtual design studios (VDS) now run between universities in the U.S., Australia, Canada, Hong Kong and South America. Like the HyperSteel development unit, they use whatever multi media software is compatible to their school system and resort to HTML platforms (as HyperSteel does in HyperSteelLibrary) when a simultaneous platform is needed, sharing a web-link in co-synchronous crit sessions. One response to this logical step into actual shared presence is contrived as a split screen in which both contributing studios appear, called an ‘infinity room’ designed by Guillermo Vasquez de Velasco of Texas A & M University which “increases psychological engagement in the same way as the ‘dissolving fourth wall’ does in the theatre.” (Laiserin 2002:142)

Columbia University’s Ed Keller bases studio programmes on his game Hypnagogue, during which time speeds up and slows down and physical boundaries and scales shift, the subject moving through a series of scenarios, which are architecturally based. (Cramer and Gurney 2000:94)

More pragmatic but still allied to game-like platforms are the Maxis company’s software Sim City, Sim Tower and Sim Earth (Battle and McCarthy 1994:111) which are tools for designing urban environments. Compatible with relatively simple personal computers
and even purchased as games for family entertainment, these programs may be interlocked to present very complex urban planning scenarios. They use believable visual graphics which allow the user to make planning decisions and then observe the results of their creations; ideas for development which may take “hundreds or thousands of years on a global scale, decades on an urban scale and years on a building scale” can be played out in a matter of hours. These include changes to streets, land use, taxation, provision of civic amenities, all managed by the software’s complex algorithms. This program is available in the Auckland school.

Examples of proprietary software which started life in university architecture schools and found their way back via commercial exploitation are Multiframe and form•Z. Multiframe was first designed in Griffith University in Australia, and form•Z, a modelling tool for testing design alternatives, arose out of the Knowlton School at Ohio State University. Both are applied in Auckland.

Whether it functions as “an instrument of translation (or) a generative device” (Slessor 2000:118) it might be said that the ultimate test of computers in architecture is the extent to which they assist or actually change the built project. Frank Gehry is a notable designer whose work reflects computer use. However, “it is still only a tool,” says a review of his design for a suite of three office blocks in the German city of Dusseldorf. These structures, one in plaster, one in terracotta brick, the third of steel covered mirrored surfaces are described as “... deftly choreographed (as if) a tea dance had been gate-crashed by a can-can troupe... (They started as sketches that were) blotchy black pen rendering(s) of whirling indeterminate forms quickly captured ...” Using CATIA software from the aeronautics industry to scan handmade 3D models to digital form, Gehry converts these back into working drawings and the computer supplies all the data needed for the cut and structure of the building’s outer skin - in this case, 355 different curved moulds for the panels of just one, of the three
buildings. Despite Slessor and Gehry both denying adamantly that the work owes little of its design quality to the computer per se, the fact that it achieves a radical geometry not possible before the advent of computers and that the design makes direct connection to the method of construction via variable panel moulding, laser etching, rapid prototyping techniques, it is equally clear that Gehry has passed into the fourth stage of Heppell's index, but avoids the final acknowledgement of its part in the radical change of the buildings he produces.

2.3 Summary

This chapter has reviewed the conditions which provided HyperSteel with its raison d'être. These formed, in summary, a synchronous situation of identified educational need with technological development for possible answers. The chapter is not about the eventual chronotopic solutions but about the preparation for their use.

This is a framework constructed from the history and practice of architecture teaching, showing how this specialised education has favoured hands-on, experiential activities, especially in the central focus of the system, the design studio. This has been retained, in spite of its areas of profound difference from the universal models of higher education in western universities. The review has examined a strong emphasis on image-based texts, and the architectural habit of simultaneous perception of the two views of plan and section, a duality which translated comfortably into the split-screen, click-jumps etc, of digital multimedia software.

This learning model is seen as owing much to 'situated learning' which is a form of apprentice-like education, marrying 'real' activities into student-based projects. This enculturating approach where practising architects guide students through design studies as if they were in professional studios, is a useful way to view design studio, but it is not pure situated learning, since the
actual conditions of architectural practice would be, at the very least, a confusing environment for study. It matches the guidelines set out in the Auckland school’s own intentions as the “... interdependent nature of such knowledge and skill in both the discipline of architecture and its practice...” (Hunt 1999: Appendix 3)

HyperSteel owes its origins to a perceived lack of intuitive knowledge about structures being applied in design. This chapter describes the context in which, faced with criticism in design studio that students were not using theory presented in lectures and tutorials, the structures and construction academic staff undertook to construct a teaching aid in the computer-based medium of hypermedia. It was anticipated that an interactive, self drive approach might bridge the gap between rote learned theory and studio based design practice.

HyperSteel joined with other items of tailor-made software being devised for particular tasks by university architecture schools, which is why a short review of the emergence of computers in higher education has been included, in order to provide markers to this convergence. The following chapters describe the development of HyperSteel, in terms of the chronotopic events which effectively mark every act of self-directed choice, and report on a survey which interrogates students and staff on their responses to the software.
3. A MODEL FOR THE CHRONOTOPE IN ARCHITECTURE LEARNING

Consideration of what may be seen, heard, felt and imagined when encountering the history, dimensions and function of a building, exposes its existence in human memory. The choice of the Civic cinema to illustrate this thesis is arbitrary, based on the strong relationship people have to the building, and the rich social experiences it provides, quite apart from its relative value architecturally. Childhood reminiscence, wartime circumstances, the glamour of film in the Hollywood heyday are all reasons for special personal memories connected to the Civic, which in turn are tied to the physical experience of being in the building. It is presented here in the same spirit of plurality which exists in design studio.

Without it being named as chronotopic, the evoking of human responses to axes of time and space is a focussing technique used in design studio where the students are encouraged by task and dialogue to recognise the impact of these sense-driven qualities on one's deeper level of imaginative understanding. Other courses in the curriculum might follow the didactic style of the traditional university but they do so only so far as the design studio
requires the knowledge they impart. Architecture education centres itself on design studio, and throughout the thesis, I centre the discussion on the value of digital media as a tool for architecture education; my intention in this chapter is to theorise it.

Whether we ‘receive’ knowledge by physics, chemistry, computation or pre-conditioning, or by all these means in some holistic cognitive way through an accumulation of tuned understandings, this thesis argues that once absorbed, this, then, becomes the architectural intuition. The educational opportunities for new interactive media like HyperSteel lie in knowing how and why the chronotopic event works on its human receiver, and thus effectively works its way into each student’s imaginative ‘cache’ of understanding.

In this chapter I discuss a theoretical model of the chronotope which will provide for architecture theory a set of understandings to develop the use of hypermedia in education. I will identify critical moments in certain contributing theories and redescribe them in terms of Bakhtin’s chronotopic form. Later in this chapter I refine this view even closer, to one sub-set of his chronotope theory: to show how the characteristics of just one of his literary models, the Greek adventure-time, resembles each of the case studies nominated for this study.

The actual context of the educational environment within which HyperSteel was developed is described in the previous chapter. Here, I will advance a theoretical framework for hypermedia within the learning process. Extending underneath the commonality of narrative in film, architecture and education, together with their existence in the cross-hairs of time and space, is the question of the significance of all these chronotopes, the “... the organising centres for the fundamental narrative events ...” (Bakhtin 1981:250) Educators can make use of natural principles of organisation; if one temporal phenomenon can be harnessed to interact with another, a spatially derived one, as for instance when solving a task in HyperSteel in an allotted time, then HyperSteel and the student together have formed a new narrative. With Bakhtin’s “organising centres”, the student has now created their own
meaning from the knowledge. They have tied their own "knots of narrative ... It can be said without qualification that to them belongs the meaning." (ibid. pg 250)

In order to frame a viable theory of education which collects these organising centres into the learning act, I will pursue the idea of Bakhtin's meaning of these tied knots of narrative. For this purpose I turn to the area of cognitive theory and its approach to intuitive knowledge collection and retention, a position informed by the descriptions of tacit knowledge by Michael Polanyi. (Polanyi 1969)

The chapter will draw on the theoretical stances of educators Polanyi and Mitchell, architectural historian Giedion, and psychologist Paivio, and apply the case studies introduced in Chapter 1 to literary theorists Ricoeur and Bakhtin in order to posit a theory linking the chronotope to architectural intuition.

In this chapter then, the following is delineated: the possibility and form of an architectural intuition; a teaching process which is tuned to it; the inseparable yet separate importance of time and space; the nature of narrative within architecture, and ultimately, the frame of reference within which to name and develop future practicalities out of the interconnection of these abstract positions.

The thesis includes a qualitative survey of students and staff, described fully in Chapter 5 and supported by Appendices III - VIII which give empirical weight to this theoretical overview.

3.1 Michael Polanyi and the intuition reservoir model

Traditionally, in higher education, as has been seen in the previous chapter, objective knowledge has enjoyed a heightened importance, especially in the science-dominated subjects to which architectural structural theory belongs.
This positivist endorsement of consciously learned and proven understandings has been objectively held. However, among other Western scientists challenging this accepted reality after the upheavals of WWII is scientist Michael Polanyi. His arguments identify the value of 'tacit' or intuitive understandings, which he sees as subsidiary to our conscious knowledge. It is a position, as Gill says, "... challenging the traditional modernist view that all knowledge is and must be explicit in nature." (The Tacit Mode. Michael Polanyi's Postmodern Philosophy. 2000:52) For Polanyi this is the knowledge we have, but do not know we have learned (Polanyi 1969).

In other words, we know more than we can tell, and this personal resource which is called here the 'intuition' we use in a near-subconscious way to make order out of unknown patterns, to give us clues as to what might be so, or even, to start the process of ordering our new knowledge. It is heavily relied on in new surroundings, such as entering design studio for the first time, or later when taking up new architecture projects. Indeed this is where the usefulness of tacit knowledge is really invaluable and is the 'payoff' from a rich design studio experience.

This subliminal or tacit level, which Polanyi called 'subsidiary', rather than 'focal', affects our attitudes, belongs to our memories, and leads to hunches - all behaviour which belongs to the intuitive imagination. Polanyi used the term 'tacit understanding', to mean 'not openly expressed or stated but implied, understood, inferred'. Tacit knowing was Polanyi's alternative to scientific objectivity, which he firmly denounced as being self-contradictory. Instead he identified the importance of one's personal intuition as a powerful tool for applying the facts of theory to the problems of design, and even, suggested one's intuition may be trained and enhanced by activities involving sensory experiences.

A knowledge of information which exists across the duration of time, just as light, sound, colour and emotional responses do, accesses the memory at an experiential level and becomes part of the individual's collected mental resources. Those learning opportunities which include such features described
in this study as cinematographic, will enhance intuitive knowledge. The more these experiential activities are dynamic, active, fluid and participatory, the better the chance of engaging the emotions of the learner, and the greater the impact on the memory. It can be thought of as "... a feel for the phenomena", says Donald A. Schon, from whose sociological observation of the 'reflective practicum' method of teaching in design studio, intuition can be put into architectural terms,

... for example, for the behaviour of solar envelopes, soils and foundations, the effects of wind on buildings, or the characteristic phenomena of buildings, economics and finance. (Schon 1988:8)

Schon was convinced that, "... these are what scientists and engineers are fond of describing as their 'intuitions' ", implying that the notion of intuition has a special status in architecture and engineering, by putting the word in quotes.

His descriptions of the learning environment in Architecture design studio are included in the previous chapter.

The following model of intuition is a metaphorical illustration taken from Polanyi scholar P. Baumard, who describes "a sort of reservoir" or a bank of knowledge in which is invested memories, "elements from which we draw, consciously or unconsciously, a basis of knowledge ..." (Baumard 1999:58). Series of words, like formulae, definitions, vocabulary are one form of deposited investment of knowledge. The look and sound of things, like colours, shapes, music, and spoken words are there; as are the sights and sounds that accompany events like the creak of a failing beam in the laboratory; or the ping! of a completed exercise in HyperSteel. There is also the movement of the learner/banker's body, either in macro form like walking through a building, or micro such as that of the hand drag-n-dropping a symbol in HyperSteel's structographics tutorial.

When the knowledge is compounded by more than one of these elements, the impact on the memory is stronger; and when one or other of the elements is recognised in a new context, as in the design of an architectural detail which
requires this knowledge, then the rest of the banked knowledge may also be available. Once the lodgement is established within the ‘bank’, it may be invested, or re-invested in different projects. The investment becomes part of a constantly moving, changing entity, joining a rolling flood of other currencies, altering and re-valuing as it goes. The greater and more compounded the investment, the greater will be the recall.

The development of the architectural intuition through this process of storage, may be seen as one aim of the long and pluralised architecture education. In the interviews which are reported in Chapter 5, the conversations revealed varied, sometimes halting verbal responses, an inadequacy also observed by Schon in architectural students “I was struck by how hard it seemed to be for many students of architecture to “think” as I understood thinking, (They could not) make clear verbal arguments and reflect critically on them in the light of internal consistency, evidence and disconfirmability.” (Schon 1988:9)

This verbal inadequacy was also noted during the survey on HyperSteel. However, at the same time and despite this inarticulacy the content of their answers revealed an absorbed - tacit - knowledge of architectural reality, and their obvious confidence in it. This characteristic stumbling with ideas and words is integrated in Polanyi’s theory. As Gill puts it:

... because tacit knowing centres in embodied indwelling of actors of which we are but subsidiarily aware, and not in conceptual analysis, we never can articulate these factors fully while we are yet relying on them in order to focus on more explicit factors. (Gill 2000:52)

When considered together, this suggests the existence of ‘banked’ knowledge about architectural structures. Some extracts from the survey interviews give evidence that intuition is at work when students use correct, profession-based terminology in general conversation:

Vic: (When you are in) someone’s house and you’re looking at the ceiling and ah! that’s a suspended ceiling or whatever. You know? And everyone else doesn’t have a clue. I find I get a kick out of that...
CHAPTER 3

Wendy: When I have a house with a steel beam you have to go and ask an engineer to give you the right size, but you've got an idea of how you want it to connect...

make the appropriate decisions when facing new problems:

Wendy: You just know that when you get the piece of paper out and start the sketches and then convert that to a building that can be built. Yes, it's there.

and apply knowledge learned in one context to other circumstances:

Rochelle: ... you can sort of see if something is going to fall down obviously.

Jack: I dare say it's more a case of knowing how things actually do go together in this place. ... There's been a few times when people say, you know like, try and span things so far and it's like, you can't ... no, you can't ... do that.

It can be observed that despite the inarticulateness also previously noted by Schon, once they were speaking about structural matters, students were able to use appropriate terminology such as 'suspended ceiling', 'beam connection' and 'beam span', in conversational contexts, and were able to apply one piece of knowledge to multiple uses, both indications that successful learning had taken place. This sense of how a building performs structurally is the important 'investment' into an architect's reservoir of intuition. "There are always assumptions, skills, and commitments", according to Gill, "that we are in principle unable to articulate because they are rooted in our subsidiary awareness and embodied existence." (Gill 2000:62) The learner appears to retain the knowledge even though they may lose awareness of the process and even the storage of that knowledge, when questioned at a later date. This phenomenon called 'tacit knowledge' by Polanyi (Polanyi 1967) is the forgotten knowledge which is always available as a resource to call on, in this case, by the architect. It has already been described by the teaching staff as 'absorption by'.
... osmosis in which students' awareness and knowledge of building technology and performance issues from lecture based subjects is subsequently expected to influence design decision making. (Hunt 1999:4)

This understanding of the whole (design decisions) as different from identifying and defining each of the parts in isolation (lecture based knowledge) is familiar as 'gestalt' psychology. "When this act takes place, the knowing agent interiorizes the holistic Gestalt or locus of meaning and thus can be said to be indwelt by it." (Gill 2000:52)

What is happening is that slowly and incrementally we develop the ability to deduce the solution to problems by accumulating educational experiences, which we learn to use to make increasingly complex tacit inferences. This exercise is developed through training so that our personal perception becomes the means of skilled discovery. Polanyi states that this is what is meant by the so-called scientific intuition: the mechanism whereby we make "discovery without awareness" (Polanyi 1969:133), based on an integration of tacit knowledge with trained problem solving.

3.1.1 Intuitive education for architects

The following description of how an architect approaches problems is apposite: "... (it is) the conscious and informed play of intention against a structure of givens to yield three dimensional form," (Mitchell 1990:239) Architect Mitchell's 'play of intention' - his intuition - meets his known 'givens' to result in an architectural product.

William J. Mitchell is an educator and architect with a personal interest in the nature of architecture in the age of digital representation. His books grew out of seminars and teaching design studies at Harvard School of Design and Massachusetts Institute of Technology Architecture School during the last decade. Convinced of the pervasive future of computer technology Mitchell has elaborated on
the manner in which architecture will alter in response to the digital
carriage of communication, from issues like work patterns, commerce,
leisure and overall, to the built environment (Mitchell 1990, 1992,

A prevailing theme in Mitchell’s work is the concept of a-
synchronicity. Although he does not refer directly to the point of
intersection between time and space, nor the chronotope as I do in this
thesis, it is via Mitchell that I link the architectural intuition with the
impact of the chronotope. For him, electronic means of expression
have brought shifting realities of time and space, so that real time is
one agreed dimension; and duration that has been stretched, or
fragmented or compressed is another. Tangible sites for buildings
have been traditional places for architectural design, and now there is a
recognition of cyberspace and its potential to alter things like distance,
access, even the need for a building at all. Since distorted time and
space are now accepted locales for society’s activities, the real places
of life for work, living and leisure are combinations of virtual and real.
So he asks, “What aggregate spatial and temporal patterns will
emerge?” He recognises that the management of a-synchronicity will
be a vital skill for architects who will draw on knowledge absorbed in
one era but needed in another, to apply, manipulate and develop it,
intuitively. “Notice how our ability to produce an intelligible
functional description depends on our knowledge of how to parse a
system into elements and subsystems in some appropriate way…”

This is the dominant skill in a time of constant change. Mitchell
categorised architecture into a language of forms and functions in
which he prescribed the use of this vocabulary not in its small
elements, but to function as a whole system which: “... must be
understood not as a simple hierarchy but as a structure of overlapping
and interlocking subsystems.” (1990:190) Rejecting what he calls
“breathless, the world-is-new, anything is possible rhetoric” (1999:29)
in favour of drawing on inherited wisdom, he gives the example of the constructed perspective of Brunelleschi, only it is now seen in the computer mediated drawing board, in an extended form thanks to the application of projection and shading procedures: “the digital image continues but ... also redefines these older traditions”. (1992:6)

There is an escalation of the numbers of public and private instances of change as a result of the electronic communication technology, what Mitchell calls the infobahn age (Mitchell 1992:50 -100). Even if activities do not change, he expects the places where they are carried out will be very different; many new activities will emerge and their zones of performance will be created out of what existed previously. How will humanity respond to this complex network of interconnectedness and capacity? He predicts an architectural solution: by the layering of a ‘virtual’ shell of communications technology over the previous struggle so that underneath the shell people live out their lives as part-cyborg, in what are partly ‘smart’ places. (Mitchell 1999:8)

Decisions will succeed or fail on the skill of assessing which interactions will be carried out, and how this will call for a subtle understanding of how to use these differences, and location, speed, distance, and cultural values will all come into play in the choices.

we would do better ... developing a broad critical action-oriented perspective on the technological economic social and cultural reality of what’s actually going on. Since new technological systems are complex social constructions we must understand our emerging options, choose our ends carefully and build well. Our job is to design the future we want ... (Mitchell 1999:12)

He expects architects to used their stored knowledge to find solutions that:

... will have the felicitous qualities that we have traditionally valued in our physical surroundings together with startling new affordances provided by widely available, inexpensive, electronic intelligence and telecommunication. (ibid. pg 32)
“The path from our present systems to those of the future need not be one of cataclysmic change...” Architects will address new circumstances, with embedded abilities gathered from their education and a range of circumstances that only ‘today’ can provide, since ‘tomorrow’ has not yet presented the problems architects will address, “... one of mostly soft, subtle incremental transformation.” (Mitchell 1999:36)

Schon agrees that this is occurring and that such dislocations:

... will be subject to the same social and political contingencies and are likely to continue any inequalities presently observed, but they will occur. (Schon, Sanyal et al. 1999:9)

In Mitchell’s terms the impact of digitalisation on architecture has resulted in people and buildings becoming partly absorbed by the cyberspace which exists in virtual reality: “Steel and concrete will still be important but they will be joined by silicon and software.” (Mitchell 1999:65) Representations of architecture with the tools of time and space, computers and cameras, have evolved into what Mitchell termed “the age of electrobricollage”. (Mitchell 1992:7)

In an article entitled Why Can’t Johnny Size a Beam? one architect puts into simple words the necessity to bridge the crossover gap between learned theory and the ability to apply it in design. “Students spend countless hours memorising formulae, crunching numbers and solving abstract technical problems that have little relation to an actual architectural project” (Crosbie 1995:92). He calls for an education which is set in real contexts, not just how to size a beam, but to configure the entire form based on knowledge about beam size requirements.

This architect, acutely aware of what is important to his practice wants the graduate’s use of knowledge to be intuitive. My investigation into identifying and naming the chronotope in digital study is to arrive at a
means of supporting useful intuitive knowledge gathering for this purpose. The intention is to provide a link between the chronotope in hypermedia and the engagement of the intuitive memory; so that the narrative in which the chronotope occurred becomes embedded in the deep ‘bank’ of knowledge carried by the student.

Cognitive learning theories hold that knowledge learned in one context, say in cinematography, may be carried over to other circumstances as long as the knowledge is seen to be intrinsically relevant. A more extreme contrary position held by situated learning theorists departs from this belief in that they feel only that knowledge learned in the entirely ‘real’ context, say, while actually employed in an architect’s office, can be transferred. I support a middle, ‘hybrid’ case which applies in the case study under examination, in which if relationships are established between contexts, the learner is more likely to make connections between the two and thereby learn more easily, being involved in making chronotopic connection for oneself.

It is the use of one’s intuition which departs from the situated learning position; by engaging the intuition, the ‘invested’ knowledge learned in one context may be used effectively in another. If one understands the principles of beam requirements – Crosbie’s problem – then one’s intuition will lead to the right computation for calculating the size of the beam. In this way, cognitive theorists seek to explain interdependencies between senses which work together to gather information, although they may do it in completely different ways.

3.2 Allan Paivio and dual processing

Any cognitive learning which proceeds via both text and time-based media (say, moving pictures or sound) carries significant potential for the learner. This has been the subject of research by educational psychologist Allan Paivio and others (Paivio, 1971, with Begg 1981, 1986, with Thompson 1994, with
Sadoski 2001, Mayer and Anderson 1991, 1992, Mayer and Bove 1996, Mayer 1999) providing a body of research to show the efficacy of 'dual coding theory'. Dual coding theory recognises that two cognitive activities carried out at the same time: language together with mental imagery, say, play an important part in successful learning. They have been shown to be more successful that one source of stimulus on its own.

Having the bulk of our academic information carried by the abstract symbols of a form of textual language has led us to believe that literacy is a matter of being able to communicate with written text. This is only partly so. It is certainly not the case that real understanding comes only through reading and writing text. "... we perceive, discriminate, analyse, synthesise, interpret, anticipate, comprehend, compose, imagine, remember, and express ourselves without text as well as with text." (Paivio and Sadoski 2001:1) In other words, knowledge through literacy involves written language and it is only one of the many ways we can communicate. There is nothing in reading and writing say the authors, that is not present in other cognitive acts. Architects have used many cognitive communicative systems: measured drawings, sections, plans, axonometric; they have used models, photographs, paintings, and as this thesis explores, films and hypermedia to express their ideas.

Cognitive learning theorists emphasise the holistic nature of knowledge over piecemeal dissection of discrete parcels, so the design studio offers a distinctly more cognitive approach to learning than the lecture system, for instance. As Knowles says: "the direction from simple to complex is not from arbitrary, meaningless parts to meaningful wholes, but instead from simplified wholes to more complex wholes." (author's italics, Knowles 1984:65) This is present as a matter of course in studio.

Dual coding theory differs from other educational theories in important ways, "It assumes that mental representations retain properties derived from perceptions in our various sensory modalities" (Paivio 2001:5) Noting the ancient Greek method of learning public speaking of 'mnemonics', by which the learner mentally placed concepts into some familiar place - a 'loci' - he
realised that "memory and thought employ traces left by the perception of external objects and events" so that as the student was speaking his imagination visited the loci and saw in his mind's eye the idea he had left there, and that "the visual sense is mnemonically powerful ... (while) mental representations such as images and words can be mentally exchanged for each other" (ibid. pg 13)

From this he deduced that when a learner has two simultaneous sources of knowledge - text plus images, for instance - they will learn better than from text alone. "...training on imagery-mnemonic systems and use of pictures as mediators ... can be extraordinarily powerful as memory aids." (Paivio 1971:351). His conclusions from the psychologists’ standpoint gives an account of "literacy’s most elusive ingredient ... meaning" (2001:2), and to him the most “novel facet” of dual processing was that it included non verbal, non textual material - things that are a large part of the architect’s traditional frame of reference.

As individuals we have a personal reference library in our memories where "... language and other knowledge (is) stored mentally much as in a richly illustrated encyclopaedia or an audiovisual film library" Paivio uses knowledge as an audio-visual metaphor " ... represented as perceptual images of objects and events accompanied by relevant verbal descriptions and commentaries." (ibid. pg 67) This selection from contemporary media is not casual on the part of an educator, as Knowles observes, “Learning is culturally relative, and both the wider culture and the subculture to which the learner belongs may affect his learning.” (Knowles 1984:65)

According to dual coding theory, learning is acquired through certain verbal-vocal mechanisms, each arising from separate stimuli but acting together, which humans use with particular effectiveness. Two dominant sensory independent coding mechanisms work in the act of learning, one is verbal, the other visual:
... the two systems differ in the nature of the representational (cognitive) units, the way the units are organised and transformed, and in their function as mediators of performance in perceptual, memory, language, and cognitive tasks. (Paivio and Begg 1981:67)

Knowledge in the form of pictures for instance, is more likely to be coded both verbally and pictorially than words alone, would be. Pictorial illustrations in the study material are therefore likely to lead to better learning than words because of the redundancy of the coding.

Other Paivio experiments included additional sensory components and how these might contribute to heightened memory. By adding auditory and visual information for subjects in tests, at the time of their study, he concludes that memory is not encoded into an abstract form, but keeps its perceptual links with the sensorial experiences which were there during the learning process (Thompson and Paivio 1994). He also concludes in this experiment that when attaching the knowledge to the stimulus, the memory stores two different codes rather than one multi-form code, so that when images and sounds are added to some knowledge to be learned there is a double chance of it being remembered.

This double check which occurs automatically, works as a hypothesis test if required, by the learner placing one form of information against another. Knowles calls this "cognitive feedback" (1984:65). As well as the information provided by the institutional curriculum in lectures, tutorials and so on, there is the residual knowledge a student already holds in their subsidiary memory to use in this process. "Cognitivism ... focuses attention on internal representations and processes as well as external stimuli and responses." (Paivio 2001:3).

Memory retrieval and cognitive processing such as reasoning or learning are part of the act of learning and in turn are often influenced by cues in external representations, in other words, visual reminders or relocation in similar physical surroundings.
As early as 1971, Paivio observed that:

The studies reviewed ... indicate that among the variables that have been considered meaningful, spatial organisation is perhaps the most important feature of effective mediating images (and) may produce effects that surpass a rote-learning base-line, or one involving a relative absence of imagery ... (1971:350)

A habit of applying a heightened sense of awareness of the external world - the spatial dimension - is what should become second nature to the architect. Many tasks that humans perform are seen as distributed tasks that involve interaction between internal and external representation. Thus a method of learning which nudges both cues - as software can with its ability for interaction (and thus dialogue with internal memory) and vast source of visual, audible and text-based data (multiple external cues) - affects the potential for successful learning experiences (Paivio, 1986, Dobson, 1999: Introduction and 368).

Other fields of study have observed this multiple input effect within which I can now observe a chronotopicity: engaging with the intersections of the temporal and spatial abstractions of architecture 'literacy'. Since the student actually performs the narrative control between images and information bodily - however tiny the finger on the mouse - underlining the steps from idea to image to fact, and so on, the resulting "knot in the narrative" (Bakhtin 1981: 250) ties the memory even more tightly in their intuitive store.

3.3 Time-space and Sigfried Giedion

Sigfried Giedion (1888 - 1968) is the historian observer of the development of time-space into the architectural world-view. He charts the arrival of time as a dimension into expressive forms, first in painting, observing as the cubists found ways to interpret movement in their art, then as he saw it in modernist architecture.
He sets modern architecture into its historical context amidst the industrial developments and engineering progress of the first decades of the twentieth century. His is the appropriate eye by which to view the era which fed the modernist film maker, Alfred Hitchcock; it was Giedion who admitted that the 'feeling' self is part of the creative process of architects and engineers, close to what Michael Polanyi called 'intuition'; and for not only noticing the cubists as they skewed interest away from the subject to the eye of the observer, but for doing it himself in photographs, most particularly his 1889 series on the Eiffel Tower.

His work *Space Time and Architecture* (1941) is generally considered to be the standard text covering architecture history in the first half of this century. It is cited here in its fourteenth edition because the Introduction to that edition contains some useful updating (Giedion 1967). As the book developed - ultimately in fifteen editions, its examples changed and were added to, so that over the course of its many editions it provided a comprehensive commentary on the period between 1940 and 1960 in European architecture.

His place in this present thesis, after this contextual one, is that he validates a method of historical debate which admits personal bias. One result has been that this invites critical response: architecture critic and theorist Mark Wigley commented that Giedion's text, like one of the machines of his modernist era, is a “surveillance monitor, looking for signs of architectural folly and fashionable use of ornament” (1995:3) referring to the historian's dislike of unnecessary decoration. Commenting on Giedion's evangelising zeal against 19th century decorative styles, Giedion seems to Wigley to have an “overriding agenda” to unmask such a structure so that “a new architecture emerges that embodies truths of material construction and functional utility independent of the vagaries of fashion.”

Giedion does not stop at commenting on the faults of the modernist movement, but contemplates its reasons and influences; he directly challenges the methods of representation which had dominated architecture, the symmetrical, static Renaissance two dimensional perspective drawn from head
height, and the 45° axonometric routinely taught at L' École des Beaux Arts. Instead he sees the cubist artists including Pablo Picasso, Juan Miro, Gyorgy Kepes and Moholy Nagy responding to time, a fourth dimension, by disregarding pre-conceived conventions in order to express it in their paintings. They do not “… try to reproduce the appearance of objects from one vantage point: they (go) around them, (try) to lay hold of their inner constitution.” (Giedion 1967:369)

These paintings seem to scatter apart on the canvas, splintering their subjects as if caught at the moment of being thrown, kissing, running, or violently dying, as one can see in Picasso’s painting of the Spanish Civil War, Guernica (1937), for instance. They embody the principle of “simultaneity,” where time and space intersect, “the penetration of inner and outer space,” both seen at the same time, and the collage-effect of “working with curved planes and different textures.” (Giedion 1967:449)

The need to express time as a visual force, inseparable from the spatial dimension is not an individual method of artistic technique for Giedion, but rather, “the expression of a collective and almost unconscious attitude.”(1967:435) He pegs the appearance of this mind-set to the rise in engineering and industrial progress, which seemed to him to result in a separation between the scientific intellect and the emotional self; so in protest, the artist ‘collective’ acted to right the balance between the spirit and the intellect.

Giedion expressed his own emotional response to this dominance of the 19th century two dimensional perspective in a series of photographs of the Paris Eiffel Tower taken in 1889 (reproduced in Georgiadis 1989:54 - 63) where he alters the emphasis of traditional photographic reportage, from the subject, to the observer.

Today, this would be commonplace, as a video camera customarily assumes the persona of the on-looker, who “stands at the centre of events”, who “lets
his gaze constantly change his perspective in order to obtain insights that are perhaps unavoidably unintentional" (Georgiadis 1989:60) with techniques that are so customary today, we are ignorant of their existence, like the slight shake of the hand-held camera to suggest the human eye; or the adjusted pan to follow a person; or the shot from very low to give impression of great height, or the obverse from above, looking down to convey the inferiority of the subject: these are all part of contemporary expression. In Figure 1 for example, the gallery at the Civic is shot from below to emphasise its apparently substantial columns and decoration; and the wide shot Hitchcock uses in the forest reduces the human figure to doll-like fragility. But it was Giedion who ascribed the term "perspective apparatus" to give a technological name to this new and disconcerting adjusted view. As his biographer Georgiadis says, "the apparatus can move in any direction, can be accelerated or decelerated, can enlarge or diminish, isolate or construct..." (Georgiadis 1989:60)

The cubist artist Kepes, writing in 1944 acknowledges the power of the motion picture camera to increase this "elasticity of foreshortening", realising that the new framing called 'close-up' "broke up the traditional space unity inherited through painting and theatre" and offered unlimited variety of ways to expand and condense space. (Kepes 1944:91)

One wonders what Giedion would have made of the digital technology which, rather than the dozens of still two-dimensional, eccentric close-up and disorientating shots he took of the Eiffel Tower, would have constructed a single user-navigable 360° image. This would have allowed him to surrender control of the subject to a third person who with mouse clicks could have looked at any level, from whatever zoom, over, through and even, under the ground as seen in HyperSteel's Case Study movie noted in Appendix II.

Giedion's contribution to this new cinematographic form of representation is to name as 'space-time' the "simultaneous depiction of the multiplicity of views" (cited in Georgiadis 1989:118) when, instead of staying motionless,
fixed and static, the observer has to move. This seems self evident, but until the start of the twentieth century, it was not conveyed in architectural representation.

Architect Bernard Tschumi, applying space-time to design, prefers to see the two indivisible strands in architecture as “space” and “events”, arguing that the interchangeability of the new terms can be found in the new media technology that “at once defines and activates space, such as electronic facades that are both enclosure and spectacle.” (Tschumi 1994:22) Since media which originate from video and/or audio recording are those described widely as time-based, so Giedion’s original usage applies.

This divided-but-separate apparent contradiction of Giedion’s perceptive apparatus is a necessary condition of cyberspace. Until now, tangible sites for buildings have been the traditional location for the architecture project, however, cyberspace with its potential to alter things like distance, access, and even the need for a building at all, means that distorted time and space are now accepted locales for society’s activities. The real places of life for work, living and leisure have become combinations of virtual and real.

3.4 Narrative, the horizon of meaning and Paul Ricoeur

Having approached a theory of architecture which places a notion of the single concept space-time in a historical context, I turn now to a theorist who has integrated them both to create one concept: what he called “an horizon of meaning”.

Paul Ricoeur, philosopher and professor of human sciences, reflecting on the problematics of a human understanding of time, first separates time into two broad notions, that of phenomenological time (that experienced or lived by the individual) and cosmological time (that described by history and physics). Then, he displays two themes: that of “recounted time” and of “constructed space”. The one that is spatial, in other words architecture, he sees as
integrating with the medium with the temporal dominant feature, the story.

The two together he describes as existing in a “horizon of meaning”. This:

... step by step, reduces the initial interval that separates the literary and narrative character of the architectural project inscribed in “stone” and therefore time from space as well. (Ricoeur 1996:64)

He describes architecture in narrative terms. In my view this horizon of meaning also exists in a new location, cyberspace; the moving image as it appears in hypermedia has little temporal dimension except the one given by the reader/user/learner/consumer participant; and the click-jump is the trigger for both. Ricoeur’s discussion on the narrative in architecture becomes, he recounts, transformed by a developmental process called ‘repercussion’, until reaching “... the crux of the matter; crossing the spatiality of the narration with the temporality of the architectural project.” (Ricoeur 1996:64)

This personal move into the architecture realm goes in three broad steps, steps which follow on from an earlier mimetic explanation of narrative (Ricoeur 1985). Evoking the Aristotelian view of literature as imitation or mimesis, which centres not on literature as a mirror to human life, but more as a distillation of what life means to humankind, Ricoeur uses mimesis as a term for the passage of action within and during the narrative. It is the act of modification, of growth and even of loss, or diminution, of the recognisable stepping-through of event and a common site for providing new meaning for conflicting ideas. Ultimately, a new form which emerges from the drama is alteration, a change in condition say of colour or sound; at its strongest it is marked by some experience of catharsis on the part of the user.

We recognise this through the multiple identity of mimesis: when one visits a building, views a film or navigates in hypermedia, one enters the structure of a world, engages in the experience there, and through a cathartic process of some kind (hopefully, in education, that of comprehension), one becomes qualitatively a different person. Catharsis may be typified by a purging of confusion (perhaps through crisis), during which there is a strong sense of
personal identification with the issue.

In a digital context, the student—a term used here since this work of hypermedia is a learning tool—may or may not make the same choices of travel route through the narrative as any other. Put at its simplest, a reader or user begins, takes several choices of route along the way and concludes when they stop. In other words, undergoes a beginning a middle and an end. Or, as Suvin puts it, “a finite and coherent sequence of actions, located in the space-time of a possible world and proceeding from an initial to a final state of affairs,” (Suvin, 1986:63) in an essay on the chronotope in the parable, he also applies Bakhtin’s “inexorable insistence on narrativity” (ibid. pg 58)

Of course, the student will also have enriched this narrative path by their own earlier life experiences and their own personality which in turn enhances their approach; and the originators of the hypermedia project will have designed in certain probable narrative routes. To Suvin, this requires, at minimum, “an agent, an initial state changing to a commensurate final state and a series of changes consubstantial to varying chronotopes.” (ibid. pg 63) At some point since this is a learning tool it is hoped (and is seen to occur in the survey presented in the thesis), they will make a break-through of their own understanding, experience what has been described as an ‘a-ha moment’, or more theoretically, catharsis, described by Ricoeur as the heart of a developed narrative, and “... the moment of communicability of perceptive understanding”. (Ricoeur 1985:176)

This free but directed course, originally directed by the now-absent, probably distant cinematographer-author, is a narrative paced out by the movement of interaction between learner and computer. It turns theory into experience, abstract knowledge into interacting models and brings the science of the lecture content closer to the intuitive assimilation of knowledge than other forms of knowledge transmission. It is also closer to what is understood to be the central pivot of the architecture education, design studio.
The hypermedia maker, the cinematographer and the architect are as much seekers after a system, a narrative, and a chronotope as any other media designer. For different views of this narrative control, (see Figure 1 pg 35). In each of the following chosen exemplars, this inter-relationship between space and time is examined, referring to the viewer/user/participant engagement which in turn will yield an understanding of what the learner experiences when engaged with moving media.

The case studies have been described in Chapter 1. The interpretive reading there and that of their respective narratives below, is made solely for the purposes of this study and like every student experience of HyperSteel different to any other and just as valid. The feature film Vertigo (Director: Alfred Hitchcock, released 1958) is an intricate play on the themes of distorted time (characters who believe they are living through non-real existences) and malevolent architecture. It is also an technically skillful study of authorial control by the auteur, Hitchcock. The Civic theatre, Auckland (Architect: Charles Bohringer in the style of John Eberson, built 1929), an example of the ‘picture palace’ style of cinema, is an instance of architecture acting as the manipulator of human emotions to the extent that it deliberately moves people (in both senses) from the street to their seats and by evocations of un-real occasion.

HyperSteel, a work of hypermedia designed and constructed in the Auckland school of architecture is the third study. HyperSteel and the experience of learning through digital media offered architecture students what Heppell identified as being enabled “... to take risks with their learning without fear of censorship or disapproval” in a private, time-based way.

The narratival path of each study has a temporal, historic foundation: that Hitchcock charted the modernist pessimism for whether architecture has the inevitable power of life and death over people with his films, is very likely; that cinemas themselves played the role of escape route from serious reality is also part of mid 20th century social history; that hypermedia marks the entry of time based media into a central position in the education of architecture, where
once film and video had been peripheral.

Their passage is also spatial, both in the real sense and the virtual: any narrative through education is one of intellectual escape and entrapment, control and freedom, all of them considered to be among the highest of aims. A dialogue between these apparent opposites is daily played out in classrooms and (in the architecture context) the design studio, and has been described and discussed in Chapter 2 of this thesis.

3.4.1 First narrative: Vertigo

Considered simply as a matter of chronological event, a feature film begins when the auditorium lights fade and the title sequence starts. Then in the Aristotelian convention, it tells the events of the middle, leading to a climax, after which a shorter denouement eases the viewer towards the end. In a way, this is necessitated by its technology which is in joined lengths of film. The chosen case study, Vertigo, is recorded on this strip of film in which there are certain known limitations: 24 frames every second, for example.

As well, following the codes of the classic dramatic plot, its beginning carries the germs of the tragedy to come at the end. Closer examination reveals more complexity: that the beginning of the film is actually part way through the drama, and during the running of the film, what is revealed is a confusion of layered stories, and then, really, the film has no ending, although several are possible. That the story is one of psychological dysfunction comes as no surprise, then, for such a narrative. In Vertigo, the narrative is composed of unexpected and complex chronotopes.

The complexity continues as, mimetic-like it develops, acting out the discordance between human helplessness and the surrounding urban constraints. This is felt, not only by the participants in the drama but surely by the enculturated audience to whom such social issues are all too real; then it exacerbates it by showing us that no matter how
virtuous we may be, the drama will turn us into something twisted and out of control. Like the second exemplar discussed below, it tells the story of a folly, but this time, it is one of inevitable and disaster: it has developed its original mimetic form into the poetic or dramatic. Its concluding experience then, will be a new existence as part of the life experience of every cinema patron viewing the film.

The experience in this drama for the viewer is a vicarious one, as we watch the brave honourable man ultimately discredited, the nice homely girl rejected in favour of the dangerous one, and constantly, the menacing city driving the protagonists to the edge. These are all melodramas people live out in the every day, usually at smaller scale, but still real. The film forces the viewer to consider these situations, identify with the authorial voice, and slowly, inexorably, experience the inevitable breakdown and catharsis of classic tragedy. At that, the audience escapes unscathed, but with a memory to add to others for storage in personal banks of imagination regarding fear, deceit and weakness.

3.4.2 Second narrative: Civic

The architectural experience, in turn, is also about ordered time, human activity carried out in a staged way, where illusion is a lure to evocative experience. The Civic cinema does very well to manage the human experience through both senses of time, the phenomenological and the cosmological. It is turned on its head, though, in this building which in serious architectural terms has been thought of as a ‘folly’, several times in its history nearing demolition, if it had not been for perseverance on the part of citizen-initiated political protests. For the Aucklander, as for any ordinary citizen, driven to defend the picture palace, dreams and non-reality are important narratives to embark upon.

After all, the act of inhabitation is not only one of answering the need for shelter, but is bound up in cultural expectations among which any
dream and illusion is as important as any other. Reading the building means making plural interpretations: one receives the text and the associated world of meaning associated with that reading and, “recounted time and constructed space exchange their meanings”. (Ricoeur 1996:71) It is an empowering experience, however imaginary the film’s plot. As Hans Dieter Schaal says of the haunting architecture in German expressionist film: “through these films people saw their own nightmares ... death witnessed in the cinema gives the viewer a sense of immortality, able to step out into the night as a survivor.” (2000:12)

The Civic design derived from the collective imagination of a population and a time, from an exiled mindset, far away from its cultural roots in the post-war British Empire, and more recent ones in Hollywood. The justification for seeing the Civic in terms of a ‘story’ comes easily once one colonize that the path taken by any patron is that from the neutrality of the pedestrian footpath, through a sequence of stairs, passages and balconies, past filter mechanisms, like the ticket box and ice cream sellers, towards the climax of starlit auditorium and beyond, to the fantasy of a feature film. Later, the return journey takes one back to the footpath, the Civic having constructed its world out of two narratives, one spatial, the other temporal.

Its mimetic development, in Ricoeur’s terms, lies in the layout and the decoration which attest to the tensions and resolutions alive in the understandings of New Zealanders in 1929. It is a ‘play’ on the meanings between borrowed codes and theatrical gestures. The religious iconography used here in an entertainment context was to titillate the colonials with naked slaves, bare-chested buddhas, and exotic and mythological beasts all displayed in gold and red and deep cyan blue. More structurally, the wide sweep of elegant staircases, the contrived elongated perspectives along the balcony, and the deliberate surprise of arrival into the auditorium, all conspire together. One could say that theolonized (Indians) were allowed to re-colonise the city,
but only in play.

The human response to the Civic is by the memory and the emotions, and the result is that of ‘being moved’, imaginatively speaking. It is a location where the patron may easily identify with the authorial voice-of-the-designer asking: why else would you go there? From the moment of entry there is a mutual agreement to the process; and what happens has to do with collective dreams, to a large measure manufactured by the film industry itself, but also growing out of the social and political climate of New Zealand after World War I and before the Great Depression. The idea of transportation is an easy one to imagine, as the patron becomes transported to another time, another location, even assumes another persona, for the time of the visit and in the safety of the make-believe.

Chronotopic transformation here is in the virtual, but clearly defined in terms of movement – ‘swept away’, ‘transported’, even ‘zapped’. The visitor to the Civic emerges, having been away somewhere. This experience, along the narrative of architecture might seem to be very distant from the educational application of moving images applied to learning, but the same evolving of mimesis can be seen in the third medium I have chosen for this study.

3.4.3 Third narrative: HyperSteel

The third example used in this Chapter, and to be developed considerably later in this thesis, is a work of hypermedia, HyperSteel. Tied together by mouse and monitor, user and machine co-create an early form of cybernetics. Every time students confront computers - in this case, log on to HyperSteel - they arrive with pre-knowledge, private interests, and the current need for knowledge. This governs the virtual event. The software deliberately connects with the intellectual, cultural and experiential environment outside, but in the space-time event the temporal action is carried out by the human partner.
The relationship between the parts of this android is one of concordance, so that the experience appears to be one of an enhanced machine-person, exploring steel-based knowledge during a space-time event. Looking, listening, working (by hand), extending (pre-knowledge), reading and drawing are the human activities, while responding, rewarding, and providing context are those of the machine-part. These are the actions as the work exists in time for the user.

The experience of catharsis is met at the “a-ha!” moment, when the tutorial example is resolved, or the human-machine produces a satisfactory configuration. At that moment there is a sense of achievement, of understanding having been progressed to another level. Together with a temporary technological implant, there has been a shift in personal mindset. If there is no moment of recognition, the ending is still an ending, one of negative feelings, perhaps even a sense of disgust, if the student’s expectation had been high.

The intention of this examination of the Ricoeur narrative, its parts and permutations, has been to lead to the realisation that the electronic medium with its distinctive user-directed emplotment, does have a narrative form. I have chosen to extend the meaning of narrative rather than deny it, in order to evoke one of infinite paths and choices with an unfinished duration, heavily reliant on the pre-conditioning of the user, all anticipated by Ricoeur when he described a discordance/concordance continuum to identify the thematic interaction taking place along the duration of the narrative in each case.

The idea of narrative spatiality opened up by Ricoeur crosses what he describes as the spatiality of architecture with the temporality of time to create a horizon of meaning. The zone concerned is one of that zone of memory “half way between wondering and the stay-at-home spirit” (Ricoeur 1996:72) which has an educative implication, since I take this to also imply the intuition, or deep memory.
To step aside for a moment from the certainty of narrative in hypermedia as the recipient of the characteristics of film and architecture, to that which marks two other literary forms, the parable and the metaphor: Darko Suvin refers to the singular difference between these as being the chronotope which exists for him in the parable, but not in the metaphor. The test he applies to his case study - in his case, the parable of the sowing of the seed, *Matthew* 13:32 King James Version - is primarily to show that any narrative may be seen as a parable. *Vertigo*, in my reading then, is a parable on the frailty of humanity when confronted by implacable architecture; the Civic, on the inevitability of a return from fantasy, the 'waking up' after dreaming; and *HyperSteel* on the benefits to the persistent student who continues to reap the rewards of clicking among the Tutorials, Case Studies and so on.

The codicil to his paper, carries this twist: if any narrative text can be read as parable, "each can also be read as a much enlarged and much transposed metaphor by subtracting the chronotope". In which case *Vertigo* would be a slide show of San Francisco locations (as it is, to my mind, in the Marker film *La Jetée*), the Civic would lose its homogenous sense of purpose (which the 1999 restoration process and undermining of original intentions may have achieved) and the hypermedia project would be an uninteresting series of lectures-in-a-box, a metaphor for all huge efforts taken, to no avail. The aim of the cinematographer, then, is to use their specialist training and skills to apply the chronotope to the work.

The drama of the chronotope applies its power for educative value in the way in which the user/learner takes control over the narrative. Thanks to the click-jump, the 360° panorama, the object rotate and the other forms of moving image identified and described later in my thesis, the individual user makes their own narrative choices. The narrative is not delivered fully formed to the viewer as it is in film, nor
is it laid out in deliberately suggestive trails as in a cinema. It is prepared by the media makers, and then left for the learner to experience.

The chance to investigate the impact of the digital narrative as learning aid came about with the computer. The actual example of the computer software at the centre of the study will be fully described in later sections of this thesis, which are devoted wholly to HyperSteel. First, however, rather than become infatuated with the lure of the computer - its speed, capacity, versatility, or how it provides a good looking veneer to human efforts - there is a stage of relationship beyond concerning oneself with the machine itself, beyond its function as a tool, to where the computer becomes a medium through which one's personal creative human instinct is expressed.

This thesis identifies the Ricoeur moment of communicability as a point of intersection between time and space, in other words the chronotopic moment as "borrowed" from the natural sciences by literary scholar, Mikhail Bakhtin.

3.5 Bakhtin and the chronotopic click
In this section, I develop the argument that the one-finger movement on the hand-held mouse which results in a change on the computer screen, referred to in this study as a click-jump, marks the single instance which defines digital media.

Ironically the hand action of the click-jump is all-but forgotten or filed as an automatic gesture as soon as it is mastered, and yet it is a most powerful device, responsible for what I contend is the most striking difference between hypermedia and other forms of text delivery.

The click itself is not so much a metaphor, since it actually exists mechanically in at least one manifestation, that of the mouse. It is more an
analogue of the instruction between finger to computer screen. At its most familiar, there is a change on the screen - and a time-based intervention of the narrative in cyberspace - when the user's finger taps on the button of a mouse. But this is only the most common; the user-interrupt may function through a variety of ways, perhaps a stylus, or foot control, or even the tongue of a quadriplegic. It is usually accompanied by an embedded sound effect but this too is analogous: it's a change, a page-turning, a 'flip' from one card of information to another. The word 'click' and the instantaneous obedience of the computer has become so closely associated that although a user may use it hundreds of times, it is when - perhaps from a malfunction - it happens without user stimulus, or when it does not change that the user can experience very strong reactions of confusion or distress.

In filmic terminology, a sudden cutting together of two noncontinuous shots, which may be for "... radical time-shattering (or) as an unintentional editing mistake" (Beaver 1994:204) is known as a 'jump-cut'. I have spliced these terms together and describe the event on the screen caused by a click as a 'click-jump'.

The action of the click-jump causes the path of the narrative being developed on the screen to shift and alter in some way to take a new direction. At that moment the temporal path of the learning experience has been interrupted, so too has the spatial existence of what was on the screen. Something has happened. In all its ways and for all its effects, I identify this moment as chronotopic, following Mikhail Bakhtin and his colleague-writers, and use his thread of theoretical discourse about the chronotope (Bakhtin 1937/1981).

Bakhtin first wrote about the connectedness of time and space and of the chronotope during 1937, in an essay to which, in 1973, he added some concluding remarks regarding abstract analysis and the situation of the author. Thus over a period of four decades, despite not returning to the chronotope in any great detail in any other writing, he established a useful designation in literature for the intersection of space and time.
The aesthetic of Bakhtin’s descriptions, once composed for the purely print-based literary form, transfer smoothly to the animated medium of hypermedia when he explains that:

In the literary chronotope ... time as it were, thickens, takes on flesh, becomes artistically visible, likewise space becomes charged and responsive to the movements of time, plot and history. (Bakhtin 1937/181:84)

In my turn I adopt this terminology and redirect it towards digital representation in the belief that if we are able to describe and name a feature of literary form, then we have achieved progress towards its management and further development. It will exist, according to Stuart, as “a heuristic device, one capable of facilitating the explication of the temporal and spatial dynamics constitutive of distinct forms of plot, story, narrative and genre.” (Stuart 1994:195)

Bakhtin himself appropriated the term from the natural sciences, careful not to “deal with the chronotope in other areas of culture” saying that “the special meaning it has in relativity theory is not important for our purposes”. Other theorists are not so reluctant, and I have followed their lead. Allan Stuart uses Bakhtin’s notion of the chronotope to secure a basis “for an interdisciplinary critique” applying “a chain of events in a cause-effect relationship unfolding in time and space,” for what he believes is a “major conceptual advance on alternative formulations” (ibid. pg 195). His alternatives are generally non-fiction forms of text and popular media.

Having a nomenclature allows for categorisation, and as Bakhtin said “it is precisely the chronotope that defines genre and generic distinctions” (Bakhtin 1937/1981:85). How he carried this out for the novel in ancient literary form became the substance of his essay, and he selected the Greek adventure-time for particular attention as the parent example to all literary genres that followed.
There are individual motifs which are chronotopic within the greater drama of the adventure-time, which: "... include within (each of them) an unlimited number of minor chronotopes ... any motif may have a special chronotope of its own ... they co-exist, they may be interwoven." (Morson 1990:252) We see this in the interweaving of themes of time and vertiginous architecture in the film Vertigo examined in the present thesis. These minor chronotopes include meeting/parting, loss/acquisition, search/discovery, recognition/non-recognition. Bakhtin treats only one in the essay in any detail: the motif of meeting: "In any meeting the temporal marker is inseparable from the spatial marker ... highly abstract, and ... quite frequently in literature the chronotope of meeting fulfils architectonic expectations". It serves as an opening, sometimes the culmination and then, as the finale of the plot.

Of special importance is the close link between the motif of meeting and the chronotope of the road ... the importance is immense ... it is a rare work that does not include a variation of this motif (Bakhtin 1937/1981:98)

What is universal in all forms of human expression is that each in some way reflects humanity itself, and this is where Bakhtin placed the importance of the chronotope. "The image of man is always intrinsically chronotopic (ibid. pg 85)". He makes the point that he is not describing chance, or supernatural power as taking the initiative, but humans taking it when it becomes evident to them. To him "chance is but one form of the principle of necessity (ibid. pg 97)". It may seem trivial when compared to classic Greek literature, but the student choice of click-jump in HyperSteel is, to them, the most evident move to take in their slow accumulation of knowledge.

When considering the spatial characteristics of the chronotope, his analysis of the sort of space in which adventure-time takes place is that of the abstract, "measured primarily by distance on the one hand and by proximity on the other". Abductions, escapes and pursuits take a lot of room to occur, but no particular space for them to occur in,
The adventure chronotope is thus characterised by a technical abstract connection between space and time, by the reversibility of moments in a temporal sequence and by their interchangeability in space (Bakhtin’s italics) (ibid. pg 100)

The chronotope of the Greek adventure-novel includes the motif of the castle, which is saturated with significance about history, of governance, of heroes and feudal era. Its visible forms of furnishings, weaponry, portrait gallery and dynastic human relationships give rise to a rich architectural narrative, to return in literary theory as Gothic novels. These then made a short move to the screen as the dark films of the German Expressionists and established certain codes for horror which were then taken up by the director of thriller movies, Alfred Hitchcock.

Adventure-time “… is composed of a series of short segments. … Time segments (which) are introduced and intersect with specific link-words: “suddenly” and “at just that moment”. According to Bakhtin, adventure-time is so “subtle and highly developed” (ibid. pg 87) that it survives with little change in modern literature. In such a scenario, where things occur by ‘chance’, where events have no consequences, the individual human being is seen as unchanging, passive, deprived of initiative. In the Greek adventure-time, Bakhtin explains, these sudden changes are often better explained by fortune-telling, omens, legends and the stuff of the supernatural:

... this logic is one of random contingency which is to say, chance simultaneity and chance rupture that is, a logic of random disjunctions in time … (ibid. pg 92)

Despite the richness and elaboration of his descriptions Bakhtin stayed within the parameters of the novel, not even addressing, as Suvin relates in the previous section of the chapter, the small yet universal text form, the parable. Stuart on the other hand, extends it to “newspaper accounts, television soap operas, radio dramas, documentary films, advertisements or pop songs,” recognising that every “such structure organizes a patterned series of causal events within particular relations of time and space”. (Stuart 1994:199)
“The chronotope in a work always contains within it an evaluating aspect”, with the potential to separate the temporal from the spatial, but since Bakhtin is of the opinion that a literary work’s artistic unity in relationship to an actual reality is “defined by its chronotope, (and) living artistic perception makes no such divisions and so the chronotope is perceived as a ‘wholeness’”:

... out of the actual chronotopes of our world (which serve as the source of representation) emerge the reflected and created chronotopes of the world represented in the work (of the text) (Bakhtin1981: 253)

Bakhtin could have left his identification of the form as an introductory exposition, preparing the way for the elaborations which come to borrow and embellish to their own ends and for their own time, as this study does. But instead he accepted this likelihood and pursued it. On the one hand he urges readers to recognise the chronotopic forms by recognising their outward form, “first and foremost we experience them in the external material being of the work and its purely external composition.” Then he warns,

... we must never confuse ... the represented world with the world outside the text (naive realism) nor must we confuse the author-creator of a work with the author as a human being (naive biographism). (ibid. pg 253)

The nub of the hypermedia experience, all there is, is context: the one contained in the dialogue which takes place between the user and the (now invisible) author. As Stuart calls this ordering of causal events,

... a complex process of negotiation, one involving a range of questions regarding amongst other matters, the means by which the text configures a specific representation of the world (the ‘world of the text’) (Stuart 1994:199),

he locates the moment of the chronotope or, the “completely real-life time-space” as where the text “resonates” in the provisional “negotiation of meaning.” (ibid. pg 209)
It is ironic to turn to a mathematical concept via Bakhtin’s borrowing of the Einstein theory, at a time when architects and planners are viewing the new media as “anti-spatial” to use Mitchell’s term, because, “The Net negates geometry. …” (Mitchell 1995:8), and by extricating architecture from the understanding that it has to have a materially constructed form, describes a software location as being either:

... a one-dimensional place in a screen-displayed text; a two-dimensional place to put things on a “desk-top” surface; a three-dimensional virtual room, a storehouse, library, gallery, museum, or landscape; or even an n-dimensional place in an abstract data structure. (ibid. pg 22)

On the other hand, the entry of the user to a program such as HyperSteel is a temporal one, and every decision and move from that point is the user’s. The space of the software and the time of the user intersect, to form the narrative along which the act of learning happens.

Admittedly, both the program and the user have temporal and spatial properties. The software has elements which move or play, or remain static and silent while the user views them, rather in the way that film and music both incorporate stillness and quiet as composing devices; so the static screen has its value, but its dominant provision to the user is to be an environment, within which a user acts. The user on the other hand cannot be passive, for then there is no ‘use’ taking place: the user carries the spatiality of memories and experiences to apply to what is viewed, but it is merely the bed for the new narrative of this time of interaction.

The narrative is formed for the first time every time, no matter how skilfully the media producer has provided links. “... the traces or ‘images’ of an event in a text (having entered the latter’s chronotopes) are constructions to be renewed by the reader.” The act of use or learning takes place anew each session with the computer, thus the narrative with its chronotopic narratives, is invented and re-invented every time, singularly. “Every text may thus be said to be facing outwards away from itself.” (Stuart 1994:211)
CHAPTER 3

This junction of temporal and spatial relationships is a particularly architectonic one, and my application of it refers to the education of architects and to the use of hypermedia as a learning aid. With the hypermedia chronotope the narrative is created afresh each lesson, and educationally this is what leads to learning, in the individual choices of direction, the moments of discovery, the slow - or sudden - realisations of understanding.

Identifying the click-jump as a chronotope is the initial step in developing a tool for the close analysis of hypermedia projects: those entirely computer-based works of multimedia. In film, its near-equivalent is known as a ‘jump cut’, and it is seen as abrupt, uncomfortable, mismatched and aesthetically ugly. But in hypermedia it is completely harmonious, logical, sensitive, and the access to discovery. The difference is that the filmed jump cut is under the control of the film maker, the hypermedia click-jump is controlled by the user who in this thesis is identified as the architecture student taking learning ‘into their own hands’.

To engage in the near-metaphor mentioned above by Bakhtin himself, in which time becomes ‘palpable and visible’, and borrowing terminology from other media, I describe the click-jump as the ‘shot’ of film. It is used in hypermedia when the user chooses to close the current screen and pursue one of several available links to others in the software. It is seen commonly by clicking once on the mouse button, but there are other technological ways to achieve the user-interrupt, global research efforts currently creating many exoskeletal devices for human /computer interaction.

Just as it is in film, the chronotope in hypermedia does not have to be collisionary and sudden - as the click-jump usually is. At other times a gradual fade-in fade-out can happen as with a morph; at still others it may be changed into some new configuration, as in screen-within-screen.

For my purpose, the intention here is to pinpoint the click-jump (and some other shot changes) as the significant moment of learner experience in architecture education. When Mitchell says: “Click, click through
cyberspace” (Mitchell 1995:24) he includes the turns, the crossroads, and the interruptions that each of those ‘clicks’ represents: when a change takes place, the pace slows or speeds up, and a chronotopic moment has taken place. At the moment of change the user/learner is in control. It may even be cathartic but it is not destructive because it is user-controlled. It marks the moment of time and space converging in a way that static images do not provide, and a bodily involvement by the learner-user, synchronising directly the content material with the learner’s mind, memory and imagination.

Beyond this identification of its form, its benefit for architecture education lies in accepting the positions of cognitive theorists including Mayer who state that the ‘added value’ given to a learning experience by images, sound, movement, physical actions or any other ‘dual processing’ is far more than when knowledge content is delivered by one medium alone (Mayer and Sims 1994). And the presence in the chronotope of converging media means that by definition hypermedia answers this dual processing requirement.

3.6 Summary

The thesis posits a theory of learning showing the chronotopic moment to be where intuitive learning takes place. The chapter has discussed its significance to architecture students for whom the intuitive imagination has a particular importance. In order to picture its relevance I evoke a model of the intuition as a reservoir or bank of knowledge. This extends the proposition set out by cognitive theorists that successful learning is a matter combining the intellect and the senses, and that knowledge is accumulated at a deep level, often forgotten until needed. The bank of the intuition is engaged by the user to accumulate knowledge and equip the imagination. The better endowed the bank, the more sophisticated the intersections are likely to be. Times of revisions, of swift choices of direction, of remembered routes, of ease in answering quizzes will tell, when the bank becomes viable and ‘pays out’ with the knowledge.
The chapter posits a theoretical framework for hypermedia in this learning process. As the organising centres for fundamental events (Bakhtin 1981:250), chronotopes in hypermedia access the memory, the emotions and the feeling capacity of learners. In my opinion this is how the intuition banks knowledge. The dual-coding theory of education held by Paivio and others provides a pedagogical justification for the use of multi-media in education, and is extended in this thesis into models including interactivity and emotional responses, additional to text and images. The practical task which falls to the hypermedia maker is to design and construct software to feed and support this use. How this was achieved in the case study under examination, HyperSteel, will be described in this thesis.

The intention of this chapter has been to distil in theoretical terms the essence of hypermedia; part literary, part architecture; grounded in 20th century modernism, and meeting demands arising from 21st century digital technology. Central to my explanation is the place of the user-interrupt, or the action called in this study, the click-jump, which directly synchronises the content of the software with the learner's body and mind. They are the "organising centres for the fundamental narratives", as Bakhtin said of these critical moments in literary form which he named 'chronotopes'.

I have used the concept of chronotope to describe the moment - and the subsequent drama in a learning moment - when the temporal action of a user intersects with the spatially based environment of a computer software program. Put simply, this is the moment when a user-interrupt effects a change in screen view. The expression chronotope is borrowed from Bakhtin who in turn took the term from the relativity theory of Einsteinian physics. What occurs in hypermedia only occurs when a user interacts with it, despite there being a vast amount of mimetic architecture as Mitchell describes, of all dimensions. It is the entry of the user - the temporal action, which brings it into play.

For architecture it was Sigfried Giedion who contributed a model of thinking, denoted as an architect's perceptual apparatus, to the concept of space-time.
He made the observation of the moment in the modernist movement when artists attempted by cubist techniques, or close up photography to express the tension between views in such a way as to imply motion. To define their moment of space-time interaction as chronotopic leads to a wider perspective provided by Paul Ricoeur. His explanation of the constructed space and recounted time in double parallel with narration and architecture, extends this literary theory of narrative. From theories of language he moved his vision to that of inhabited space (1996). This contributes a “crossed intelligibility” I can borrow as entirely appropriate for the hybrid medium of hypermedia.

Informing a theory of hypermedia and recognising its multiple identity follows that of Ricoeur in his mimesis explanation: that literature (or media in my terms) is imitation or mimesis of some drama during which new meaning arises. It is a meaning which sometimes includes the experience of catharsis. My view is that film, architecture, hypermedia and the act of learning all share to some extent the convergence of time and space in a narrative form, even to the point of a cathartic outcome.

In Chapter 1, I chose to interrogate examples of text: one of film and one of architecture, as a precursor to a wider study of a third text, that of the hypermedia software HyperSteel presented later in the thesis. In posing questions about the best use of new media in the imaginative and intuitive processes of architectural education, I introduced the value of a cinematic ‘eye’ for an architectural imagination, with just such plurality of background understandings as Ricoeur called for, so that inhabiting a building would be a "retort" to its construction; when

... to learn to see the act of inhabiting as a focus not only of needs but also of expectations, .... just as the reception of a literary text ushers in the test of a plural reading ... acceptance of intertextuality ... and therefore of the stories of life ...(1996:72),

and in this examination the ‘stories of life’ of the selected case studies are narratives arising out of the needs and expectations of a population of learner/users accustomed to a culture including film and architecture. Already
on entry to the new zone called cyberspace in which to learn, there is a familiar set of understandings based on these forms.

The central exemplar is *HyperSteel*, to which a large part of the rest of the thesis is devoted. Here in a work of electronic software, the user-driven click-jump is seen as the single characteristic which differentiates this medium - hypermedia - from that of film and architecture. Each click-jump in hypermedia is a knot in the narrative of its telling. Its *mise-en-scene*, to borrow the concept from film for its architectural sense, is operated on by the cyborg interface, part human part machine, of the click-jump. It is intended that during this self drive experience, a catharsis-like experience of successful learning will take place.
4. CHRONOTOPIC INTERSECTIONS IN HYPERSTEEL

The work of hypermedia, HyperSteel, acts, within this thesis, as the denotation for my proposition that there is a role for the cinematographer in the intuitive education of the architectural imagination. The practical contribution of the filmic form and its narrative application within the basic techniques of film production have been demonstrated as they relate to cinema and to hypermedia, the thesis referring to the Civic Theatre and Vertigo as models introduced in Chapter 1.

This chapter will describe the design and development of the hypermedia software and its later more elaborate form HyperSteelLibrary, a product developed in the University of Auckland School of Architecture. It is supported by Appendix I, a list of the personnel who directly participated in its development, and Appendix II, which is a summary of the seven separate groups of data bases included in the learning package.

It is tempting to suggest that the deliberations in this present thesis had taken place and been acted upon before HyperSteel was proposed. This is far from the truth, which was instead, that HyperSteel grew out of a climate of
experimentation and previous analogue multimedia, as was explained at conferences both in Australasia and England (Linzey 1993, Granwal 1994, Soutar 1995, 1998, 2000). At most, it was due to a mounting sense of tension being noted in the teaching environment, “arising out of the combined pressures of increasing student numbers, the variousness of their scholastic origins (thus special educational difficulties) and the explosion in the amount of information to be studied” (Granwal 1994). The authors speculated that “... post compulsory study, tertiary catch-ups, revision courses, and re-training for career changes” would become a feature of architectural education, noting the trend towards policies allowing students to “enter a subject at any level or from distant locations” (Granwal 1994) were at that time being introduced. The primary motivation, therefore arose from an educational need, rather than the desire to make use of an appealing technology which had recently presented itself.

In fact, progress was deliberately taken cautiously: “if, little by little teaching management can be absorbed and applied from within the computer, with its heightened presentation techniques, then teaching will have moved to meet the problem.” (ibid. pg 170) And even the physical appearance - the ‘space’ to be inhabited by the new teaching mode, appeared in a suitably unexciting style for this authoritative program: “Overall style was kept conservative - after all this was not a comic book nor was it a desk top version of student radio,” (ibid. pg 171) nor was it to be a replacement for the traditional libraries, lectures and workshops. The raw material came from lecture content, illustrations, videos, and steel based texts provided free of copyright obligations by the supporting company, BHP New Zealand Steel Limited. Architecture students with a personal interest in computer use became programmers, and the working space was located in the school media studies resource.

As manager of this resource, and a film maker, my role was partly supervisory, partly to ensure that issues of a filmic nature were exploited to the full. At this experimental stage, “the design worry ... is that the user will not find everything in the (program) the narrative trail must make everything
available ...” (ibid. pg 171) A narrative which communicates linked ideas within a moving medium - video, film and son é lumière - is familiar to film makers, quite apart from the technological imperative of a moving piece of film which must carry images on each of its frames. The film maker, as described of Hitchcock in Chapter 1, must be concerned constantly with continuity, plot, and the implied understandings of camera shot and the collective references of mise-en-scene. The dominant relationship is that which exists across time; the contribution to HyperSteel requiring successful narrative cohesion will be from the one most closely attuned to temporal matters. This, despite its new narratival form being carried apart from the authors, and in the hands, literally, of the user.

The new medium paid its dues to the media which had preceded it and acknowledged that filmic narrative form would share certain qualities of hypermedia narrative. Films themselves take many forms of narrative but all share the nature of ‘story’ a film behaving as a reflection in fiction of our lives: ... narrative is a fundamental way that humans make sense of the world. (Bordwell and Thompson 1993:64) To Bordwell a film narrative is “a chain of events in cause-effect relationship occurring in time and space” (ibid. pg 65) a description which is near to the chronotopic effect described above.

As the narrative plays out for us, we spectators overlay our own expectations and preconceived ideas, and what we see will add to these to provide further assumptions. Film makers count on this causality being present and deliberately evoke it. For instance, genre identification is one part of the source of audience expectation, since genre forms a set of ‘rules’ about what we might see. We notice cues that are visual, aural, and cultural and with these cues the film makers intend to shape the resulting responses, like surprise, fear, self identification, amusement and so on.

Space, dominant in architecture, is subservient to time in film; it provides the settings and the physical relationships between human actors and their surroundings; it may not be seen, but implied by the way what is on-screen is presented: often this is what leads to narrative development: “Typically a
narrative begins with one situation; a series of changes occurs according to a pattern of cause and effect; finally a new situation arises that brings about the end of the narrative." (ibid. pg 65) The temporal, however, is inescapable; even distorted or absent, the sequential placements of beginning, middle and end always make their existence felt. Openings and closings and patterns of development in film are inter-dependent. The end of a film is very important: "A film does not simply stop; it ends" (Bordwell and Thompson). (ibid. pg 74)

On the other hand, time is central to filmic narrative, either as a film's duration, as its structured rhythm, or as the order of events. It has a chronological order and a dramatic order. Although events may be presented out of chronological time, for instance in flashback, the temporal logic is still important to the unfolding of the narrative. Ironically it is so important that a distortion of the sequence of events is often used as a device to make the film more interesting.

The ending of a film is the cathartic event of the work, achieved through the narrative played out in the preceding moments. The same happens in our experience of a building: by the time we leave we have a knowledge we did not have when we entered. It is in the difference between the beginning and closing of a film that we learn crucial understandings, like any false assumptions, certain patterns in the story, and above all, we discover how much we have learned in the course of the screening. It is this cathartic possibility the learner may experience in the closing moment given to the user as they 'quit' the software of a hypermedia program.

What else exists in the filmic imagination that may be of use in hypermedia? The filmic structures to be re-engaged in the design of *HyperSteel* from the narrative structure of film would not be that of the 'sealed' plot of a film because the time value of duration would have been surrendered to the user. The opening, internal drama and ending patterns would take on a new form, one based on a provided space, but a variable time-scale. It would also owe much to those early expectations and assumptions which form the first premise of the film maker, which act as cues to prompt the deeper memories
of the user and evoked in *HyperSteel* to shape the resulting responses. These are the details outlined below in the descriptions of the development of this program.

### 4.1 Hypersteel Development

Architecture curriculum carries the constant intention of blending quantitative theory, studied as separate academic subjects, into the open learning environment of design studio. The reason for *HyperSteel* development was to address a perceived gap between the two. *HyperSteel* academic editors and content authorities were drawn from several members of the teaching staff responsible for the science curriculum.

An early in-house competence in the production of multi-media in the Auckland school, coupled with a generous grant from the country’s largest producer of steel, BHP New Zealand Steel Limited, combined to provide the required mix of expertise and the stimulus of need, ability and finances to develop the *HyperSteelLibrary* in 1993.

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**Figure 2.** The main menu buttons in *HyperSteel I* and the screen explaining navigation styles.
In 1993 Senior Lecturer R.J.W. Granwal was of the opinion that structural cognition is innate and in architecture education it is possible to: "...induce skill at structural prediction, (by) attempting to free up the structural sense most of us are born with, and which in early years we used in play." (Granwal, 1993:29)

His first contribution to this belief was the devising of a system of symbolic notation called Structographics, by which to indicate patterns of loading and stress response in buildings. He then saw that computer based media offered ways of putting these near abstractions into play-like drills. Granwal was the first academic editor of HyperSteel, and Structographics would later form the basis of one component of HyperSteel Library.

The experimental project which in due course became a regular part of the architectural science curriculum followed the contention, formed by the staff at Auckland school, early in computer adoption, that:

Teaching by computer offers one-to-one tutorials, an environment for private exploration and the fascination of advanced technology. HyperCard and other authoring platforms give the educator new ways to create 'games for learning' and how to manage vast amounts of seemingly unrelated data. (Granwal, 1994 unpaginated)

The design and construction of HyperSteelLibrary, as with all hypermedia software, required the skills of three main areas of expertise. The computer technologist was responsible for graphic design and computer programming. The media producer or cinematographer attended to all presentation delivery whether sound, animation, movies, text or interactivity, and also took responsibility for arbitration in the event of dispute, and therefore project management. Overall editorial direction was given by the academic editor, responsible for provision and approval of all content matter.
Of the three the cinematographer is the specialist communicator, with the task of embedding such effects that would inspire, motivate, amuse, challenge, and stimulate the student use. This individual uses what Kester Rattenbury has described as the "greedy eye" of the film director, to "... stage an idea carefully, mood and ambience and view, observing with a greedy eye the possibilities which architectural space and structure open up." (2000:35). The range of possibilities includes dialogue, music, imagery, timing, the symbolic implications of colour, shape and line. In turn, "architecture needs to have all its forms of perception and self analysis wide open to deal with a new understanding of the relationships between the perceived and the physical." (ibid. pg 36) The making of HyperSteel took place in a media production facility within the school, which was already responsible for many theatre and video productions, oral and video archives, and multiple slide-and-music presentations.

Figure 3. Structographic symbols placed as drag'n'drop on a timber shed.
Starting with the small laboratory for word processing, which later grew to hundreds of computers able to carry out unlimited architectural functions, the media facility observed the stages of computer absorption identified by Stephen Heppell and described in Chapter 2. It started with topicality, when the computer itself was the focus of attention; then as the first educational software became available, surrogacy, or the computer as baby sitter; then as the material in computers began to work on the culture of the institution, a stage of progression; finally a recognizable pedagogic evolution when changes were able to be observed in the nature of knowledge itself. (Heppell, 1993)

The development team followed methods outlined in the introductory literature from the ‘Multimedia Lab’, a research facility established by the developers of Apple Macintosh computers and HyperCard as their guide for how to construct interactive multimedia. The director, Kristina Hooper wrote several technical reports in the late 1980s, referring to this medium as ‘intelligent pictures’, ‘pictorial conversations’ or ‘full spectrum learning’. (Hooper, 1988:7) Explaining why software developers felt such introductory texts were necessary, and addressing such issues as advances in technology, integration of other media, and the provision of standards, she noted that authorship was in a state of flux:

... in an area that involves a range of players that come from very different traditions, including movie making, television, publishing and computer development. (ibid. pg 2)

The reason for the Macintosh reports was the lack of any direct guide about how to formulate a design solution in digital multimedia.

Whereas movie makers can “read” a script to visualize a movie, and architects can “read” plans to visualize a building, there is not yet the experience or the representational forms in the culture relevant to multimedia. (ibid. pg 3)

This was certainly the situation for the makers of HyperSteel. The first task was to modify a syntax for design out of other media experiences, to blend the
film maker’s narrative techniques including such elements as sound, rhythm, pace and drama, with an architect’s strengths in visual composition. The method employed an awareness of texture, light, structure and detailing and explored the use of cultural connotations in language and iconography. It put into practice similar work habits of the architect in collaboration, constructive criticism and revision.

Following Hooper’s suggestion, small prototype design examples were made before starting the main hypermedia work. This was in order to experiment with image capture, the appearance of text on the screen, to check interface ideas and to invite potential users to test how robust were its interactive links. It incorporated text, photographs, artwork, movies and sound. The prototype also carried sample methods of navigation and self-drive tutorials. The important technical function of reviewing the operational functions of each new software towards the end of each stage was carried out under the supervision of the computer management staff of the school.

At the inception of HyperSteel in 1993, the new medium ‘hypermedia’ did not have generic categories, as such. There were few games, nothing that could be described as a ‘literature’, so there was little taxonomy to follow. The design strategy... arose out of a client base of young high-achieving students in a western architecture school in the latter half of the 20th century. The local surrounding urban environment was one of machinic, mirrored surfaces, high rise buildings and life redolent with iconic images whether in the street, popular culture or the rapidly developing World Wide Web. (Soutar 2000:122)

The filmic style known as ‘mise-en-scene’, a term arising from both the stage and film traditions of overall staging design, was taken as a design guide. A unified appearance, navigation practices and other details meant that the same sense of identity would survive throughout its development, in the way that is created to last for the duration of a work of film. In the event, during the five years of active development, HyperSteel did change in its appearance and use, but with each re-design similar visual elements were carried through and
several interactive features were developed from the first ideas. External influences like those mentioned above, showed in the navigation buttons exploiting the top-left, bottom-down of the western reading convention, the overall appearance of steel-like colours and patterns, and a steel ball-bearing interactive button. These are examples of the details which belong to its *mise-en-scene* and compare to the disciplined attention to filmic detail shown by Hitchcock (Finler 1992).

The design and development of a new form of educational vehicle must, in the absence of an established method to follow, draw on similar experiences in teaching and the history of the client discipline. In retrospect, *HyperSteel* is neither film nor architecture despite containing many features of both. It is not a commercial product although it appears like it, and has features which belong in the mass media including coined names, logos, sponsorship messages and even sounds which can be found alongside those in the studios of media producers.

![Figure 4. Audio recording of the architect brings reality to an historical entry](image)
Its appearance identifies it in terms of its time and community of users. In other words, for the architects it is typically image dominated, boundary-bending, and intellectual. To be student-friendly the images, sounds and colours bespeak youth, popular culture, advertising, and mass media; from the idiom of advertising came a logo and product-style names. The overall name *HyperSteel Library* was coined, to imply a collection of material, some of which is in text form but which is all useful to study in this course.

At first glance, digital material such as *HyperSteel* looks as if it belongs in the advertising world of graphic designers, sound bites and jingles. It is true the names *HyperSteel* and *LearnTerms* etc were devised in a cultural climate which includes television screens and urban advertising hoardings. This is because there were no existing labels nor a code whereby names could be given authority. It was also because it was designed to be attractive to young people whose recreational surroundings carried plenty of the commercial gloss, and this was a 'look' like any other and should not be deliberately anti-youth. It was however, considered quite conservative for its time.

![Diagram of HyperSteel Library](image)

*Figure 5. First screen of HyperSteelLibrary*
A fact of life in the modern film is 'product placement', the deliberate placing of a named item in a prominent position in a film. The context of the production of *HyperSteel* also included commercial sponsorship, and the main body of *HyperSteel* was designed courtesy of funding from BHP New Zealand Steel Limited. Thus the company logo and its name were used in its appearance. The logo of BHP was usually the link button to the credit sequences, but it and the sequence are given very subtle predominance.

Like the library of any higher education institution, the user can browse generally around the subject, clicking just as one would peruse the books on a nearby shelf. As in a library it is possible to find supplementary course materials like notes, and examples of assignments, it includes collections of photographs, plans, drawings and other images, recordings on video and computer disk form.

Unlike that library you will not find a live librarian to personalise your search, nor very much that is not associated with the structures course. Nor is there a predominance of text-based information. Further, *HyperSteelLibrary* does not contain the cut-and-thrust of discourse that arises over academic authority when there is a variety of opinion available: it contains only one set of agreed academic authors, which means that inevitably there is bias in the choice of knowledge data installed on to the hypermedia software.

These are seen as the limitations of this hypermedia product. On the other hand, in *HyperSteelLibrary* the user is able to do certain things in a way that is not found in a tertiary education library, like using material that is easily downloaded to another medium – digital, hard copy, magnetic tape for a secondary use in say essays or reports. Also unlike a traditional library, there is a mixture of images and text, interactivity and associated links, rather than being text-dominated. There are also the game-like functions of finding solutions to problems by freehand drawing within the program, checkable on-screen.

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A problem in designing interactive self-paced material is to directly answer that early stated problem: "that the eventual user will not find everything ..." (Granwal 1994:171). The aim was to emulate the Moebius strip with its constant endless weaving path, and place sufficient links so that the student would follow the sequence of observe - question - hypothesise - test, without realising they had been manipulated to do so. This was particularly successful in the tutorials, where students found they were required to learn and answer test-able questions. Heppell has stated that students may already have "internalised a taxonomy of clues and clues" which their teachers and parents do not recognise but which derive from computer games and have become "increasingly common currency" (Heppell 1993:234). These, then will be the design styles to pay attention to in the hypermedia literature in future.

![Image of a screen showing a case study designed in World Wide Web style, with clickable links and 360° horizontal pans](image)

Figure 6. Case study designed in World Wide Web style, with clickable links and 360° horizontal pans (or, 'arc shots', in cinematic terms)
4.2 Technology and the medium

The importance of technology to film, architecture and latterly hypermedia cannot be underestimated. It is affected by a history in which control of technology has slowly moved out of the architect's hands, at the same time as it is moving towards a liberation of the film maker from technical concerns.

The relationship between architecture and technology has evolved from a time when the master chose from fundamental resources like stone and wood, applied the transforming power of fire and water, and at the head of groups of craftsmen, supervised the erection of buildings; until at the end of the 20th century by which time science has fed technology with infinite alternatives for the systems humans have brought indoors, for their health, safety, communications and energy wants; until the architect and technologist live and work in armed compromise negotiating across each other's parameters towards a shared aesthetic.

Film is the child of technology. It is the product of near simultaneous inventions of controlled light source, a movable shutter for a camera, and a motor driven projector. Its early days were dominated by the limitations of the technology: the duration of a shot was the length of film which could be pulled past the lens in one winding of the camera spring, the speed of the film was based on how long it would be before it burst into flame from the projector light, the location of the action depended on available light, and so on.

By the end of its first century of life, film's array of technology helped by its attraction to well-funded activities like space travel, and war, has been to provide film makers with such choice that it has almost freed it from the constraints of technology. There are so many ways of making moving images that it could be said that the technology has disappeared. Nowhere is this more evident than in the cinemas of today: once a projectionist was given four years of apprenticeship, examined and licensed for proficiency and was considered the in-house wizard; today this person doubles as the manager, turns on the computer-driven timers at the beginning of the day which in turn
run the eight projectors for the eight cinemas in a complex, leaving the human being to return to the action of the ticket sellers and popcorn machines.

There are certain general areas of cinematography which are technologically determined.

4.2.1 Mise-en-scene

The spatial element termed the 'mise-en-scene'. Here, such things as the physical requirements of sets and settings, the manipulation of light and shade, the use of the mechanics of scale and movement and that of pace and tension are recognised in all three media under study:

Modern architecture not only serves the cinematographic set (decor), but imprints its stamp on the staging (mise-en-scene), it breaks out of its frame; architecture 'plays'. (Robert Mallet-Stevens, cited in Vidler, 1993:46)

'Mise-en-scene' derives from the French for 'theatrical staging' and refers to the way the director stages the work so totally, that every element is under the one control. If a scene may be imagined as the reflection of a state of mind, with a range of features collected together to make one single sense unit, this is how film makers see mise-en-scene. It contains "... a host of purely spatial and temporal factors to guide our expectations and hence shape our viewing of the image." (Bordwell and Thompson, 1993:163) Cinematic mise-en-scene encompasses both the staging of the action and the way that it is photographed. If there is one common issue in film and architecture mise-en-scene which is important over others it is that of spatial management. As Vidler describes it, architecture is the 'matrix' upon which film sets out its imaginary locations,

... out of this intersection of the two arts, a theoretical apparatus was developed that at once held architecture as the fundamental site of film practice, the indispensable real and ideal matrix of the filmic imaginary, and at the same time posited film as the modernist art of space par excellence – a vision of the fusion of space and time. (Vidler, 1993:46)
In movies this space/time experience is defined by the two-dimensional frame of the screen, and it may be re-framed by set elements at the direction of the film maker. It also involves such technical matters as choice of film stock which can change the sharpness and colour of the image; lenses which affect depth of focus and width of view; camera angles and all the many details which build up the subtleties of what is seen. In the case of architecture these are three-dimensional concerns and involve the structure itself and the actual placing of elements around it. In both disciplines it can encompass other elements, like audio, or the fabric of draperies and costume, and issues of duration or the length of time a transformation takes. All these are details under the control of the cinematographer in one milieu and the architect in the other.

For all its technical, managed control, it is through the mise-en-scene that film — and architecture — becomes expressive. It is the artistic endeavour of the architect, the film maker and the hypermedia designer. In all fields this has become increasingly the province of people working in teams, each with their own expertise, their own contribution to make. The issue of whether or not a single individual — known as ‘auteur’ in film — can be the creative genius behind an entire work is questionable because a film is such a complex construction. This thesis however is about the education at architecture school where every participant in the learning process is developing a personal intuition, of which HyperSteel and its moving images is part, and therefore the notion of the single creative expression is valid.

This elaboration of what mise-en-scene means to architecture, introduces how media production exists as a world within architecture, and the following explanations continue, in order to relate techniques of the one, in terms of the other.
4.2.2 Cinematography

The temporal control over chronotopic form in film lies largely with the camera - and to a less extent at the editing desk - as it does the work of the shifting eye across and through the spatial context. Among the tasks in this category are exposure, lens choice and framing, all of which have editorial implications used by the director to achieve the overall *mise-en-scene*. “The ‘shot’ does not exist until light and dark patterns are inscribed on a strip of film” (Bordwell, 1993:185). It is however, much more than the simple choice of shot, although this is a vital task, not only for the size of the shot, but how long it is held, and if it moves during its progress.

Hitchcock employed dissolves, long shots and the slow quiet speech of his main actor James Stewart to set a slow rhythm to *Vertigo*. One example of many, is a series of long slow tracking shots of the first day the protagonist Scottie spies on Madeline to discover why she appears to be living in the past. The slowness is to give a dreamy, unreal quality to the sequence. A long take, as in ‘time taken’, or ‘duration’, sets a slow thoughtful tone to the work. It provides freedom for the viewer to interpret what is seen. Hitchcock often provided these slow moments, influencing the viewer’s feeling of tension to increase.

Directorial choice of lens affects both what is seen and the duration of the shot, for instance to manipulate the reading of scale. When the viewer is denied context the only clue to scale is the relative size of the human figure. A dramatically shifting sense of spatial relationships is given when the lens and the distance from the subject change simultaneously, as for instance in *Vertigo* in a famous shot - which has since become almost a cliché - which is a combined zoom inwards or closing the lens iris at the same time as physically pulling (or ‘tracking’) the camera backwards. The effect is very unsettling and is used to convey Scottie’s desperate experience of vertigo from the height of the tower.
Both film director and architect share an interest in the composition of objects in space. The film director achieves this by achieving cues about depth by such techniques as choice of lens, camera angles, graduated lighting and the relative size of people or walls in a shot. In a building there are visual counterpoints arranged by the architect for the user to experience. For instance in the Civic there were many moments of arrival – at the main foyer entrance, at the head of the stairs, on the mezzanine corner under the tower, where the eye is caught by a sudden change in ceiling height and exaggerated decoration.

One such chronotopic moment occurs in all the examples named here. It is achieved by moving the camera through a continuous horizontal axis, or pan, of 360°. In all cases it uses a giddiness for a different purpose (see Figure 7 pg 131). In a) it is used in the bedroom scene in Vertigo to place the viewer literally into the centre of the action to identify with the acrophobia sufferer. The camera moves around Scottie and Madeline, the shot starting in the bedroom, and ending in the garden of the convent leaving both protagonists confused and off-balance. In b) in the Civic foyer, the elements of an unidentified exotic Eastern palace completely circle the double height space. It is richly decorated with golden columns and false night-sky like vaults. Niches with statues of buddha and dozens of elephants; reliefs of dancers and other fantasy creatures; enormous chandeliers moulded with elephants and monkeys; and a latticed balcony dividing wall all create a sumptuous surrounding. The 360° pan view is not so much a dizzying one, as it is in Vertigo, but it does help to divorce the patron from a sense of ‘real’ time or what might be happening out in the street: in the Civic, all is wonderful, glamorous and faraway. Shown in c) VRML technology provided HyperSteel with the means to give students a drive-yourself view of several locations in the Raceway Case Study. Navigating 360° around a location provided an example of hidden events waiting for the user to find, part of the overall scheme for
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*HyperSteel*, as Chapter 5 will explain further.

It was hoped that if the user is doing the driving, the feeling of dizziness will not result - but during the survey recounted in Chapter 5, one participant admitted to it triggering his “inner ear condition” (Subject Dell).

4.2.3 Editing

Contriving the inter-threads of time and space are the cinematographer’s concern at the stage of editing. Critical attention, here, to the co-ordination of one shot to the next, is of less interest than it would be to research that was purely filmic. The technique of cross cutting, with its power to manipulate viewer emotion is missing in hypermedia.

This multiple chronotopic experience is achieved when two scenes which are purportedly taking place at the same time are interleaved, thus doubling the drama, or one drama is used to build up tension for the second. In *Vertigo*, it is its absence which contributes to the tension: for example, if instead, the director had cross-cut to the conspirators discussing how to use Scottie’s acrophobia against him, while he was chatting to Madge in her room above the city, the audience would have been ‘in on the plot’, as often happens in television drama today. Instead, Hitchcock chose to keep us in the dark, as innocent as his hero.

In place of the manipulated cross-cut of an edited film, the Civic incorporated contrasting views between a cluttered wall full of neon-lit elephants, buddhas and bas reliefs with the large triangular void of the three-storied foyer. Then, once on the stairs to the auditorium there was ‘no looking back’, one was committed to the new space.
Figure 7.

360° horizontal pan:

(a) In the foyer, Civic Theatre, the balustrades and pillars which enircle the upper foyer. 
(From "The Mighty Cric," Peter Wells, 1989)

(b) In a scene in "Vertigo" in which the dual locations swing around the woman with the dual identities.

(c) In the interior of the Ellerslie Racing stables, a case study included in "HyperSteedLibrary" by which the learner may self-drive around the location.
In hypermedia there are few such devices of a dramatic nature available to the maker: no strong authorial view, no darkened surroundings, and no external linear narrative story. The user is left to follow a pace and create a narrative of their own. The challenge for the hypermedia maker is to provide a sense of things left undone, questions still to answer, some event embedded there for the student to find. These elements are detailed by computer games researcher Thomas W. Malone as challenge, fantasy and curiosity (Malone, 1981). This was the aim of the chronotopes embedded in *HyperSteel* for the student to self-explore.

![Figure 8. An example of a bending moment exercise](image)

On this screen the information is carried in many different ways. Real case, a movie, and click'n'draw are shown here; mathematical
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diagram, text definition and theory explanations are available at a click.

A sense of pace and excitement was heard in the interview discussed in Chapter 5, as subjects explore HyperSteel they talk to themselves:

Chris: ... no, I haven't seen this one ... (drawing tool) Very hard to control ... That's interesting ... Oh! Do the next one? So what's that one again? Was that a deflection? No, that's a bending moment ... these are quite complicated questions ... Oh! Okay ... Oh! Really! Difficult, Advanced, and Bewildering ... Oh, that's flash ... this is so good ...

The foregoing description of some of the methods used to manipulate the users – be they film patrons, or students in higher education – is selective only, in order to explore parallel techniques in three different media which understand and exploit the chronotope.

4.3 How the chronotope acts in HyperSteel

In Appendix II, the details of the individual components of HyperSteel describe the wider context of the chronotope as it occurs in hypermedia, because by its interactive nature, every user-interrupt is a moment where as Bakhtin said, "the knots of narrative are tied and untied" (Bakhtin 1981:250). I anticipate that creators of this medium, in its future developments will devise and evolve further ways to express these "organising centres for the fundamental narrative events" as he expressed it. Although early in this history, HyperSteel contained a number of specialised hypermedia devices:

One such device is the Click - Jump. The computer screen is always a 'moving image', insofar as a user navigating their way through the features of a multimedia program is causing the image on the screen to move constantly. It modifies and performs at the user's own pace and choice of 'shots' stimulated by the mouse or other device. This sudden change of on-screen images produces an effect like the 'jump cut' of film. Whereas this effect in filmic terms is often chosen to deliberately discomfort the viewer, in computer
terms it is so common that it has become invisible to the user.

Figure 9. Three different user-interrupt icons

There is also the 360° horizontal pan. This self drive version of the full circle appears in experimental form in the Case Study section of HyperSteel. It originates as either photograph or video, stitched together so that the user may be ‘driven’ round a location, zoomed in, and zoomed back. It allows a location to be seen in the context of its surroundings.

Technically its production is an example of the use of traditional knowledge and new understandings. It requires a combination of the film maker’s pan shot, and the still photographer’s wide angle shot. It must be taken from a position close to the subject and with a camera that gives the greatest depth of field possible.

The result is a practical example of theories discussed in Chapter 3. It is the interactive equivalent of the dizzying circular shot described in Vertigo in Chapter 1, and the sense of being in the centre of an exotic location in the Civic cinema. This component uses eye and hand together with expectations to fully ‘work’ the scene. It is a form of time-image in which the parts move,
constantly and interconnected but each time over a different timespan and at a different speed (see Figure 7 pg 131).

Another hypermedia device used in HyperSteel is the virtual reality animation. Unfortunately the constraints of time meant that only one, fully moveable animation of architectural elements was included in HyperSteel. A section of modular wall from the racing stables featured as a case study was re-drawn for manipulation as if it were hanging in space. This enabled its unusual foundations and guttering detail to be explored for examination. Linked access was made from the relevant lecture, as well as the case study.

![Image of HyperSteel interface]

Figure 10. Navigable wall section included in lecture notes

Manipulation of this 'piece' of wall, like the horizontal pan above it is a new form of architectural representation, quite different from any previously used.

There are also flash screens. In the management of hypermedia especially those like HyperSteel which run several underlying software engines, or jump
from HyperCard stack to stack, there are intervals of waiting time. Here, "flash screens" are opportunities for something to be available on-screen while the user waits. Throughout HyperSteel these have featured such diversions as the Structures lecturer on video, a poem on skyscrapers, the HyperSteel ball bearing zooming towards the camera, a short quote about Structographics. Flash screens have no educational function, but they serve to disguise time, and as such they closely resemble the filmic convention of 'cutaways' which are usually shots of a less important content, "frequently used to cover short temporary ellipses" (Bordwell 1993:230)

![Flash screens with rotating ball (left) and lecturer introduction](image)

**Figure 11.** Flash screens with rotating ball (left) and lecturer introduction

### 4.4 Issues arising from the development of hypermedia

The proliferation of hypermedia in education in the future is bound to affect libraries of the traditional sort, either requiring new forms of the institution or altered balance of resources for the existing ones. The recognition which HyperSteel makes, that different people learn effectively by different stimuli, thus including images, colour, movement, hands-on participation, mathematical diagram and textual definition as all part of the descriptions and exercises, will be more and more understood by higher education. Chalk-and-
talk is already being balanced by workshop activities, site visits and video. This will be reflected in the libraries which serve them.

Features found in traditional libraries but not in HyperSteel include the advantages of a human librarian, and the academic authority of multiple opinion. Both these should be weighed up when making hypermedia available to classes, and in Auckland University HyperSteel is always used in association with all the forms of traditional architecture teaching, as lectures, tutorials, workshops and design studio. This balances any charge that HyperSteel is 'babysitting' the student/learners.

The issue of the machine playing the role of the human in education is a serious one, against which it is suggested there would be an advantage in software created by the home institution over one made as a product for sale by a text-book style publisher. This 'babysitting' has been identified by Heppell (1993) as the 'surrogate' stage of computer use in education. HyperSteel includes a small on-screen introduction by one of the academic authors which is one way of personalizing software. E-mail based discussion about course related topics, on-line chat meetings, and digital publication of assignments will all ease the familiarity with computer mediated learning and in turn will teach staff how to use it better.

What is more important within an educational community is an institution-wide evaluative framework for hypermedia teaching modules in pedagogical terms. Diana Laurillard refers to several valuable characteristics of computer-mediated experiences which have been considered desirable in higher education, but hitherto unattainable:

To operate intrinsic feedback, the straightforward tutorial must be augmented with a simulation, as this is the only medium so far which has been able to offer this. Then it becomes a very powerful teaching medium, because it adds the dimension of adaptivity to the strong interactive capabilities of simulation and modeling (Laurillard, 1993:157).
These are measures which may be applied to *HyperSteel* which is a 'laboratory-like' activity within the computer:

The interactive media ... can support the learner in what was otherwise only possible through real-world experience ... (ibid. pg 181)

Because they are computer-based, multimedia products can be adaptive as well as interactive. This means it can support guided discovery learning. (ibid. pg 186)

Laurillard uses filmic metaphors when she says that:

... learners are collaborators in the development of the narrative – they know the *denouement*, (and) they can define the path to it, while having access to guidance and a checking mechanism that pre-empts them wandering aimlessly through an unfathomable database ... (ibid. pg 188)

It is contended that rather than *HyperSteel* having a value as a single one-off 'product', Laurillard's requirements for learners to be collaborators in the narrative act of learning, define the gains met. It contains and acts as a simulator of many architectural exercises, it is constantly interactive, and it is accompanied by the controlling cycle of the wider architectural course.

Its particular contribution is the one made by the chronotope. This would be insignificant if it were merely that *HyperSteelLibrary* included examples of video, sound and animation. The entire collection *HyperSteelLibrary* – both as a suite of learning materials and an experimental hypermedia project - is a completely fluid medium itself. Apart from the short samples of traditional moving pictures, like the racing stables videos, it is a comparatively static presentation, until over and above those small movies, there are the user-driven click-jumps for navigation, the self-drive 360° panorama views, the reusable draw-on exercises, the scrollable lecture notes and the game-like quizzes about *Structographics*. In its entirety, it is a shifting reality, its learner-controlled plates of time-images following a different narrative route at every playing, as each individual learner follows a unique learning path.
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Its manufactured form emerged from known technologies in the cinema and educational fields, but with distinctly new forms of representation in sound, simulation and interactivity, and it has been trialled and added-to. Its form and design show similarities to the practice of architecture education identified in design studios and it is more like a library with its variety of stimuli than a single text book which relies on print and some illustrations.

Cognitive theorists have noted the positive stimulus to intuitive understanding which comes when moving illustrations accompany text. In addition to this, HyperSteel incorporates interactivity and access to the 'virtual reality' of cyberspace for student architects. It is suggested that this heightened response is the single most valuable contribution to transferring students' knowledge of theory into practical use in their design work.

The next chapter will report on a reflective survey from 19 staff and students about their experiences with the software in a qualitative review of responses from their first experience of this learning medium.

4.5 Summary

In its design and construction, HyperSteel drew from its development team their combined intuitive knowledge, imaginations and the wide ranging skills they brought to the task: knowledge of steel construction, image based production, teaching, human manipulation, their personal delight in the digital technology. In particular there was an imaginative appreciation of "... games for learning" in that "we might discover ways to induce skill at structural prediction (to) free up the structural sense most of us are born with and which in our early years we use in play." (Granwal 1993:169)

Without directly following cognitive theory, the developers foresaw the significance of intuitive knowledge and the value of multiple inputs to its understanding and storage. In tentative, experimental ways they employed cinematography techniques that can be seen to be both spatial, and temporal,
and in their combining, chronotopic.

Spatial concerns in film are those known collectively as *mise-en-scene*, or staging, and include sets, colours, costumes, or even as in the case of *Vertigo*, the film stock used to achieve a certain visual effect. In its hypermedia usage, between student and computer, the predominant phenomenon engaged is the temporal one, as when choosing click-jumps, or when navigating 360° location scenes. Together, whether it be in a bending moment tutorial, or examining elements of a case study, or carrying out the repetitious drills of *Structographies* memorising, the narrative unfolding for each one of the students, is an architectonic chronotope.
This chapter recounts and analyses a number of structured conversations during sessions with *HyperSteel* by students and staff. This research survey was carried out in 1999 after the program had been in use for 6 years. The aim of the survey was to assess qualitatively whether or not it was the subjects' own perception that *HyperSteel* had enhanced their intuitive knowledge of steel structure theory. These subsequently became summarised in four separate general responses, two positive and two negative in their tone. These are outlined and explained in the chapter.

Participants were directed as they took a 'guided tour' of the entire *HyperSteelLibrary* suite to ensure they had seen or used the special features of hypermedia. For this reason, the survey did not observe a 'natural' interaction with the program, when users follow private interests, but these may not have located or worked through certain features which were included in every participant's tour. Spontaneous reactions to these demonstrations were recorded on audio tape; the tapes are now held in the architecture library.

Despite the rather artificial supervisory control, when it is more usual for the
student/user to interpose the temporal factor of management over the spatial one provided by the computer, it was possible to observe many marked patterns of interruption and the users' overt responses, verbal and non-verbal. Very vigorous, animated behaviour was noted at these times of change, whether it was interruption or answer to scenarios they had encountered, their heightened behaviour indicated a strong likelihood that that moment would leave a strong trace in the students' memory and thence to their 'banked' intuitive knowledge.

The context in which HyperSteel functions as a learning aid was discussed together with subjects' personal study strategies, attitudes to structures theory, and perceived design studio competence. It was not so easy to observe any immediate improvements in students' later design skill with steel based construction in studio, which was the primary aim of the hypermedia development, but comments from the teaching staff did indicate an improvement. This differed from the students' own comment that in fact they favoured traditional non-digital patterns of study including rote learning, by which they had already had proven success.

This chapter includes a discussion of the reasons for, and appropriateness of qualitative survey techniques for this study; a description of specific techniques employed to collect information from participants and a short profile of the participants. In addition the chapter contains an analysis of the content in terms of theory included in previous chapters. It is associated with Appendices III - VIII, which detail the design and formalities of the survey.

5.1 Qualitative research

Before describing the survey, its methodology and justification are outlined. Qualitative surveying is a method of data collection which has been given considerable attention over the past decade, as social researchers Denzin & Lincoln (1994), Kvale (1996), Morse (1994), and Wolcott (1994), report. It is a way of gaining an overview of some difficult or poorly understood social/
educational phenomenon by taking account of historicity and context, and placing personal experience at the centre of the research.

The pivotal difference between quantitative and qualitative research is similar to the difference between inductive reasoning and deductive reasoning. Deductive arguments, or those resulting from strictly logical information are rarely useful in social research, which always favours the process of accumulating confirming evidence, and in building up patterns of argument. Inductive results, for that reason, are flexible, layered, and allow for teasing out different values of meaning whether they be local, reflective or consequential. Since knowledge is socially constructed, it is valuable to examine the social surroundings of the activity. Within the present context this is done in the following survey by discussing the learning of structures theory generally, not just through the use of HyperSteel.

In contrast to conditions for quantitative assessment, the rules of causality do not have to function for qualitative research. Rather, multiple causality is discovered, and this is built up in analysis into a network of cause and effect in near and wide contexts. Causal questions are then retrospectively gathered into a narrative to explain conditions, or outcomes, what is present and what is absent and so on, so that other such 'stories' can be cross matched and triangulated to support and qualify it or subject it to revision.

5.1.1 Discourse analysis
Methods from discourse analysis, the study of language used for communication within a particular context, are applied to transcription of the interviews which were conducted following the templates in Appendices III and IV (Georgakopoulou 1997). These techniques are used to identify and describe not only the meaning of interviewees' responses but the mood, and cultural context in which they were said. The interviews were conducted in a conversational manner. Conversation is a turn-taking activity, an exchange of meanings between (in this case) two people. Discourse analysis borrows from
linguists the analysis of small verbal phenomena, and from sociologists the way in which exchanges are used to learn something about the social and cultural context of life.

The conversations carried out in the interviews and seen in the transcripts here, are not informal and spontaneous in the way that two people meeting unexpectedly would be, but despite the constraints of gender, age and control, they are comparatively casual. Instances of the interviewees being freely critical of the educational process, using colloquial language and ‘thinking aloud’ expressions, suggest that under the circumstances, the people involved were relaxed and informal. This reflects the generally easy relationship people have with each other throughout this school, despite status, age and other cultural parameters.

5.1.2 The interviewer

In a qualitative study the researcher functions as a combination of observer, interpreter, and finally after analysis, reflector of the phenomenon under study. It is a holistic process and requires that any conditions of the human dilemma involving the researcher must be declared.

The social dynamics between myself the interviewer, an anglo-New Zealand woman in her fifties and the survey subjects are complex. There are the merely visible ones of age and gender, and the less noticeable ones which can become acutely obvious in conversation - matters of cultural identity like music taste, sense of humour, political stance even occupational status. Mine were not really known to the subjects, so they had to operate in this ‘conversation’ based on appearances, assumptions, manners and possibly my heightened interest in computers given the topic of our talk. To overcome this I was careful in my language patterns, sometimes matching linguistic forms, sometimes allowing outbursts outside of the interest of the survey to continue.
For their part I am sure that the student subjects exercised many small and formal courtesies towards me, not the least of which was to share with me their honest opinions despite it being sometimes criticism of the system I might be seen to represent. I take this as a compliment. For my part I feel my worst error was in my personal trait of impatience when I interrupted or spoke too soon, something I realized when transcribing that would have yielded something of value. The loss was mine.

5.1.3 Selection of subjects

All staff and students of all the papers in construction and structures were notified of the survey. The academics responsible for this course, comprising a senior lecturer, part-time assistant lecturer, and tutor each contributed an extended 90 minute interview. Some individual students came forward, but it was not until a summer school design paper was in progress that sufficient volunteers were available, partly because there was less pressure of time since no general subjects were being studied at that time. I am very grateful to these students who responded with courtesy, interest and enthusiasm. Many left the interview expressing an interest in returning to the HyperSteelLibrary to assist them in future with their studies.

This group of subjects represent every level of scholar in the department of architecture from first year to graduate student/ tutor, to lecturer and part time assistant lecturer. A short profile of each is in Profiles (Appendix VIII). The nineteen subjects include both men and women and their nationalities are from a range of New Zealand, ethnic and immigrant populations. This is detailed in the Profiles Appendix. However, both Huberman & Miles (1994), and Stake (1994), note that such a study will founder if too much aggregation is done based on categorical qualities such as age, gender, level of schooling and so on - what is important is their own confidence, their own intuitive understanding, their own perceived subconscious knowledge. In the discussion of results from the interviews, pseudonyms are used when
quoting from the subjects.

5.1.4 Interview design

...qualitative designs are not copyable, off-the-shelf patterns, but normally have to be custom-built, revised and "choreographed". Miles in Denzin & Lincoln (1994:431).

This metaphor of choreography used by Miles is an apt one for the series of discussions about HyperSteel which follow rather a circular path around the subject of perceived intuitive knowledge. During each conversation a screening of the moving components of HyperSteel took place. Not directly, but returning to the issue several times, the talk turned on the question: does this serve your intuition and imagination in structural matters? The pattern of the discussion was planned to allow this to be answered in as many ways as possible. The template is attached as Appendix III.

I initiate discussion first about student's early life experiences of practical structural activity, and inquired about the intuitive understanding gained; then I lead talk away to education in structures here at school; then go through the tour of HyperSteel and finally discuss their working life in the future as architects. Each time I refer to this special skill, and thus gain many different individual perceptions of 'structural intuition' as a concept. During the tour of HyperSteel I am able to link the moving images and thus chronotopic moments to this sense of emotional response.

5.1.5 Transcribing, editing and data reduction

The transcription of interviews is not only a conversion from speech to text of the words on an audio tape. It is actually an act of interpretation itself, the plainest of punctuation marks imposing a non-neutral control over what has been said (Kvale 1996:160). This documentation, therefore follows his advice to make use of the interpretive opportunity and use punctuation, editing and description of body language to
convey as full - and therefore useful - a description as possible: 
“...Transcripts are decontextualised conversations, they are abstractions...” (ibid. pg 165) He links this stage of qualitative
research to its being the research given expression by its philosophical era:

... postmodern conceptions of knowledge emphasize the contextuality of meaning with an intrinsic relation of meaning
and form and focus on the very ruptures of communication the breaks in meaning. (ibid. pg 168)

In order to clarify without distortion or undue editorial manipulation I used considerable punctuation to convey the voiced conversations, I reduce the conversations from the original verbatim versions retaining only matters of interest to the threads of the survey, and I use uppercase letters for all comments, actions and questions by myself. Some words that are unintelligible are left un-transcribed, with the word ‘unintelligible’ in brackets. Non verbal information like body language, or laughter is put into brackets. All fillers are included as if they were words – Ummm, etc. This schema has been modified from the techniques of discourse analysis (Georgakopoulou 1997).

Transcripts of the recorded interviews have been checked and agreed on by a neutral observer. See Appendix VI for a Check of Transcript Statement.

5.1.6 Results and analysis of interviews
Two major areas dominated subjects’ responses to the survey. They are first, responses to the characteristics of the time/space interactions contained in HyperSteel; and second, the perceived value of study techniques which include HyperSteel usefulness.

Throughout, the recorded interviews reveal certain patterns of response which may be summarized as four distinct reactions, two of which are positive towards hypermedia as a learning mode, two which suggest
rejection:

1. Strong verbal, emotive reactions to the identified new moving forms of media observed in the conversations, confirmed that ‘dual coding’ as described by cognitive theorists does stimulate response in the user.

2. The chronotopic properties of HyperSteel as seen by the user are indeed important to this client base as expressed both in repeated compliments for its appearance, smooth navigation, easy manipulation and quirky humour; and in involuntary responses to certain pre-planned events.

3. Text plus images plus interactivity and movement provides hypermedia with many variable ways to learn. But, according to their own opinions as stated, it is probable that students do not alter their preferred method of study, reading and re-reading text, despite the reactions in number 1 (above).

4. Continued uneasiness – globally – in the face of considerable technological upheaval affects both student experience and their expectations for professional practice in architecture.

These patterns will be further delineated in the following Sections:

5.2 Survey responses to characteristics of chronotopic events in the HyperSteel software.

5.2.1 Spatial issues
5.2.2 Direct comparison between media
5.2.3 Perceived success
5.2.4 Prior experiences leading to later intuitive confidence
5.2.5 Perceptions of personal architectural intuitive knowledge
5.2.6 Personal study choices
5.2 Survey responses

The results include a variety of responses, frequently verbally expressive including expletives, laughter and hand waving. When carrying out some navigation, users ‘talk themselves’ through it. Subjects’ comments about the movies in HyperSteel were not only articulate and vigorous but also expressed their personal intention of using the moving image in design studies. They talk about its content, relevance and effectiveness.

Certain devices are derived from filmic tradition but are now distinctively digital. They are also moments when by the use of the user-interrupt fit the description of Bakhtin, as moments when the knots of narrative take effect. They include:

- 360° horizontal pan. This self-drive version of the full circle, is the interactive equivalent of the dizzying circular ‘arc’ shot used in both film and architecture which allows a location to be seen in the context of its surroundings. It is described throughout this thesis as a new form of time-image,

- virtual reality animation. This moveable animation of architectural elements allows the simultaneous provision of plan and section. Like the horizontal pan above it is a new form of architectural representation,

- the click-jump. The users navigating their way by the mouse or other device is causing the image on the screen to move constantly, producing an effect like the ‘jump cut’ of film,

- flash screen. These serve to disguise time and closely resemble the filmic convention of ‘cutaways’.

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The subjects are shown or asked to remember many of these examples from HyperSteelLibrary. The overall impression from these reactions is that chronotopic events invariably evoke an emotional response. The language of the students reflects their cultural and social life. When commenting on HyperSteel, choice of words tends to consist of youthful vernacular and terms that in themselves reflect an intersection of time/space that is chronotopic: "pop", "clonk", "buzzing", "chuck", "blast", being used in responses.

_Dell_: It's just wonderful how you can pop in here and pop in there. It really seems quite easy to find your way around.

_Kelly_: It'd be nice to click here and click there and have it whoomp or something. But no, this is definitely better. It has a newer feel about it.

5.2.1 Spatial issues

The following sections address the devices which employ a user-driven chronotope - when the student controls the program either temporally, in the speed of a zoom or a pan, or jumps back and forth between two views; or spatially in the choice of image, framing of a zoom or video clip.

Both the film maker and the architect are concerned with a sense of space, achieved by the cinematographer with lenses and focus, in architecture by the arrangement of the physical elements. In the computer the notion of seeing both 2D and 3D views simultaneously (ambient and ambulatory vision) is a new facility in representation, but a deliberately acquired skill for architects.

_Dell_: I think it's important actually to be able to show a connection between 3D and 2D. I really wonder with some of the students here whether they have a full appreciation of how things stack up in three dimensions? When they are given a 2D view or approach ...
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_Henri_: Oh, this is really good. Yes. I mean it's both two dimensional and three dimensional at the same time. You can get a plan view, you get an elevation. Yes, very effective ... yes.

Recognition of this sense of space is part of the growing awareness encouraged in architecture design. This student ("Yves") had a recreational interest in dancing:

THE DANCER HAS A SPECIAL UNDERSTANDING OF SPACE

_Yves_: I guess that would give me a feeling of how much I move around in that space, yes. I've never really thought about it that way (laugh) I think I can probably visualize space ...

A BIAS TOWARDS INTERIORS?

Yes (for summer school) I'm exploring the idea of exo- and endo-architecture. My site is (an inner city) library. I'm going to keep the exterior skin and change the inside.

5.2.1.1 _user interrupts_

The most common movement used in interactivity is the mouse-click or click-jump, discussed in Chapter 4 as being most closely akin to the jump-cut of the cinematographer. The difference here is its interactive control as the timing chosen by the user. Commentary varies as to its success in _HyperSteel_, seeing its potential.

_Kelly_: ... to be able to click on things and have text relating to it instantly.

MAYBE AS YOU RUN YOUR MOUSE OVER IT

... yes, maybe there's a text box alongside that constantly
updates depending on where your hand is ...

Or, negatively:

_Dell_: I quite enjoyed just breezing back through them but I found that it didn't seem particularly easy to scroll back.

_Enid_: (comments slightly sarcastically on walking through the case study building) and for its narrative you create your own movies?

_Chris_: I think its nice that you get the moving diagrams. You can't get movement in a text book, and you don't get that self-checking in a text book ... I seem to remember the students responded really well to that drawing and then checking, drawing and checking .. see these sorts of diagrams where you get the diagram and you get the answer? _Structographics_ would work out quite well with that. You know, you call up a diagram of a building and just go clonk! And there'd be a _Structographics_ symbol ...

_Dell_: I think it's a useful tool for seeing what's happening ... I love being able to move the image around and see how things are actually connecting or relating to each other rather than just thinking them in my mind ... I think a fly-through would actually be a good introduction, but if there was something in particular that I wanted to look at I'd want to be able to ...

(DEMONSTRATES STABLES CASE STUDY MOVIES)

... It's interesting that those stables are actually used as part of our lectures in (construction and structure) course on the blackboard and I think that a lot of people didn't actually know quite what they were, where they were. Something like that
would actually help to give a bit of context ... I like the immediacy of it and having all the information concurrently on the screen.

Rochelle: Trying to show how the building is used I guess.

GOOD IDEA?

Yes. I mean it’s all very well calling it a raceway but until you see people using it ...

Frequently as their comments illustrate, the subjects feel they want to add to, or change the software itself.

5.2.1.2 360° pan

This is the still image compiled in an imaginary tube shape which is presented on the screen as a still location, which by pressing with the mouse becomes chronotopic for it will circle as if around an actual site. It is the equivalent of the circular pan, or ‘arc shot’ described in Chapter 1 in Vertigo in which the actors kiss in the centre of the shot while the camera tracks around them. The architectural equivalent is seen in the foyer of the Civic theatre where the interior gaze is deliberately drawn around the balcony with its columns and niches and gold painted creatures. The intention in both the filmic and architectural forms is to dislodge or confuse the viewer. The digital version can also be dizzying, but since hand control is with the user, this is by the choice of the individual.

Wendy: Oh, wow! How on earth did you do that? (EXPLANATION)

I love that! That’s a good idea!
(DEMONSTRATES 360° PANS IN CASE STUDY)

HAVE YOU SEEN THESE BEFORE?

Lee: I haven’t actually made one but I’ve seen them turning up in (drawing software) and ... things like from photos as well. Haven’t actually made one but ... (lots of conversation about 360° pan making)

ARE YOU INTERESTED IN MOVIE CAMERAS

Yes I did (the course in AV Techniques) last year. Its particularly interesting.

HAVE YOU USED IT IN DESIGN?

Yes I generally have a blast at that at some stage.

Si: Yeah! (laughter) That’s pretty cunning!

(ZOOMING IN AND OUT) IT GIVES YOU THE FEELING AS IF YOU ARE GOING EVERYWHERE.

Yes it does.

5.2.1.3

object rotate

This technique has no equivalent in the media of any former era. Although produced quite differently, it is an extension of the idea of the 360°. It shows an object or location which is totally constructed within the computer (it might contain visual information which derived from a photograph but it is actually artificial). Its interactive control by user mouse is total, the subject being seen around, over, through, as if in close up or by
long shot. One example only exists within HyperSteel unfortunately, because this ability to show how an element of a building looks under ground or from overhead, or how it is attached to adjacent components is a valuable demonstration. But at the time of construction it was too time- and computer-hungry a technique for more than this one experimental example.

(DEMONSTRATION OF OBJECT ROTATE)

*Frank:* You ask the student to manoeuvre around the model to give the view of different angles. Very good, because most of the time when students get taught by only overheads and slides its only 2D, one shot, one view only but this you can see what happens on the other side or why they are doing this. Really?

(DEMONSTRATES CASE STUDIES VR MOVIES)

*Glen:* In movies you're restricted to where the camera goes.

**IF YOU DO AN ANIMATION TO SHOW ME YOUR DESIGN I AM TRAPPED IN YOUR CAMERA VIEW**

*Glen:* So I can show you all the good parts.

*Kelly:* That makes a big difference compared to the stills. ... Being able to see how the structure goes down under the ground or above the ground because that is obviously one of the advantages. You could suddenly make ground that you can kind of half see through which is different to going underneath and seeing it here because although you can see ... I think that is very informative.

*Wendy:* Oh, wow!
HERE YOU’VE GOT AN ELEMENT OF THE CONSTRUCTION

You can see at a glance ...

YOU CAN SEE WHAT IS HAPPENING BELOW GROUND. HAVE YOU EVER OPENED YOUR EYES UNDER CONCRETE?

Only when I’ve dug footings ... (laugh) How do you pull it right back so you can view it?

DEMONSTRATION

Dell: I love being able to move the image round and see how things are actually connecting or relating to each other, rather than just thinking them in my mind ... because while the image might be similar it’s much more immediate on the screen.

5.2.2 Direct comparison between learning modes

In its own educational context, HyperSteel was introduced as an adjunct to the already wide scope of material in the curriculum. However it was inevitable that during the survey conversations, the students would compare the media. Often it was the filmic characteristics which made HyperSteel more attractive.

For example, the students often compared HyperSteel to traditional forms of study, mainly text books with their text dominated display:

Kelly: ... the classic mistake of (text) books is to have illustrations which are labeled with Figure 5 and the text related to that might be two pages on ... (the main undergraduate architecture history text) is a classic and quite often the text relating to it might be a couple of pages either side of it ... it can
take you five minutes to find the bit of writing that relates to it. Something like this, to be able to click on things and have text relating to it instantly ... ... also I think its important the way you've gone to the trouble of having this background and so forth. Makes a difference I think ...

When they compared *HyperSteel* to the university lecture, which has the advantage of a 'real' person talking in front of the class, they regretted the lecture's transitory nature, because once the lecture is over, all that is left is the student's own notes:

*Lee:* (the CD is) definitely a step in the right direction. I mean I'd like to have a lot of that. Like, all those lectures and everything it would be awesome having it on one CD at home. More as a thing – because with lecture notes you know – great! You've got them – if you can read them and stuff – but at the end of the day you lose them and they're going to be handy at some stage.

*Rochelle:* One also good thing about this is often with some lectures you don't get good lecture notes and you might miss one or whatever ... or the year before you get to something you don't understand and you can go back to the year ... can you do that from here? Can you do that?

SURE YOU CAN BECAUSE THEY ARE ALL THERE

... and look up what you missed from that year or what you didn't understand?

... just looking at how much information is on this I might be tempted just to go and print out quite a lot of information just for personal use. Is nice to see it all on one place rather than scattered.
Si: It's like a lecture isn't it? It's like somebody in front of you, talking while he's drawing at the same time, drawing tiny little pictures. It's like that. It's just that this is, like, on the screen.

The chronotopic form of the lecture notes in *HyperSteel* includes minimal film-like elements, just scrolling fields and click-jumps to linked information, but these were noted as having advantages over the student's own notes.

This analysis relates the filmic elements of *HyperSteel* to the experience of learning architecture theory. Many design skills are cinematographic. Such characteristic working habits as a *mise-en-scène* approach, and filmic issues like depth of field (for sense of place, or seeing plan and section simultaneously *en face* and *en profile*); interactivity (taking time into one's own hands, literally); and the use of sound effects to evoke mood are all part of the way an architect approaches a design.

5.2.3 Perceived success

In order to gain qualitative impressions of how young architects felt they personally understood about structural science, questions were directed around what they themselves perceived to be their architectural intuition and how this differed from the kinds of knowledge and understandings held by engineers. This last is important because of the close affiliations between the two professions, and the differences in their education and working practices. It is also significant because *HyperSteel* addressed the area of theory taught by engineers within the school.

In the conversations, it became clear that the subject's personal perception of intuition was linked, in the opinions of the teaching staff, to the balance of knowledge between engineer and architect in any design situation. As situated learning theory states, knowledge is so socially based that students learn not only the information but why and
even how it is to be used, by the surrounding context in which it is presented (Anderson, Reder et al. 1996).

This distinction is very important, giving a human scale to the boundaries of each small and large task in the working life of a designer. It is acutely felt in this teaching department where the science of structures is taught by engineers, giving the students a clear model during lectures, tutorials and design studio, of the different professions and their expertise, language and attitudes. By this demarcation, they learn to absorb the social misinformation that the only engineers teach structure theory, and only architects teach design theory and the two are not really relevant to each other.

The students had been selected from across the levels of the five year undergraduate course and each one was at different stages during a very long and pluralistic education. There were small indications of growing intuitive confidence, but little surety about how this had come about. They reported some anxiety about the new electronic media and many described how they depended on traditional methods of study regimes to prepare for examinations. The results can be divided into three groups of conclusions: students prior experiences leading to later intuitive confidence; their perceptions of personal architectural intuitive knowledge, and their personal choices of study methods.

5.2.4 Prior experiences leading to later intuitive confidence
Since HyperSteel was intended to contribute to courses in structural science, each individual’s early awareness of the structural reality of surrounding built forms is of interest. Students and staff alike comment on the discovery of a personal awareness of architecture which led them to a study of architecture in the first place: awareness is one part; actually knowing how to create a three dimensional form is another. These experiences are vastly different from individual to individual because students come to this department from a diverse educational watershed.
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There was a perception that previous experience was important to a personal sense of accomplishment. It was as if they felt that ‘a good start’ meant carrying a confident feeling right through the degree:

_Dell:_ ... putting a suspended floor in my garage. I did that myself with the code information I had available, (New Zealand Building) Code 3604 and the like. I did that. Other than that I’ve done quite a range of cabinet work, basically for myself ...

... I see a lot of students who are doing design work that seems to have very little consideration of construction and structure. It seems to me that the earlier that basic issues get introduced the better.

**THE THEORY - WILL YOU HAVE TO LOOK IT UP?**

_Dell:_ I don’t think I will, no.

The above comments show how valued real-life experience of structural forces is, and how varied it can be, expressed by one student remembering such a tutorial:

_Glen:_ One of our Construction tutorials last year was making concrete. You can’t make concrete on the computer. You know, the hands-on experience of making concrete you just can’t do in computers.

This pithy maxim “You can’t make concrete on a computer” sums up the inadequacy of simulation over a real-time sensory experience. In the future it is to be hoped that digital simulation never takes the place of a workshop or building site experience, although one-on-one use of digital resource may compensate through interactive Case Studies and an introduction to terminology and the basic principles behind
scientific theories.

5.2.5 Perceptions of personal architectural intuitive knowledge

The value in qualitative research lies in the chance to record - in socially constructed vernacular language - illustrations of theory in action. Both teachers and students in this survey, put into words various definitions of intuition which have been discussed in this thesis.

In emotive, energetic and positive ways, all the students and teachers respond to the software, agreeing that intuitive knowledge is the aim of an architectural education, but expressing it variously according to their personal language articulacy. They worked through the examples talking easily both to the interviewer and to themselves as they 'think aloud' their solutions to interactive tasks:

Lee: It's definitely a step in the right direction. I mean I'd like to have a lot of that. Like, all those lectures and everything it'd be awesome having it on one CD at home. More as a thing ... because with lecture notes you know, great! You've got them - if you read them and stuff - but at the end of the day you lose them and they're going to be handy at one stage.

YOU CAN...

... all that I've been taught.. That's excellent.

Oxman sums up the acquisition of knowledge as "constructing the explication of schema, knowledge structures and global strategies." The interview subjects acknowledged the value of experiential learning, to their intuitive sense, what Oxman recognises as "cognitive design ... the constructional form provid(ing) a representation of the structure of knowledge" (1999:110), and there are a variety of ways in which the students put into words their perception of this imaginative sense:
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*Alex:* ... he (the student) learns it so that he knows that he can now forget about it.

*Chris:* ... if it looks right it tends to be right.

*Dell:* It's all in here. Well, some of its intuition. Other than that it's obviously what I've learned.

*Enid:* ... you do it without consciously thinking.

*Frank:* ... in their final year or more senior year they may start to think "Ah!"

One teacher said:

*Alex:* ... I think the student has to learn about structure even if he then never really uses it again but he learns it so that he knows that he can now forget about it.

Or as Oxman put it, gaining “meta-cognitive insights” (ibid. pg 121), while “acquired information, already stored” (ibid. pg 109) is her term for this summing up:

*Barry:* ... the most important thing is the fact that he understands how loads are transferred, absorbed. Now that is the most important thing. It can really only be got from a feel for a structure or a building ...

*Chris:* ... I think on a final note, if it looks right it tends to be right...

The survey yielded certain understandings about the development of design intuition, linking two-way interactions between experiences and theory:
Lee: Well I mean I guess it’s all about experience. I guess by that stage ... and this is one good kick start because at the end of the day it’s all related to reality ...

Peta: ... (with) my experience in making things in the sculpture department, I was able to communicate three dimensionally a little easier than some of the other students.

Peta: Actually once you know how to do it, like riding a bike ...

WHAT IS RIDING A BIKE? WHAT’S THE SKILL?

Peta: It’s automatic, after a while (laugh).

They described what Polanyi called “tacit understandings” in many different ways, using words like ‘common sense’, ‘general knowledge’ or ‘automatic’, or referring to their own ‘minds’ or ‘heads’ as if they were a kind of receptacle for understandings:

THE THEORY - WILL YOU HAVE TO LOOK IT UP?

Dell: I don’t think I will, no.

WHERE IS IT?

It’s all in here.

Enid: ... I think in your mind you hold all the basic things you’re doing with architecture. I think mainly what you hold is stuff you’ve learnt as you go.

Frank: Yeah I mean, these years of studying it is how people are going to make it or not. It’s just giving yourself an awareness ... a student may be, like, in their final year or more
senior year they may start to think “Ah!!” Everything starts to make more sense to them.

_Glen_: ... he gave us a lecture about them and suddenly I said “hey that’s why we did this and why this happens” and I could pull everything into context.

_Henri_: ... I always wondered how did they know? But you sometimes know. Yes. It’s there ... I guess that’s the way the mind works. So you’ve learned it but you never know until you’re confronted with ... yeah ... (laugh)

_Kelly_: Well a lot of what we get taught is a continuation of my general knowledge I think.

_Rochelle_: ... I mean from general knowledge you can sort of see if something is going to fall down obviously.

_SI_: Yes, you kind of know that’s how it works. That happens at some point. You don’t realize it but you’re absorbing ... I think its common sense. Yes definitely.

_Yves_: I think ... Sometimes I can work it out in my head.

_Wendy_: You just know that when you get the piece of paper out and start the sketches and then convert that to a building that can be built. Yes. It’s there.

**5.2.6 Personal study choices**

A review of the conversations reveal a learning environment in school which is both contextual and textural, interwoven with threads of curriculum theory and presented in many forms. As well as the _HyperSteelLibrary_, a computer mediated compendium of the lectures, tutorial topics, case studies and exercises, the learning avenues available during the course included design studio activities; the
discipline-specific library (texts, journals, theses, research reports); lectures (theory, slides, verbal emphases as given by the lecturers); laboratory-based practicum, and site visits. As well, they had their own research for assignments, essays and tests. However, despite all this choice, there is a general preference for traditional methods of rote learning at times of stress, for example when studying for examinations. By far the most popular choice of study mode is some form of text (lecture notes, books, definitions etc) and six of the student subjects directly referred to the unattractive technique of rote learning repetition in order to memorize theory.

*Lee:* It’s just good to have something to go over ten times before an exam.

*Vic:* Just did a lot of reading through over and over and writing it down repeatedly so I knew it inside out.

*Wendy:* I cope with the words. I like the idea of seeing what’s happening.

Despite the architect’s traditional bias towards image based graphic representation, the students in the group do not choose images as a form of resource to turn to when studying, nor did they favour facts embedded in numeracy. However this was how it was described by the few that do:

*Dell:* The pictures are more easily readable. I find that text - especially scientific - is not always readily understandable.

**YOU'RE NOT A TEXT PERSON?**

*Dell:* I don’t generally have a problem with text. It’s probably the way that presentation of material has progressed, that I tend to go towards graphic material than text material.
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DO YOU MAKE MODELS?

Kelly: Yes but I am quite happy to draw things as well. Drawing this kind of thing I see value in that for me. I definitely get something from it.

Some students referred to real-life experience as being their favourite way to learn:

Yves: I like learning by doing something rather than by reading about it.

And several identified listening to lectures as important to them:

Enid: I don’t think I could have done it without the lectures. I think I can remember that (a HyperSteel demonstration) coming in lectures. It’d be “Ahh!!”

and by contrast:

Wendy: Some people (lecturers) are too fast that you get left behind anyway. You don’t even know where you are.

Of interest to this survey are those who had little experience of HyperSteel but ‘invented’ a device such as the digital learning software in front of them (while I knew it was provided for in HyperSteel):

Frank: To me I think it would be better for students to have a chance to actually draw it themselves and then learn rather than just see it. They will remember more next time if they draw it themselves. They know what’s going wrong.

Ike: What really needs to happen is during every lecture it needs to be on the screen there ... just be part of the lecture.
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You know a couple of points there, turn to it and say “this is what HyperSteel has to say about it”

Many express familiarity with images, models, and animations and wish that these could become part of study, but seemed to think that that is a fantasy. Most of this is discussed before the interviews turned to a closer examination tour of HyperSteelLibrary where early demonstrations of these ‘fantasies’ are seen, and those subjects express satisfaction that their hunches are correct.

It is important to stress that no consideration was given as to whether the students have been, indeed, successful - in measurable terms - at relating theory to the practice of architectural design, nor is there any judgment of teaching success applied to the group of respondents except what the lecturers choose to tell me in their conversation. Teaching staff, however, have opinions about this:

Alex: Last year invariably the ones that failed were the ones that hadn’t done any of these exercises.

Barry: Well that’s what I’m saying about the curious student. I think the better student tends to go on in HyperSteel. That’s what I’ve seen. He’s curious, he’s confident, he can explore something in a variety of ways ...

Chris, having already revealed teaching practice value in HyperSteel, has misgivings regarding human nature and whether the motivation to continue to explore HyperSteel would remain after the set exercises had been achieved:

Chris: ... I think what happens is when they’ve got the options to choose: they’ve got the options to avoid. And I wonder if there are actually avoidance mechanisms inherent in this method that aren’t in the text books. Because the diagrams are
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there ... The power of *HyperSteel* is that it gives - because you are interactive, (there should) be instant feedback telling the student “You are avoiding text, you are avoiding reading the text, you are avoiding bending moment diagrams.”

And then he answers his own criticism: there is a digital way to circumvent the problem, by the computer itself silently observing each student session for length of access etc. Discussion then widened out into computer software design, and the potential of tests from computer mediated material.

The teachers all refer to the holistic possibilities of this course:

**WHAT ARE YOUR FAVORITE PARTS?**

*Alex*: I’d like to see another case study (like the Ellerslie Race Track Case Study in *HyperSteel*). I think the case study could bring it all together. The case study should show, with the descriptions and the general talk about how it all works... All of that coming together for the finished project and a recognition by everyone that it’s a successful finished project and that it’s something that’s special and it’s not just ordinary and boring ...

*Barry*: ... the *HyperSteel* program has the benefit of combining lots of elements so that - of course it cannot give a hands-on experiential thing with a building - but certainly from my perspective it reinforces the learning. And one thing it presents is a range of buildings so that what visually the architecture students can see is a relationship between function and structure.

*Chris*: That’s great. I think the Time Line is really fascinating.. Because students don’t really get a feel for this (the progress of a building project). I guess they do in (Business Unit) courses
but in that sense it ties it in together. It’s really interesting. ...

With Chris I introduce three extra concepts which are unusual aspects to university teaching. I do this because he has been the most involved with tutorials and other practical activities. They are the notion of ‘play’, whether a sense of fun could be exploited in his tutorials; group activities; and what place failure might have in successful lessons:

EXPERIENCE THAT WAS ENJOYABLE AT THE SAME TIME AND IT FELT LIKE PLAY. IS THAT A GOOD THING.

*Chris*: Of course it is. I think that play does happen in (Construction and Structures) labs.

WHAT ABOUT THE VALUE OF GROUP ACTIVITIES BECAUSE A LOT OF UNIVERSITY WORK IS DONE IN A SOLITARY WAY. IS GROUP WORK OF VALUE?

Yes especially in earlier years when it’s important to build those bonds for the course generally.

WHAT ABOUT THE CONCEPT OF FAILURE AS A LEARNING MODE.

The Structures labs tended to be loaded to failure and that was always exciting for everybody. It was almost like make-believe failure really because it didn’t matter and the beams I think were loaded to failure ... they were loaded to high anxiety on my part. So that was also quite valuable too probably. But failure yep, definitely yep testing to failure ...

All three of these educational principles, humour, collaborative participation, and controlled failure exist in *HyperSteel* and can be
programmed into digital teaching material very easily, using techniques borrowed from the film production world.

Of interest to consideration of hypermedia use are the chronotopic ‘inventions’ postulated by the subjects which nearly matched features already part of HyperSteelLibrary, including the chance to draw on the screen, computer-mediated feedback and the opportunity of private access to the material outside of semester times.

5.3 Summary

The value in a qualitative research study lies in the multi-faceted ‘construction’ which results. This chapter uncovers one part of the structure of architectural education described in more general terms in Chapter 2, where its context in the wider tertiary education is discussed. Here, it is how HyperSteel sits within the course on structures theory which is under examination, and how it uses its constructed form – derived from cinematography – to aid the absorption of intuitive understandings into the imaginations of novice architects.

By identifying chronotopic intersections in use, and analysing the users’ temporal interactions within the software space, it has been possible to gain a picture of student learning. In summary they include both emotive reactions at chronotopic moments; and strong verbal responses to interactions. The survey also reveals the negative reaction that, despite demonstrated attraction, students will reject new learning aids amid unease at the general technological upheaval in their learning and professional milieu.

The conversations yield more than a set of personal opinions of the teaching practice in one subject of one undergraduate degree. They signal a continuum in the strategies of learning. On the one hand there is a retention of long-lived text-based learning patterns and a continuation of the stress felt towards technological change. And on the other, they confirm the value of dual
coding, combining images and text as a method of presenting information to be learned. In particular they endorse the stimulation experienced from the chronotopic event when it is part of architecture education.

This research culminated in the subjects participating in the focus of the research: out of the interviews have come several shared beliefs about what would improve HyperSteel. These include the confirmation that students do return to drill-and-practice as a method for the memorizing of facts. This endorses such tutorials like Structural Exercises and Structographics' inclusion in HyperSteel. They agreed about the opportunity hypermedia has to balance bias in the teaching staff's delivery. The conversations revealed teachers' opinions on race and gender based abilities which may otherwise affect their teaching. Yachting, rugby scrums and a dominance of the male gender in speech patterns could be balanced in digital media by a choice of other construction examples. As well, the admissions by tutor-subject, Chris, that play or fun is a valid contribution to practical exercises, and that collaborative pursuits are good for the team-practised profession of architecture were useful, as was his comment that failure as a principle is a necessary one for an architect to experience, as long as it is failure without fear. All these are features which can be designed into hypermedia for architects in the future.

As has been noted before, by Schon: "I was struck by how hard it seemed to be for many students of architecture to .... make clear verbal arguments and reflect critically on them" (Schon, 1988:9). It was obviously difficult for subjects to put into words what was happening in the mind, but in this return to the matter of intuition, one student expressed the strength of this method of learning:

WHAT GOES THROUGH YOUR MIND WHEN YOU ARE DOING (THE WRITE-ON STRUCTURAL EXERCISES)?

Jack: It's good. I think probably the best way of doing it, is actually trying to guess it first. You actually try to remember once you've
actually tried to have a go at it yourself. No. I think these are actually brilliant ... that we should be learning from. This sort of way of doing things... Excellent ...

This extract shows the student hesitantly putting into words the internal process by which intuitive understanding is acquired. This exercise has required from him previous experience, predictive ability, interactive involvement, and visual literacy. The particular exercise referred to in this comment had been constructed out of all the disciplines studied in this dissertation: its appearance and navigation from the filmic, its content and facts from architectural science, and ultimately, its underlying educational motives.
CONCLUSION

This thesis offers a conjecture on what might be considered to be the literary form of hypermedia and its application to the architectural imagination, or intuition. This is in the light of hypermedia’s existence since at least the mid 1980s (Hooper 1988), during which time it has evolved several genres of which two, educational tutorials and games are mentioned in this thesis, and so it is pertinent for it to assume its own literary grammar and codes. Architectural authors, like Marcos Novak, are among those who have coined terms for a future hyper-architecture glossary in “sequence”, starting with architecture and spreading outward, to articulate: “... what I perceive to be a growing cultural tendency towards algorithmic indirection, liquid variability, non-rationality and eventually full virtuality.” His entries for the glossary include: ‘liquid architecture’, ‘trans architectures’, ‘transmusic’, ‘transmorphosis’, ‘allogenesis’, ‘eversion’ and ‘transmodernities’. (Novak 1999:72)

My way of working, rather, has been to start with a known literary code, together with its theoretical analysis and grammar, and assign it to the central essence of hypermedia, so that in making a match, the new literary form -
what Novak calls the “poetics of new technologies” - gains the authority and inherited thought of the older one.

I turn to the ‘chronotope’ of written literature to examine its properties and in this work, assign them to the moment of human-computer interaction. Originating in the sciences, it was first used in literature by M. Bakhtin in his analyses of the novel (1937 and subsequent editions until 1981). At its simplest level in computer parlance, this is a ‘click’. The word, and the action, the tap of a finger on a mechanical mouse, is analogous for the digital action and reaction which instantaneously take place, where, it may be said, the text negotiates a meaning. This negotiation is the point of difference with other literary forms, for this is where the reader - not the author - takes charge of the narrative. It is a moment when the virtual space of the computer is intersected at a time chosen by the reader/user, and the narrative continues under their control. This relationship requires that in this thesis I examine matters of time, space, narrative, and their context for my central concern, the education of architects.

I do it through three case studies, transecting between one and another to follow the narrative of the arguments, rather in the way that chronotopes occur in hypermedia. They are: *HyperSteel*, a work of hypermedia developed in the school of architecture in Auckland; the film *Vertigo* which carries the authority of an auteur film maker, whose plot is concerned with the manipulation of time and the implacable power of physical surroundings; and the Civic theatre, an Auckland cinema whose function it is to use its architectural form to offer escape from daily life to imaginary times and place to the patrons who visit it. By treating these three case studies simultaneously and together, I make an approximation of what it may be for the hypermedia imagination to click through *HyperSteel* from one educational context to another. The case studies of the film and the building, each representing a different face of the concept of ‘cinema’, are elaborated in the thesis by way of close readings, comparative descriptions and a view of each as narrative, in illustration of the writings on narrative by Paul Ricoeur.

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The review of the work of hypermedia, *HyperSteel*, is further informed by the transcribed interviews of a qualitative survey of students and staff who are users of the learning aid, in use as part of the architectural science curriculum at Auckland University.

6.1 Time-space and the chronotope

In this thesis I have selected three distinct examples of work produced in three media and I have asked in several ways, where is the evidence or sign of the imaginative impulse as it reveals itself; what are its characteristics and how can this be harnessed in a teaching moment. I have described these cases so that their plots, or narratives, or time-space intersections are laid out for view. This has meant reducing to close-up detail, the smallest parts of their design, for in each medium described here, this is exactly how they are constructed: by the intricate placement of elements in what film makers call a *mise-en-scene*.

We may observe here, both the spatial and the temporal nature of each case study’s existence; and in what ways the two intersect in each, to demonstrate chronotopicity. For this reason they have been selected not for their experimental or ground breaking quality - which are interesting - but for their ‘ordinariness’; their artistic merits are not an issue; rather their existence in time and space are what is interesting.

In continuation of this practice, I further select from each a single feature which encapsulates the interaction of time and space and acts as a marker for the signified chronotope: somewhere in *HyperSteel* there is a screen divided into two; down on the scrollable left hand side runs a series of lines, like a ladder; on each line a small coloured marker moves to the right. It is a time line, marking off the months during the construction of a steel building incorporated into *HyperSteel* as a finished example of the principles and practices being drilled and tested in many small parts in the rest of the hypermedia program. On the right hand side, as the user-interrupt pauses over
the coloured marks on the left hand time line, illustrative photographs, diagrams and a video might appear.

The screen is a slide of a list of facts, nothing more. Until, that is, the user ‘clicks’: in an instant, another fact appears, the month changes, or several months may be passed over, the completion date is tapped, and a video runs. There are sixty seconds of sound and pictures: excitement is generated because it is the final moments of a race as the horses are driven past the winning post to the jumps and shouts of successful punters; the construction deadline has been met, the racing calendar resumed after the building interruption, and there is profit all round (see Figure 20, Appendix II). The excitement of learning plays out as the student turns the slide show into narrative; the instants of time when the arrow connects are the cumulative chronotopes: “the place where the knots of narrative are tied.” Bakhtin (1935/1981:250).

“Its all very well calling it a raceway, but until you see people using it…!” Rochelle, who made that comment was at the end of her fifth year of study as an architect. She had come to Auckland University from a small town high school and in the interviews appeared to have little certainty about her standing in design studio (noted in Appendix VIII). On this minimal evidence only a suggestion can be made, but it would seem that Rochelle’s shyness, lack of in-school confidence and apparent need to see the human outcome of a building project all highlight some of the useful characteristics of HyperSteel: a privately accessed, multi-media approach to learning about construction science; one which carries both theory and illustrative material, and importantly, one that is self-driven and self-timed. Rochelle had no difficulty with learning the scientific principles to do with steel, but until she ‘saw the point’ of the building it had held little relevance to her personally. (Knowles 1984:204)

The equivalent of a time-line in a movie house is the screening schedule: if you had gone into the foyer of the Civic in its days as a cinema there would have been a board displaying the names and session times of the films being
shown that week. There would be posters showing a scene from the film, and glamorous portraits of the stars. When the patrons entered, paid, checked their tickets and walked up the stairs, those sessions times were marked one by one, marking the cycle of each day in the life of the Civic: 11am, 2pm, 5pm, and 8pm, and occasionally for the ‘horror’ fans, a midnight session on Sunday!

Since its restoration as a lyric theatre, the routine has changed and there is no daily passage of patrons. Instead, fitfully, the big foyer is thrown open on special nights and crowds fills the space before moving into the star-lit auditorium for a musical extravaganza or prize giving event. During the day the tall glass doors of the Art Deco lobby are locked and you may peer through at a dimly lit set piece; the paintings, scrolled columns, buddhas, fantastic animals are all there, but nothing is happening. The difference between the two daytime eras is the lack of chronotope: as a cinema, the Civic once lived out an interaction between action and setting as the ebb and flow of patronage occurred. Suvin marks this removal of vital participation in his essay on parables. He writes that a parable is any narrative or “a finite and coherent sequence of actions, located in the space-time of a possible world and proceeding from an initial to a final state of affairs”; remove the chronotope from the narrative, he says and you are left with a metaphor. (Suvin 1986:63) The locked-up Civic becomes then, a metaphor for frozen dreams!

A timetable of sorts also exists in Vertigo: there is a scene which takes place in the forest, that is so haunting it has been imitated by other film makers, notably by Chris Marker in La Jetee and Sunless. Rosa, a woman who appears to be living both in the present day and in the past life of her grandmother, is staring at the rings of a felled tree. Scottie watches her. “Here I was born.” she counts the rings. “And here I died”. She seems to be talking about another past, and future, all in the past from the present they are living in. We who are the audience to this scene do not yet know that this is all pretence, and play-acted by “Rosa” to trap Scottie. We - and Scottie - have the chance to believe in a kind of doubled-over time scale, and we are reassured because she is pointing to the material evidence of that time, on the physical evidence of time passing, the growth rings of a huge tree.
The universal concept of time has layers of meaning in these examples. Each work has a historical importance for the democratisation of media within its own era: HyperSteel is an elaborate version of the early teacher-built stage of software development, what Stephen Heppell called the "cottage industry of teachers coding useful little programs in their back bedrooms" (Heppell 1993:231); the Civic has provided generations of an isolated population with a taste of luxury and glamour at bargain prices; the four dozen Alfred Hitchcock mystery-thrillers including Vertigo, gave film-goers a 20th century modernist text in auteur construction.

Each of these illustrations described above, of moments in their existence, carries some physical evidence of chronological time rather like why we wear a watch on our wrists: the time line, the film schedule, and the tree rings. And the moments may be broken up by dozens of smaller different possible instants, perhaps Rochelle does not choose to see the video, or we see Scottie in a close-up cutaway which alerts us to his doubts about Rosa, or the ball of a demolition crew swings through the doors of the Civic. All these moments are possible, but did not happen; they were not chosen by the protagonists in the narrative, because the chronotope was a different one.

One could say that time was being used, by the narrative; and space is used by inhabiting; and inhabiting is narratival, happening within moments of time: "inhabiting is made up of rhythms of stopping and moving, of fixing and shifting." (Ricoeur 1996:66) Space too is part of all space; its existence is understood to be both real and able to be literally inhabited in some way; and virtual or metaphoric, with some alternate existence.

Writing before the multi-media possibilities of virtual technology, Sigfried Giedion recognised these shifting perceptions in the art of the cubists. In discussions on the history of architecture, he proposed the term 'space-time' for the first time and began the shift in modern times away from the formal Renaissance image of architecture as the only representation allowable. A historian of the technology which in the early 20th century was rapidly altering western economies, and as bridges, railways and factories became society's
icons, Giedion looked for an artistic perspective in these works. His photographs and descriptions of the Eiffel Tower seemed to be as near to moving pictures as he could make them: "... the slender iron web that remains suspended in mid-air ... intertwines as it strives upwards and simultaneously becomes intermingled ..." (Giedion 1928:7) Giedion also questioned why art and science had become separate areas, when - particularly in architecture - an a priori connection existed between them, and movement. His book, re-printed many times, *Space, Time and Architecture. The growth of a new tradition* (1941/1967) has become a central text for architecture students since, as an introduction to modernism, as the point of realisation that a historical work may derive from personal opinion, and at the point of arrival of another generation of technologies which are altering social, economic and educational world views. Significantly for this thesis, his work signalled the beginning of an understanding about an intuitive understanding of movement, and simultaneity.

A film is still a contained entity. It exists along a time line predicated by the length of a piece of light-sensitive plastic. It has a fixed duration within which its makers contrive chronotopes using people and settings, ideas and editing. In its century of history, film has gone from being short pieces of a magician’s stage act, to generating different forms, genres and styles.

There is an equivalence between a story being told and a building being constructed and an explanation of what the reader understands in the story and the human experience of the space made by the building, tied up in the memories which have gone to make up the story and the building. Ricoeur reminds us of this difference by calling them “recounted time” and “constructed space” before he assures us that there is no difference, and they can “no longer be thought of separately.” With itinerance, the “partner of narrative identity ... space and time are integrated with one another in what Bakhtin has called the chronotope” (recur 1996:72).

Time and space are both indivisible, according to the 18th century philosopher, Immanuel Kant. For this reason, in his *Critique of Pure Reason* when he
ordered the fundamental concepts of the way we think into twelve categories, there was no category for time, nor of space. These, he believed, belonged in the intuitive self, or the realm of the senses. Time is the form of an ‘inner’ self, there could not be a thought that does not exist in some temporal form; and space is the awareness of the ‘outer’ sense, or anything that is independent of oneself. In our work of theorising we have subdivided by terminology: universal time, chronological time, historical time, instants of time; internal and exterior space, outer space, hyperspace and virtual space; by adopting the chronotope, hypermedia establishes a basis for understanding which accepts Kant’s single intuitive existence for these various dimensions.

The elements of a chronotope are: a particular space, intersected by a particular time, chosen out of the infinity of imaginative possibilities by an author. The difference in all three is that the author of both the architectural space-time and the duration of the film, has actually lived and contributed to the work in another time and another place altogether. Now in hypermedia, the new medium, the controller of the chronotope is the present patron/ user/ viewer/ inhabitant.

In working with digital media one is always aware that its spatial characteristics derive from earlier forms of information technology: we employ images, sound, text and ideas in a somewhat similar way to books, but not books; videos, but not video; letters, films, installation art, but none of these things; we put these elements into a machine which displays them as if they were on a screen, behind which seemingly infinite storage capacity exists, with instant access. Theorists have invented terminology to explain the remnants of these other communication forms; instead I have sought an existing concept which has an accepted form in literature to shift across to this new literature, bringing with it a body of research and understanding. This avoids the redundancy created by invented words; it sidesteps the time it takes for new terms to become accepted, and reinforces the new media as a literary form in its own right. The characteristic which marks out hypermedia as distinct is the means whereby its chronotopicity functions.
It is hard to imagine a work of architecture that is not chronotopic to a greater or less extent. It would not be rail stations, libraries, hospitals, or any of the public spaces which exist to house the busy, rapid reactions to the needs of humanity, where thousands of events take place every day. The time-scale of each action may be longer, but chronotopes are also taking place in and around structures like public parks, sculptures or machine depots. There are chronotopes within chronotopes; any chronotopic event may be made up of many smaller ones, "... they co-exist, they may be interwoven (and) any motif may have a special chronotope of its own." It is not even a categorisation of profound or extreme experience: there are dozens of small chronotopic interactions at the domestic level of a house and a smaller number of very dramatic ones at, say, a forest fire lookout. "It is common moreover for one of these chronotopes to envelope or dominate the others ..." (Bakhtin 1938/1981:252)

It may also depend on the perception of the observer. Architect educator Bernard Tschumi has an aversion to pure form in architecture; he recalls visiting Le Corbusier’s Villa Savoye in 1965 and being impressed only when he saw the plaster falling off the concrete, "It is my contention that the moment of architecture is that moment when architecture is life and death at the same time, when the experience of space becomes its own concept" (Tschumi 1997:7) His chronotopic interest was attracted by the movement of materiality, rather than the human actions in those examples described above.

6.2 *HyperSteel* user assessment survey

As part of the research for this thesis, I carried out interviews with 19 staff and student users of *HyperSteel*, recorded on audio tape and analysed according to qualitative research techniques (Dinham 1989, Strauss and Corbin 1990, Denzin and Lincoln 1994, Kvale 1996). The subjects represent a cross section of the school population, from every year of the five year undergraduate programme, to graduate-tutor, to staff directing the architectural science curriculum.
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The interviews were designed to elicit reaction to the tutorials, its usefulness, and the subjects' perceptions of successful learning strategies. The responses are mixed and carry cautions for those teachers wanting to incorporate digital alternatives in education, to wait until users are completely confident with the new media. “People tend to feel committed to a decision or activity in direct proportion to their participation in or influence on its planning and decision making”, as Knowles says (1984:123). Some survey subjects expressed uneasiness about the pervasiveness of computers before they were personally ready to work there, even nervous that it might be imposed before that time. “The reverse is even more relevant: people tend to feel uncommitted to any decision or activity that they feel is being imposed on them without their having a chance to influence it.” (ibid. pg 123).

It was noticed however, that subjects almost in spite of themselves, delivered spontaneously emotive and verbalised, reactions to the program, whether in completing a tutorial task, or taking part in an unexpectedly evocative animation. Cognitive psychologists have learned that emotive reactions are often associated with non-verbal events, rather than the more mono-media experience, like lectures. Multi media experiences such as that presented by HyperSteel, are more likely to arouse emotion and in educational circumstances these researchers admit the “powerful role of combining imagery and language”. This theoretical approach, of 'dual coding theory', which is the cumulative result of two decades of study by cognitive psychologist Allan Paivio and others (1971, 1981, 1982, 2001) suggests that “an emotional state, however aroused, increases the probability that relevant images or verbal reactions will also be activated” (Paivio 1986:80). Further, that memory and thought make use of the multiple sensory experience and are retained in “modality-specific representations” (Paivio and Sadoski 2001:5) and then retain these properties when confronted with some larger mental structure.

As a fourth year student put it: “You just know when you get the piece of paper (for designing) out and start the sketches and then convert that to a building that can be built. Yes. Its there” (Wendy).
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This deeply retained memory of things learnt and then held in what Gill calls a "subsidiary awareness and embodied existence" (Gill 2000:62) is developed in this thesis into the metaphor of a reservoir or bank of knowledge into which one lodges information, as a desirable location for the retention of the technical knowledge regarding steel construction. The survey deliberately collected student views on how one stored the useful technical knowledge for architectural designing: fifth year student Yves said "sometimes I can work it out in my head".

That the mise-en-scene approach to tutorial design was successful with the survey group was noted, not only by their recognition of its film-like design and appearance, but by the separate features they remarked on spontaneously, and which carried the same visual and active codes of the popular media of young people at the end of the 20th century, a "... media rich world of aural textual, visual and graphical complexity" as Heppell describes the contemporary student cultural milieu. It offers a "complex sensory mix where traditional information structures exist alongside the frenetic and multifaceted." (Heppell 1993:233). This, in contrast to the monomedia cultural inheritance of their university lecturers and design studio teachers, means that this generation may also have devised their own new learning skills to take advantage of this plural media environment. Certainly Heppell thinks so, describing a practice of active cognitive processing in which the student "dialogues" with the software, utilizing "grammar, ground rules, aural and visual cues and clues, which are used to signify meaning, to indicate generic structure and to reference the information web." (ibid. pg 234) These elements of what the cinematographer refers to as a 'mise-en-scene' are being passed on to the makers of digital media entertainment, especially game designers.

Stephen Heppell has particularly informed this thesis with his description of the four stages of computer acceptance in education. I note that HyperSteel itself barely makes the third, transitional stage of progression, as teachers and students take over the computer in order to create their own interactive software. Occasionally, there are glimpses of the fourth evolutionary stage, in some of the animations, or the graphics based write-on tutorials, but the
ultimate stage of admitting its role in changing the way they work, and finally, designing architecture completely in the computer which could not exist except through digital means, this is a harder level of acceptance for architects. The thesis noted that in the fluid designs in Dusseldorff by Frank Gehry for instance, there was no admittance by author or designer, despite the use of powerful and ingenious software, that the computer had stood between designer and completed buildings. (Slessor 2000)

If we were to combine this new level of information management together with the importance to adult students of a sense of relevance and ownership over the knowledge, it is possible to imagine a new generation of HyperSteel, one designed and built by the students themselves. If it were necessary for every student to submit as an assignment, a working interactive tutorial proving some formula, or definition, or principle of structural science, and then these were accumulated together, there would be a 'mine' of self drive puzzles, games, animations and so on, to draw on as study aids. It is important to emphasise, that in order to be successful, apart from carrying an accurate presentation of the chosen scientific principle, the tutorial would not function as a successful communicator unless there were chronotopes present. A set of images, a series of slides of text, and a moving model, will not constitute hypermedia, for the user will not be engaged to interact.

6.3 The chronotope in architectural Education

The centre of the architecture school life is the design studio where, under the supervision and guidance of experienced practitioners, novice architects work on projects. Paradoxically it is both the most heavily weighted area of architecture education historically and philosophically, and the most different pedagogical experience from the rest of the university. It is also the locale for the most vigorous expression of opinions about education by its inhabitants. A key issue for this thesis then, is the form and antecedents of design studio and how the commentary included two general areas which ultimately affected the development of HyperSteel.
I have depended on the descriptions of Donald A Schon of Massachusetts Institute of Technology to provide a social researcher’s view of studio, which he summarises as a “reflective practicum” which by setting up a dialogue with their studio coaches, students gradually work towards a virtual version of a real design solution. He emphasises that “a feel for the phenomena is what designers need, even more than they need to know the relevant equations … these are what scientists and engineers are fond of describing as their ‘intuitions’.” (Schon 1988:4)

In fact, a lack of this innate ability was one of the contemporary concerns in the Auckland of the mid 1990s: the ongoing complaint that in design studio students seemed to be unable to apply the factual principles they were learning in the non-studio part of the course. It reached a head in 1993 when at the annual conference of the Australian and New Zealand Architectural Science Association, under the title Architectural Science: Past Present and Future, many speakers referred to a perceived dichotomy in studios between technology and design, and put their solutions publicly: “no improvement is likely unless there is an educational shift and design is integrated into technological knowledge rather than the reverse” was the opinion of Simon Hayman of the University of Sydney. From senior lecturer W.Granwal, Auckland, came a suggestion that this technological knowledge might be taught in such a way as to “induce skill in structural prediction… (believing) that structural cognition existed before mathematics was formally developed”.

Out of this impulse for a more intuitive learning opportunity, one integrated with the morés of the design studio, came the chance for investing in a complex suite of digital learning tools for the subject area of steel, supported financially by the major manufacturer of steel in New Zealand, BHP New Zealand Steel Limited.

The second general area of debate about studio arises from a political and social philosophy held by many left wing teachers that the studio, in its deliberate attempts to share the practicalities of architectural work with practising architects, tends to continue an enculturation process which promotes the same attitudes and prejudices of the dominant individuals in
Typically this has its roots in a European, male, middle class, conservative value system, in which those who are not part of that class find themselves marginalized. The issue is of lesser immediate impact on HyperSteel but the ability of hypermedia to offer a form of learning that arises from the student body itself, and provide private, non-competitive self-driven methods of study, suggests an avenue for readjusting this dominance. This is especially since the grammar, codes and management of the new media lie with the younger generation of student. It has been observed in architecture schools globally: "Some of the early student adapters found themselves in the unusual position of teaching their teachers ..." wrote Cramer and Gurney in an article on Columbia University's response to digital media and what has become known as the 'paperless studio'. (2000:94)

One Auckland answer to the Eurocentric dominant studio has been introduced by Dr A. Ward in his community design projects, directed mainly towards client groups in the Maori and Pacific nation communities. Since these groups are constantly negotiating the difficulties of post colonial reassertion of ancient land and spiritual rights, there has been an urgent stimulus for his students to learn about issues of power and architecture's place in that struggle. Ward introduces patterns and models, and achieves finished designs through collaboration between students and clients techniques of design which avoid verbalising, talking or writing. (Ward 1991) This description here is deliberately brief, because it has not been part of the history of HyperSteel, but it contains further endorsements towards the possible evolution of architecture learning. It indicates a likely shift in the patterns of power in studio already indicated in the superior digital literacy of students themselves; it reinforces the importance of an other-than-text literacy in our information skills, and it illustrates the possibilities of collaborative, non-hierarchical interaction in the design process.

Computer use in the latter half of the 1990s has extended the interaction possibilities internationally, a crucial matter for schools in Australia and New Zealand, who have always been aware that they were studying a professional tradition which has its roots in the northern hemisphere. This has been a
general fact of life in Auckland, already mentioned in this thesis with reference to the acute feelings of sentiment aroused by the Civic cinema and Hollywood films, and something to be accepted at architecture school, except when countered perhaps by the expensive occasional study tours arranged by energetic staff. Now, however, ‘virtual design studios’ have become a reality, including ‘electronic pin-ups’ with mutually compatible software, and synchronous student presentations in which schools across the world may participate in each other’s design activities. (Laiserin 2002:142)

Somewhat harder to surmount, is the time difference: as the near-antipodes of Great Britain, and in very different time zones, New Zealanders will always find themselves meeting synchronously at times when their own body clocks indicate less-than-sharp attention. However, a nearer version presents itself and arises out of the potential for *HyperSteel* to be web based and accessible from a student’s home or other location: a digital studio-on-the-road, combining the traditional ‘field trip’ with the mobile capabilities of telephones and computers which would take advantage of this country’s variety of urban and rural building sites, and all the features of internet connections with libraries, geographical data, weather schematics. At the same time it would be able to interconnect visually and interactively across the country for the interchange of ideas with city-bound practitioners or schools of architecture in other centres.

At another level, one concerned with university administration, the development of computer data collection technology is also able to provide certain behind-the-scenes capabilities which must be reviewed in tandem with the more obvious features because it relates to ethical issues. The teacher providing *HyperSteel* for their students either as an aid to learning scientific principles or in order to test their knowledge by way of the tutorials, may also collect information about that student’s interaction with the program. This is technically feasible, and may be in one of two ways: embedded in the program there is already the possibility of secure on-line marking of tests, which has been used, but not to any great extent, because wider use requires changes to university rules and the administration of tests; the second possibility is the
capacity (already exploited by supermarket chains in their loyalty card campaigns) of computers to collect data on the user: for instance, how long the student has spent on the program, which tutorials took longest to solve, which were accomplished very quickly and thus were very easy, which mistakes were repeated, which screens were open for long periods and perhaps were being studied thoroughly, which screens were not ‘found’. This observation of the student would obviate the ‘private’ nature of the hypermedia product, and carries certain questions of invasion of personal information.

However, the asynchronous opportunity for discussion with tutors and fellow students over the material presented in the program via intranet access is certainly a constructive support mechanism which already exists for university courses, and can also be enabled for HyperSteel and construction science.

6.4 Summary

This study concerns itself with the interplay between the two constituents of our existence: time and space, and in its turn, finds itself caught in its own time-space, enacting a chronotope that is as various as the teaching program in an architecture design studio. This thesis stands between the practical arts of film and architecture, serving as client the engineering and architecture industries. It owes identity to its location in New Zealand and its isolation from other schools, multimedia producers and film companies. Its history has just rolled into the 21st century but it pays theoretical dues to writers of an old Europe and film makers of a prosperous Hollywood.

Its primary intention has been to arrive at the single characteristic which marks out hypermedia as a new communicative form, and to do that I have adopted a term from the older literacy. The adopting of ‘chronotope’ comes with the responsibilities this work accepts, of defending its use, and it also opens up the promise of further evolution as the hints already described above, suggest.
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The work has also been about borrowing between architecture and film, since both activities freely re-cycle what they find from each other and from the culture, economy and politics of the society they serve: here, the film maker borrows the condition vertigo and all its dramatic connotations; the architect takes the altered perspectives and cultural evocations from the stage of the gaudy faraway, and builds them into the Civic; and a teaching/learning program provides experiences familiar to students used to computer games and videos and the users were observed to speak and behave as if they were taking part in some entertainment. They accelerate the amount they change, develop and learn as a result of this circular association.

It is arguably, in the proficient use of movement, sound and narrative links where imaginative issues that are diffuse rather than concrete can be investigated. Added to the benefits of positive learning strategies and the use of computer imagery in architectural documentation, the relationships between architects and film makers can be seen to be combining in an aesthetic for hypermedia. It has resulted in new fields of endeavour for architects: cinematographers are turning to architects to create their computer based environments for films such as The Lord of the Rings (Jackson, 2001/2002), and Matrix (Wachowski Brothers, Warner Bros, 1999), and the field of games development, which has opened up new representational opportunities for architecture. By installing the basic architectural massing in a computer, applying trompe l’oeil effects, combined with some decorative elements, even at first year level architecture students can achieve an apparently tangible illusion of their design. Philip Campbell, gameplay designer, identifying himself primarily as an architect, goes further:

... the emotional impact that can often only be implied by the best architecture can be vividly acted out in a game, with a palpable sense of danger, the threat of ‘real’ death, a life lived at hyper-reality pace. We can carelessly defy gravity and logic in a place where Escher constructions are not merely visual conundrums; they are traversable and habitable (Campbell 2002:113).

Even since my involvement with the day-to-day provision of movie-based support to design activities ended, and since the present study of HyperSteel
was undertaken and completed, design activities closely related to filmmaking have become progressively a major component of undergraduate design education at the Auckland school and I believe that similar and related design research directions are being followed at some other leading schools of architecture such as the Architecture Association, London, and the Royal Melbourne Institute of Technology. Joint programmes of studio and project oriented design have been undertaken with these other schools in recent semesters. Digital authorship is rapidly becoming commonplace in architecture education also in some radical practices.

Even if it proves to be the case that HyperSteel does not continue to be used at Auckland or if it is only of marginal importance in terms of the whole life of the school, yet this opening up of architecture education to what I am calling the cinematic has been a ground-breaking project. In conclusion, and above all, the theoretical analysis of the mouse-click continues to be relevant in this period of the apparent transformation of the discipline.
PRIMARY SOURCES


BIBLIOGRAPHY


Architectural Design, 70, 16 - 19.

Cinema, Harvard Design Magazine 81 - 83.

Dinham, S. M. (1989). College Teachers Thinking and Planning: Qualitative Study in 


A. di Sessa, C. Hoyles, R. Noss & L. D. Edwards (Eds.), Computers and Exploratory 
Learning. Germany: Springer.

Dobson, M. (1999). Information enforcement and learning with interactive graphical 
systems. The Journal of the European Association for Research on Learning and 
Instruction, 9, 365 - 390.

Representations. Learning and Instruction. The Journal of the European Association 
for Research on Learning and Instruction, 9, 303 - 307.


99 - 103.


Grand Style, 42, 63 - 67.

Approach to Film Form. In G. Mast & M. Cohen (Eds.), Film Theory and Criticism. 
New York: Oxford University Press.

Sphere and the Labyrinth. Cambridge Massachusetts: Massachusetts Institute of 
Technology.

Cambridge Massachusetts: MIT Press.


& N. Entwistle (Eds.), The Experience of Learning. Implications for Teaching and 
BIBLIOGRAPHY


BIBLIOGRAPHY


BIBLIOGRAPHY


Rapoport, A. (1984). Architectural Education: "There is an urgent need to reduce or eliminate the dominance of the studio". Architectural Record, October 1984, 100 - 103.


BIBLIOGRAPHY


BIBLIOGRAPHY


SECONDARY SOURCES


FILMOGRAPHY


Lang, F. (1922). *Dr. Mause, Der Spieler*. Berlin: UCO-Film.


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APPENDIX II

HYPERSTEEL COMPONENTS
A detailed description of the seven data bases comprising HyperSteel.

HypersteelLibrary
The user requirements for HypersteelLibrary the largest form of the HyperSteel project calls for an Apple Macintosh computer with System 7.0 or later, and 16MB RAM. It contains 880 files or 70MB of material and in order to achieve all navigation functions, it is necessary to re-configure the Netscape browser with additional preferences, as instructed on a jacket with the CD or on the first screen of the program.

It is deliberately designed to look like a very plain web page, a familiar and reassuring front screen to an undergraduate arrival (see Figure 5 page 123). The intention is to encourage confidence in the student working alone to set up the on-screen working area to their personal requirements. Technically speaking, it is scripted in hyper text markup language (html) in two vertical scrolling columns which allow the user to browse in one, using the other to control a return. The ‘back’ button and re-sizing functions are the most likely of the usual web browser controls to be needed. Links lead to all the components though the main content topics of:

1. Lecture Notes,
2. Case Studies,
3. Self-drive Tutorials,
4. Structographics Symbols Charts,
5. References,
6. Tests,
7. Teachers’ guide, student handbook.

HypersteelLibrary is the access to three main sets of material, and other references:

Lecture Notes, Case Studies and Tutorials.
1. Component: Lecture Notes

This includes 12 lecture notes for each of three years. Attached to each year are workshops, tutorials, special case studies. Within the notes for some lectures are links to revision and extension lectures and there are occasional links to specific places in other material. For instance in Year 2, Lecture 4 "Frames", there is a link to HyperSteelIssues which shows an interactive demonstration of beams loading theory. Quitting from here will return the user to the lecture notes.

Providing lecture notes in hypermedia gives students the chance to print-to-hard copy, extend or revise their study of the lecture course privately and in their own time. This accessibility is particularly important because the range of differences in students' structures experience before entering university means that individuals have very diverse study needs in every class. Notes for the workshops and tutorials explain how these activities relate to the lectures.

The academic content of these lecture notes, reproduced here in full, follows that given by the lecturers. Some are in note form, others fully written in essay form. They strongly reflect the client community of HyperSteel, focused on the conditions of the Auckland and New Zealand building industry. They include considerable drawings, tables, formulae and other 2D illustrations.

When they are out-of-date they will easily be amended without losing any of the other elements of HyperSteel. A group of short sample essays presented as case studies are linked from here. Technical simplicity means these files are easy to copy to disk, network or paper so they can be used for examination preparation or for inclusion in assignments. The 2D illustrations have been retouched from material which originated as photocopied handouts. On the whole the finished product is an improvement on the handout, having been through an extra editing process.
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Note: There is in Year 2 Lecture 1 "Forces on Buildings" a link to a student assignment on Euler's Formula completed in html, together with a QuickTime movie and links (see Figure 12).

In Year 3 Lecture 2 "The Basics of Columns, Footings, and Framing" is a link to a student-drawn example of a wall component animated in virtual reality (QTVR) and able to be user-manipulated to show its underground construction details. These were constructed in StrataStudioPro®. Several lectures require an understanding of the Structographics symbols. As well as a main menu button link, there are embedded links to the chart for easy user access. The "Back" button will return the user to their place in the lecture.

![Image of QuickTime movie]( WHY DO COLUMNS BUCKLE? Advanced Structures 755-101 Interactive Assignment Helen Stevens 1996)

Figure 12. Student structures assignment with QT movie

2. Component: Case Studies

2A. Component: Five Case Studies

These include short essay-style descriptions of structures chosen for their unusual or thought-provoking manner of design. They have been provided to complement and extend the course, and to give a design-based context to structure theory. Written by the tutor attached to the course, they are
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accessible from the main *HyperSteelLibrary* menu, also within the lectures series.

They have been scripted in hypertext markup language (html) and are able to be copied or hard-copy printed.

2B. **Component: Case Study of Alexandra Park racing stables, Auckland**

This is an extended example of hypermedia text, and offers exploration of a steel building of unusual design (see Figure 13). It is accessed directly through the case studies menu in *HyperSteelLibrary*. It has its own internal navigation, and a main identifying icon to its own home page. Its main sections are:

- Guided Tour
- Construction Time Line
- Design Issues
- Companies involved in its development.

![Image of a webpage design with clickable links and an edited video]

*Figure 13.* Case study designed in world wide web page style, with clickable links and an edited video
The Alexandra Park racing stables case study sums up the entire course theory in one practical example, providing notes on its structure, design and construction stages. The overall impress is of a building in use, and how its construction in steel gives it advantages for that function. The value of seeing a local building designed and built in Auckland heightens the sense of personal identification for students.

It recounts the construction sequence of the Alexandra Park racing stables, in Auckland. Real issues confronting engineers, clients and architects are outlined and there are photographs and drawings of most stages and details. The firms involved in its construction are listed.

Technically, the case study is in web site format which opens within the HyperSteelLibrary but later emerges in its own page. The 'Back' button returns the user to HyperSteelLibrary. It is divided into four quarters, and highlighted text in one quarter links to images in other quarters. Unused quarters contain photographs on random rotation from a library of images.

In the guided tour section, special design features include five self-drive horizontal 360° panoramas included at main locations around the building. These were made in one of two ways:

a) either from video footage taken on a tripod from a central position inside the building, or

b) by stitching together 30mm wide-angle photographs in Photoshop in vertical format. Utilities published by Apple at the time and downloaded from the web gave the geometry to convert the Photoshop files into QuickTime movies. These were then able to be self-driven by the HyperSteel user. As well as rotation in a full circle, limited zooming in and out is possible (as in Figure 7c, pg 131).

There are two edited video movies with sound. One shows the interior of the stables during a working day (see Figure 14), the other a public race night and
the running of a race (see Figure 20 pg 236). While neither shows many of the structural features except as background, each demonstrates the vital activity which takes place here, its excitement, colour and bustle. These glimpses of the sounds and appearance of the stables explains many of the design decisions discussed in other sections.

Figure 14. One of two movies in the case study shows the day-to-day action in the stables

3. **Component: self-drive tutorials.**

These comprise:

A) *HyperSteel I* (as opposed to the entire suite of materials) a compendium of steel knowledge. This contains further elements as tutorials:

i) *External Forces*

ii) *LearnTerms*

B) Drive-yourself *Structural Exercises.*

C) Drive-yourself *Structographics Exercises.*
D) *Loads and Loadings* tutorial.

A small sub-program written *HyperSteelLibrary* allows the tutorials programmed in HyperCard®, and Macromedia Director® to be opened from within Netscape. It requires the user to re-configure the browser in their computer, by an instruction signalled on the entry screen of *HyperSteelLibrary* and easy to carry out. The sub-program performs the link so that Netscape remains running.

3A. **Component: HyperSteel I**

This component of the suite is referred to as ‘I’ because it was constructed first. It is an on-screen compendium of steel-related information and quizzes. Its historical content is largely extracted from *Architecture in Steel: the Australian Context* with the kind permission of the author and publishers (Ogg, 1987). This textbook is an Australian resource about steel and its use in architecture and there are many examples and narratives which resonate with New Zealand architects.

Other material comes from the teaching material used by the academic authors of *HyperSteel*.

It includes a suite of elements with its own linking technology. All elements of this version link to all the main sub-sections of *HyperSteel*. Menus and sub-menus lead the user from main sections of History, Production, Issues, Uses and Tutorials into an interconnected series of screens offering text, illustration and various elements to demonstrate the subject (see Figure 2 pg 117). All screens show a one-step link backwards, together with a link back to previous sub-section. There are also links to the credit roll, and a Quit button.

The technological decision-making process of *HyperSteel I* is important. This program is a HyperCard stack. Its appearance and navigation reflects its design in 1993, as an early example of hypermedia, constrained by the limitations of HyperCard and colour at the time.
The choice of host computer was determined by its ubiquitous availability: the most likely tertiary level Macintosh computer in student laboratories was the 'LC'. This provided a 640 x 480 pixel screen, colour, animation (QuickTime movies) full motion video and audio replay, at between 1 and 2 megabytes capacity. Options for video capture and replay were limited, and since capacity was tight, choice of video would have to be very careful. Colour was another quality to ration because its use slowed down the running of the program. There are two small video clips, and two sound-only audio tracks.

Links are designed so that a subject introduced in one main topic can be followed up and elaborated in another. For instance the following sequence takes one theoretical concept to be studied and traces how it appears on-screen:

Concept: Beam action.
Start: HISTORY.
Click to: Building Type.
Click to: Expositions.
Click to: Centre Pompidou.
Read text, view illustration.
Play action: Richard Rogers, architect explaining his interest in using steel in a way that makes his structural intentions legible.
Click to: PRODUCTION.
Click to: Structural properties.
Click to: Stress-strain diagrams.
Read text, view diagrams.
Interact to: load the beam to failure.
Repeat until concept understood.
Click to: Linked concepts in ISSUES.
Click to: Structural principles.
Click to: Beam Theory.
Click to: Shear Forces and Bending Moments.
Read explanation, study diagrams.
Click to: TUTORIALS.
Click to: External Forces.
Click to: Bending Moment Diagrams
Click to: First example.
Draw on unfinished diagram, relate to real-case example.
Play movie, study mathematical explanation, read text.
Click to: Next example, and next one etc.
Click to: associated Concepts.
Click to: ISSUES, Bending Moments for longer explanation of principle.
Click to: ‘One step back’ icon to return to Bending Moment TUTORIAL.

Each screen of the External Forces tutorials includes the same information presented in different ways, to provide alternate ways to study the concept.

One is the ‘draw-on’ facility. Programmed uniquely for HyperSteel because this facility was not then available for HyperCard users, it allows the user to engage a drawing point directly onto an example problem, sketching the solution, which may be checked with the demonstrations.

Another was a movie of the action of the concept, previously programmed in Multiframe®. It has changing colours showing the points of greatest stress.

In the HISTORY section, short sound bites of architects Richard Rogers and Norman Foster explain their particular design bias towards steel structures.

The PRODUCTION sub-menu includes an introductory video from one of the academic advisers of HyperSteel. It also includes two animated demonstrations which may be activated by the user.

In USES a ready reckoner has been installed from which the user may learn the permissible loads on beams according to the profile and size of proprietary
beams. By inserting dimensions the reckoner will return the availability of the beam. There are fourteen of these calculators.

3A i) **Component: External Forces**

This component containing 34 examples of structural theoretical principles, devised by the academic authors of *HyperSteel*, is intended to provide random examples for users to complete either as a problem solving task, or repetitiously in order to ‘pattern’ their intuitive understandings of the theory.

Accessed from within *HyperSteel I* via the tutorials sub-menu, it links to theoretical concepts related to each example. Sub-menus lead to deflections, bending moments, axial stress diagrams and load paths. It is a HyperCard stack with clickable hidden fields, available randomly. The ‘draw-on’ feature is a sub-program written for *HyperSteel* within HyperCard.

The central function is a ‘click ‘n’ draw’ screen which gives users a point as if it were a pencil, in order to draw freehand onto the lines of a problem. An ‘Erase’ removes the user’s drawings. Other ‘clues’ to each problem include an ‘as-built’ example, a text-based definition, a QT movie or a math graph.

3A ii) **Component: LearnTerms**

Designed to introduce undergraduates to the terminology used by architects and engineers for specific structural components, it includes 81 sketches of steel construction components (see Figure 15). It is accessed from within *HyperSteel I* via the tutorials sub-menu.
Figure 15. A sample screen in *LearnTerms*

This is a HyperCard stack, in which users may take in their choice of term, then the correct answer will be shown. The examples are random, and collected in categories of Roofs, Walls and Floors. A Test version is available under password control of a tutor. It has a guessing game-like quality, as the user may or may not choose to reveal the terminology during the interaction.

3B  Component: *Structural Exercises*

Figure 16. A tutorial in *HyperSteel I*, giving the user a simple click 'n'draw option to practice an answer
Three levels of problems are available, in which deflection, bending moment, shear forces and compression are all included in random selections in some 75 alternate structural situations. The groupings are in order of difficulty, and, as a compliment to the architecture students’ appreciation of challenge, the levels are named Difficult, Advanced and Bewildering. Accessed from within HyperSteelLibrary, they are designed to extend the value of the external forces problems already met within HyperSteel I (see Figure 16).

Using Director® as an improved programming software, it was possible to supply the user with a number of active tools: a pencil point, a straight line, an eraser, a wipe function, next, previous, and the suggested answer. This palette of drawing tools means that the user can make a more refined drawing than had been possible in the External Forces exercises in HyperSteel I. For the learner this feels more satisfying, and results in a positive endorsement for a solved problem.

Figure 17. A draw-on screen with extended palette of drawing tools
When the user has completed 9 answers, they all appear on-screen together for revision and re-occurring faults can be addressed. This occasional interruption is a small reward and rest for the student-user.

The Help button opens a set of Structographic symbols and definitions scrolled by a flag graphic which seen elsewhere in HyperSteel.

**3C Component: Structographics**

The Structographic symbolic notation was devised by Waldo Granwal to enable the learner to analyse a structure by placing symbols describing its theoretical action. The program provides a number of structures from simple and familiar to the highly complex, and thus users can extend their understanding by applying what has been learned to each new situation. Altogether there are 15 alternate diagrams on which to attach symbols, the structures having been chosen by the academic staff teaching core papers in Structures Theory.

The six structures are all familiar to students at the Auckland School of Architecture. A studio stool. A pup tent. A shed built of timber framing, weatherboards and steel roof (see Figure 18). The tallest tower block in the city. The school itself. An unusual triangular multi-storey building.

![Image of HyperSteel interface](image)

**Figure 18.** Common New Zealand timber frame shed used to apply structographic symbols
As well, the main *HyperSteelLibrary* menu page accesses a comprehensive list of Structographics symbols with definitions.

The interactive drag ‘n’drop elements, sound bites, and mouse-over shadows were all programmed in Director. On each of the structures, the action of ‘mouse-over’ reveals the shadows of its structural form such as beams, columns, ceilings, etc. Each structographic symbol may be ‘collected’ by the mouse, and ‘dragged’ to the structure. As the shadows of elements are revealed, the user may ‘drop’ the symbol. It is returned to its place at the side it is not appropriate for that action of the structure. If it stays, description is accurate.

A user may wish to leave an example half-completed and return later when other examples have been attempted, thus applying one principle to several instances. The symbols already chosen stay in place. Short sound effects accompany the movement, and a ‘Completed’ noise and graphic is the reward.

**3D Component: Loads and Loadings**

Accessed from within *HyperSteelLibrary*, this tutorial was included to explain the simple level of theory regarding loading on structures. 12 topics are covered. It provides revision to those entering architecture from having had little experience of construction prior to starting university. The free, user-choice navigation means that users follow their curiosity, rather than a sequence controlled by the author.

A Director program, this *HyperSteel* tutorial is the most similar to the conventional hard copy hand-out for a traditional lecture. It is a set of screens with coloured word links (see Figure 19). The screens are like pages in a textbook, with ‘post-it’ note style clickable navigation buttons, and highlighted words which jump to associated screens.
4. **Component: Structographics Symbols Chart**

Accessed from the first screen of *HyperSteelLibrary*, this is an extended list of 47 symbols to support the tutorials and lectures.

5. **Component: References**

Accessed from the first screen of *HyperSteelLibrary*, this is an alphabetical list of text-based reference material.

6. **Component: Tests**

Under tutor control, these are available for *Structural Exercises* and for *LearnTerms*. They comprise the same material as in the tutorials. When required they are loaded onto a suite of computers, say, in a teaching laboratory, at a scheduled time.

Ten random examples are presented to the user. They are dated and timed. The program prints the answers as a report, which is then collected and counter-signed as the student leaves the room.
Several features of the tests exploit the resources of a computer to advantage:

a) The tests include the same freehand draw-on facility of the structural exercises held in the main *HyperSteel* suite.

b) Because the program is precise about the duration of the test the lecturer is able to see later, what this could imply. If the student took a long time to do the examples perhaps they were, therefore, struggling, or they took a short time but got many examples wrong, displaying a casual approach to the problems.

c) Random examples for each test means they may be applied at staggered times which makes it possible to use a computer laboratory many times for the same test for the class of a core subject.

7. **Component: Teachers' guide, student handbook**

This hard-copy handbook provides a stepping stone between the traditional lectures, tutorials and paper handouts, and the new media opportunities of hypermedia.

**AUDIO**

*Video clips with sound.* In the racing stables case study, short edited video sequences of activity in the racing stables, allow the program to present a glimpse of the clients and end-users of the building. The sound-track of horses' hooves, chatter, then the excitement of an actual race, enhances the movie.

*Sound 'bites'.* In the *HyperSteel History* collection, distinguished architects spoke briefly about their response to the use of steel in their designs. This gives an added dimension to seeing static pictures of these celebrated designers' buildings.
Sound cues. Rewarding noises on completion of an exercise, was used for the Structographics exercises, but remembering that HyperSteel is usually used in a computer laboratory it was felt that repetitive sound effects would be an irritant to nearby students, so this opportunity was not extended.

Figure 20. Edited video in HyperSteel case study

Figure 21. A rewarding sound accompanies completion
INTERVIEW TOPICS FOR STUDENTS

1. Introductory:
   - student's present level of study, gender, previous schooling characteristics
   - background in structural principles prior to entering university
   - general attitude to using structural theory in design.

2. HyperSteel
   - using the computer, the student will be shown a number of examples of how structural theory is represented, particularly those features including an example of a time based function and asked to freely comment
   - have they used each feature during their study
   - do they agree / disagree with this manner of representation
   - do they have a personal opinion on how or why it does or does not work, in assisting them to understand
   - is there a feature in HyperSteel which has particularly attracted them for some reason.

3. Intuition
   - how would they describe the importance of knowing the theory of structural understandings
   - which concepts have been difficult ones to learn
   - do they need to 'look things up' when applying theory in design – what sort of things do they look up
   - what sort of things do they know without thinking can they remember when they began to know these things
   - is it more / less important for an architect to have an intuitive feel for structural understandings
   - does their own personal way of learning lie mostly in words, images, moving images, sounds, or say, mathematical formulae? Is there another sense – say, a tactile, or physical one, involved.
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Purpose of Interviews:

a) The interviews will seek out certain relations between *HyperSteel* and the construction and structure course.

b) They will provide a range of subjective language and experience during the educational process of becoming an architect to do with intuitive understandings:

   - The software by which they will be analysed will identify and establish patterns between such terminology as instinct, feeling, design flair, automatic responses, insight, inspiration, subconscious, spontaneous and educated guesses.

c) The development of a useful intuition ("immediate comprehension without reason") together with the core curriculum and the use of *HyperSteel* will be able to be compared for links between them.

d) The importance of time based elements of multi-media design will be identified in actual examples.

e) The software program *HyperSteel* will be subjected to a useful review process.
TOPICS FOR DISCUSSION WITH LECTURERS

1. What place has C and S had in the curriculum in the past – is Structural theory important or is it an engineer's problem?

2. When (i.e. which year, at the beginning, middle or end) do you start to make reference to HyperSteel? Which parts of HyperSteel?

   Do you get noticeable effects – what are they? Are they short term, or long term?

   Are you familiar with all of HyperSteel?

3. How would you describe the knowledge that is gained through HyperSteel: facts, abilities, attitude, habits?

4. Please make a statement about what the change in technology has meant to you – from chalk to screen. Features, problems, advantages?

5. Patterns of use – what common links are there among HyperSteel users? What signals a student who might be going to have trouble with structure theory? How does HyperSteel answer this?

6. Preparing material for the computer – is it the same as a lecture? Different? Better? Worse? Teaching now includes lecturing, tutorials and self directed tutorials – any comment?

7. The Computer is a very hungry medium – have you found it so? It is also fast – or slow – comment? Having all this material available in several forms – can you imagine what will be involved in managing it in the future? Have you considered the problem of assessment? Testing?
APPENDIX V

CONSENT TO PARTICIPATION IN RESEARCH

THIS CONSENT FORM WILL BE HELD FOR A PERIOD OF SIX YEARS

Title of Project: The Contextual Place of HyperSteel in an education for Architecture.

Researchers: Ms A Soutar.

I have been given and have understood an explanation of this research project. I have had an opportunity to ask questions and have them answered. I understand that I may withdraw myself or any information traceable to me at any time prior to completion of data gathering without giving a reason.

I understand that I may be approached by phone or in person for clarification at a later date.

I agree that interviews may be audio-taped for this purpose.

Signed:

Name (please print clearly)

Date:

APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN SUBJECTS ETHICS COMMITTEE

TRANSCRIPT CHECK

These tapes are the recordings of the process of discovery of an interactive computer programme. The transcripts are selected comments of the interviewee and the interviewer. Much of the dialogue is not recorded on the transcript because it relates to the actual working of the computer programme.

The parts of the recordings which have been transcribed, however, are to my knowledge accurate renditions of what was recorded onto the tape.

Wong Liu Shueng
13th November 2000
PARTICIPANT INFORMATION SHEET

Name of study: The Contextual Place of HyperSteel in an education for Architecture.

Name of Researcher: Ms Anna Soutar

Name of Department: Department of Architecture, University of Auckland.

This study is being taken in part fulfilment of the requirements of a PhD.

Invitation to participate: you are asked to contribute to this study into the purpose for computer-aided learning material (CAL), known as HyperSteel in the Construction and Structures Course. This material has been available since 1992, each year being added to and incorporated more into the curriculum.

This research has arisen out of the widespread use of Information Technology in education. Examination of its use is important to understanding how to improve its delivery.

Your contribution will be by way of a 45 minute interview with the researcher, which will be tape recorded. This interview will be transcribed then analysed in such a way as to discover patterns of responses in many individuals who have taken the Course. This will appropriately be done through a data management computer program.

All interviews, data analysis and subject codes will be completely anonymous, identity records being held by the researcher, not available in any other way. The tapes and transcriptions will be held secure for six years from the start of the study after which time they will be destroyed.

There is a possibility that you may be approached by phone or in person for clarification on some points at a later occasion.
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You may withdraw at any time from this study without giving any reason.

Thank you very much for your time and help in making this study possible. If you have any questions about this project, you may contact me in Room 541, Department of Architecture. My home phone is 3764871.

For additional queries about the project and your participation please contact either of my co-supervisors:

Dr Michael Linzey
Post graduate Supervisor,
Department of Architecture
University of Auckland
Telephone 3737599 ext 8626.

Dr. Richard Hamilton
Affiliated Supervisor
Department of Education
University of Auckland
Telephone 3737599 ext 5619

Alternatively, you may contact the Head of Department of Architecture:

Professor John Hunt
Head of Department
Department of Architecture
University of Auckland
Telephone 3737599 ext 8690
APPENDIX VII

For any queries regarding ethical concerns please contact:

Dr Dennis Moore
Chair
University of Auckland Human Subjects Ethics Committee
c/- Finance Registry
University of Auckland
Private Bag 92019
Auckland
Telephone 3737599 ext 8939
APPROVED BY THE UNIVERSITY OF AUCKLAND HUMAN SUBJECTS
ETHICS COMMITTEE

On March 1998 for a period of 2 years, from March 1998, extended March 2000
Reference: 1998 / 031
APPENDIX VIII

SHORT PROFILES OF SURVEY SUBJECTS

Identification information and full transcriptions of this survey are held by the University of Auckland School of Architecture Property and Planning Library. The following descriptions are intended as a summary of the interview subjects, their gender, status and short notes on their pre-University education. In addition, any significant influences which might have affected how they perceive their own Structures understanding, are noted.

The names are pseudonyms.

"Alex"
Teaching staff.
Male.
New Zealand Pakeha.
Senior Lecturer in the course Construction and Structure. In charge of the Structures stream of lectures and support materials, of which HyperSteelLibrary is one part. Since 1994 the content author for HyperSteel development. An engineer by profession, he is accustomed to taking an adversarial position among the architects in studio in order to defend the necessities of structural requirements against some design impulses proposed in studio. He sometimes expresses difficulties with habits of sexist language which is acceptable among his largely male dominated peers, and with using computers as an everyday tool.

"Barry"
Teaching staff.
Male.
New Zealand Pakeha.
Part-time Lecturer in Construction and Structures, with particular responsibility for the first year's compulsory paper and its tutorials. He shares this work with his practice as a civil engineer. He takes great care in devising practical ways to introduce the architecture students to theories he learnt in a very different, numeracy-oriented way as an engineering student.

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“Chris”
Teaching staff.
Male.
New Zealand Pakeha.
Tutor in Construction and Structure. Working as tutor to support his PhD in architecture history. Educated as civil engineer and worked for ten years before coming to architecture school. Also educated in the rote-learning of theory, ‘blind’ acceptance of numerate understandings methods of the engineering profession. However having very recently been through the architecture undergraduate curriculum is able to integrate engineering theory with architecture design requirements. Very comfortable with the academic presentation of material, prepared the short Case Study papers in HyperSteelLibrary which provide not only interesting discussions of structural principles in real buildings but model academic answers for essays and examination questions.

“Dell”
Fourth year student.
Male
New Zealand Pakeha.
He has been out of the education environment for four years since school working at non-architecture associated jobs, before entering architecture school. Articulate, confident, aware that he is interested in the business side of architecture – he makes several comments about seeing himself as a practitioner. Describes himself as a pragmatist and impatient with any non-practical approach.

“Enid”
Fifth year student.
Female.
New Zealand Pakeha.
She came to architecture school directly from an all-girls city high school. The daughter of a master builder (“he’s a general builder but he does lots of fiddly things”) she is confident about structure theory and her own designing skills.
“Frank”
Fifth year student.
Male.
Immigrant (Chinese).
He attended an Auckland state high school. He cannot remember any practical experience from home or school which might have given him any sense of structural ‘reality’, but he now relates design ‘beauty’ with its structural success. A vacation job in an architect’s office has started him thinking about the relevance of practice-related skills.

“Glen”
Second year student.
Male.
New Zealand Pakeha.
Educated at a private boys’ school which gave him wide opportunities to mix artistic activities with senior State examination preparation. At this stage of his degree he admits to seeing little relationship between Structure theory and HyperSteel.

“Henri”
Fourth year student
Male.
Foreign (Central European)
He is the son of a practising architect. He is very well spoken, and self confident. His schooling included little that was practical, biasing towards the mathematical, preparing students for higher education in the technical professions.

“Ike”
Third year student.
Male.
The son of a practising Auckland architect. He has completed an undergraduate degree in English Literature, with a major in philosophy, and has had various jobs, none of them related to either degree. He rejects the practicality of house building which he said he “grew sick of” during his childhood, and told me that he was not intending to practice architecture but continue on into Masters towards the
philosophical side of academic work. During the interview and demonstration he started with being quite offhand about HyperSteel but became engrossed in some of the examples of the exercises.

30009 “Jack”
Third year student.
Male.
New Zealand Pakeha.
A qualified architectural draftsman, educated in a small country town state school and polytech. Both the polytech and his family circumstances gave him the opportunity of building site experience. Admits to difficulties in architecture school learning the theoretical side of the degree although he has completed the third year.

30010 “Kelly”
Third year student.
Male.
New Zealand Pakeha.
A third year student from a small private urban co-ed school which emphasises a broadly based education. During this, short intensive studies of mechanics, house building, and projective geometry and other such subjects are given. At home he had the opportunity to do practical projects under his own initiative. He came to university straight from school but took a year off to visit Germany.

30011 “Lee”
Third year student.
Male.
New Zealand Pakeha.
A student from a farming background who attended a well-established all-boys boarding school in a small city. His body-language is restless and energetic, and he has an advanced interest in the design of computer software.

11012 “Peta”
First year student.
Female.
New Zealand Pakeha.
A student a previous undergraduate degree in Fine Arts. She attended a private all-girls school in Auckland where she followed an interest in those subjects. Childhood practical experiences involving structure included girl guide projects such as putting up tents, making three-dimensional pictures and bush craft.

51014 “Rochelle”
Fifth year student
Female.
New Zealand Pakeha.
She went to a small town all-girls school. Despite being almost completely through her degree she showed very little confidence in her own abilities.

40115 “Si”
Fourth year student.
Male.
Immigrant (Chinese).
A Chinese-origin New Zealander educated in a small city at a state high school. He is a fourth year with a father who is a mechanical engineer, so he spent his childhood visiting a garage, being allowed to do simple things. Has come to terms with the bias of the school towards aesthetics rather than structural reality, but regrets it because his own preference is towards the latter. Expressed personal pleasure in understanding how buildings perform.

30116 “Vic”
Third year student.
Male.
Immigrant (European).
Went to a small town single sex school. He does not recall many opportunities from his childhood for practical experiences. He admitted to having learning difficulties of several kinds at school and has sought extra tutoring from the course tutor.
APPENDIX VIII

51017 "Yves"
Fifth year student.
New Zealand Pakeha.
This student went to a small city based girls' school. It has few resources so the student found her own way in seventh form Design. Her main interest until entering university was dancing and her family circumstances have given her the opportunity for international travel. Despite this worldly experience and having nearly finished a degree in a demanding professional school she expresses a lack of confidence in her design ability.

41018 "Wendy"
Fourth year student.
Female.
New Zealand Pakeha.
A married woman, with a three year qualification as draughtswoman before entering university. In her drafting work she specialised in designing and drawing up kitchens. She and her husband, a builder are developing some land and have already designed and are building two homes on it. She has had considerable experience in getting drawings through the permit process and has a 'hands-on' view of the construction process.