INTRODUCTION

Early cinema holds untold fascinations for researchers. Two such, apparent in the literature almost from the very inception of film studies, are the meaning of the images and the lack of any durable consensus around either its technological origins or its principal inventors. For many years, the first area of research appeared to yield to the idea that, as film was an emerging and unprecedented form of representation, it took time for producers to learn how to manipulate moving pictures expressively. Since early films were thought to be merely primitive attempts at a film language that audiences only later began to recognise and appreciate, a catalogue of “first uses” in respect of film form was developed to show how film-makers gradually realised the potential of the medium to convey complex messages in the form of narrative cinema. By the late 1970s, however, this approach began to be challenged on a number of grounds as evidence from the archives appeared to show that early films were more semiotically dense than had previously been recognised. Perhaps the most significant stimulation to the re-evaluation of early cinema history was the 1978 conference of FIAF in Brighton which brought together film archivists and scholars in an attempt to rescue early films from both physical decline and academic obscurity. This produced a dynamic re-appraisal of much of the received wisdom of film history, and as new evidence emerged it became clear that many of the accepted assumptions about the naïveté of cinema’s early period were based on unsound or partial evidence that demanded nothing less than a complete revision. The intellectual movement that began to cohere around this project became known as the “new film history”.

Rethinking the emergent period of cinema as a sophisticated form of popular entertainment, rather than simply a primitive stage of the technology, also forced historians to reappraise the predilections and appetites of the people who went to see films at the close of the 19th century. A close study of the archival evidence also confirmed that it was no longer safe to assume that the mass of the audience was naïve and easily amused by innocent pleasures. On the contrary, the evidence of the films and the ways in which they were used suggested that, in many ways, the viewers were as visually competent and sophisticated in their reading of narrative as we are today — perhaps even more so. Under the influence of this revisionism a new generation of film scholars has now emerged from the academies who regard early cinema as a complex cultural artefact to be understood on its own terms rather than as a transitional phase to the present state of the movies. This thesis builds upon the pioneering work of these new historians of cinema, and on the consensus of opinion about early cinema as a sophisticated cultural expression, in order to focus on some unresolved questions about its technological origins. It poses the question: how can we integrate a history of the technological origins of the cinema with the methodological approaches that flowed from the 1978 FIAF conference?

The issue of invention and the historiographic problems it poses has proved something of a difficulty for film historians of all shades. As a matter of narrative convenience all stories require a starting point and the stories of the cinema have, by general consent, begun with particular technological achievements. There was a general consensus that Edison invented
the basic technology and that the cinema proper — projection to a paying public — started with the first public screening of films by the Lumière brothers when they displayed the Cinématographe in 1895. From this agreed beginning other histories could develop, whether they were popular accounts of the unfolding of cinema or specialised academic studies of production, distribution or exhibition. In the light of new research in the early 1980s however, it has become apparent that this assumption was a convenience that overlooked some major, as well as some more marginal and less well documented, achievements in moving picture technology. As a consequence of some careful revisions, the claim that cinema started in 1895 has been challenged by marshalling evidence from patent archives and other contemporary documents. As this data has been amassed, confirmation of many of the premises of “new film history” have been confirmed, not least that audiences approached film screenings from a rich experience of screen entertainments which were as technologically complex as the cinematograph. While on the one hand this insight has produced a denser understanding of early films and has helped us interpret them, on the other it has inhibited a coherent explanation of cinema’s technological origins that would be consistent with “new film history”’s’ achievement in reinstating early cinema as an important determinant of what followed.

Histories of particular inventors have proved to be inconclusive as archival evidence has come to light in recent years. For example, it is apparent that rather than dominant inventors — the Lumières and Thomas Edison — competing for priority, there were many other people working independently on similar, if not identical, devices in quite geographically dispersed locations. Some of these other inventions were technically viable but they failed commercially and were lost. Disputes over individual rights and priority have merely complicated the matter and do not help to explain in the final analysis, how the cinema was invented. Even in the 1890s the intellectual ownership of the invention of cinema technology was a confusing issue as Edison’s protracted litigation demonstrates. Hierarchical histories of patent priority highlight the conflict between competing claims for individual inventor’s rights. That these claims have been shown to be inconclusive is clearly evident in the extensive histories of Thomas Edison and the lack of any convincing consensus about his precise role in the process of inventing the Kinetoscope. It was Hendricks’ painstaking work that undermined the myth of Thomas Edison as the inventor of the cinema and opened the way for culturally inflected accounts of the invention. Against a background of scepticism about the idealisation of cinema as a realist medium, Noël Burch, J L Comolli and Michael Chanan have attempted to rewrite the history of early cinema as a cultural or ideological event in an extended social process. Using the bourgeois ideal of realism, the socially-coercive effects of representation, or the controlling dimensions of popular entertainment forms, each has argued that the cinema emerged not from individuals but from the forces of political organisation and the processes of the redistribution of resources. Such necessary radicalism has opened the way for further reflection upon the intersecting network of social, economic and political forces that gave us the cinema at the close of the 19th century.

It has become clearer to subsequent generations of researchers that the final ensemble of photo/chemical technology and film transport mechanisms necessary to produce a
perceptual effect of movement on the viewer was more an aggregation of efforts by individuals with quite different expertise and ambitions. The imperative of portraying movement in a photographic image, for example, was not shared by all the pioneers in the field. At the Physiological Research Station in Paris some, such as Marey, were interested in metaphysical questions of language and experience as well as the analysis of motion, while others saw a clinical application for the apparatus in the treatment of mental disorder, and yet others were interested in the reconstitution of the illusion of movement from chronophotographs. Moreover, while the photographic basis of cinema can be shown to have its origins in scientific research into the nature of light, it is evident that ancillary industrialists, keen to maximise profits, also contributed to the development of a standardised flexible material suitable for film production. Similarly, the development of reliable mechanical hardware (cameras, projectors, perforators etc.), as well as film transport mechanisms, have also been shown to be the outcome of diverse inventors, competing manufacturers and the demands of film exhibitors interacting with audiences.

While building upon the revisionism of the "new film history", film studies has become more rigorous in dealing with such diversity. In the process, the conventional accounts of the beginning of cinema has become something of a neglected orphan. Its approach to cinema technology has been much more consistent with the earlier, redundant approach to film history — as a "Romance" history of firsts. This poses an uncomfortable formal discontinuity between the two methodologies, and a satisfactory reconciliation is a pressing necessity if the ground made in revising all film history is not to be lost back to a mere parade of firsts. There have, of course, been a number of attempts at revision, perhaps most famously in Tom Gunning's seminal article on the cinema of attractions that at least demarcated the very early period as having qualities we were in danger of overlooking. Charles Musser's history of American screen practices, Noël Burch's work on the ideology of Modernism in France and Michael Chanan's study of the early British cinema from the point of view of the ideology of entertainment in the 19th century, have all invested the appearance of early films with a technological sub-text. Each has focused on a particular national cinema but their accounts, based on specific archival evidence, make no general claims about the processes of the invention of cinema. Their histories have proved resistant to export beyond their specified national environments and do not encompass the heterogeneity of film form; a deficiency that is difficult to reconcile with the cinema's rapid technical universality. Local solutions are insufficient to explain this multicultural and multilateral event and, as a consequence, there remains a lack of consensus among scholars as to when the cinema began. The outcome of the discontinuity between the new history of cinema with its rich mass of data and the "old" history of the invention of the technology impinges directly on any questions relating to the cinema and can no longer be effectively suspended if progress is to be made in film studies.

The intention of this thesis is to make some contribution towards resolving the question of the cinema's technological origins in such a way as to show how the very lack of conclusive evidence of individual responsibility for the invention points to a necessary condition for its invention. Its assertion is that the differences, and the very mutability of the devices that emerged from the inventor's laboratories, allowed for a dynamic process of reinterpretation,
and that to proceed we must acknowledge more fully the intellectual constitution of the collective groups that received them. It will suggest that the collective interpretation of a number of devices around the same time was an important determining factor in how various machines were used. Its method is to build upon the work of previous generations of film scholars and to add to the existing explanations of the cinema as a specifically late-19th century technological occurrence in such a way that some of the outstanding historical questions might be reconsidered. This involves both a meta-discursive approach to film studies and a reorganisation of the existing data. As a consequence, throughout this thesis two stories will be told in parallel; the stories of the beginning of the cinema and the story of how our consensual understanding of those stories has altered. It will be apparent in this mode of presentation that the underlying premise of the thesis is that invention and history are dynamic processes in which ideas become stabilised — often temporarily — through a cultural process of representation.

This process of dynamic interpretation is not confined to the popular reception of cinema. As we will see in Chapter 1, the intellectual processes that have been used to understand the cinema closely parallel the story of its technological emergence as each generation of scholars and enthusiasts have renegotiated the meaning of the same cultural object. While film studies as an academic discourse has unflinchingly embraced the question of how films carry meaning by looking outside the field to such disciplines as semiotics, psychoanalysis and cultural studies, it has generally been reluctant to consider how technologies acquire meaning in equally complex ways. Yet elsewhere in academia, technology is not simply regarded as a "thing" that happens but, as David Nye makes clear, as a process subject to interpretation:

A technology is not merely a system of machines with certain functions; it is part of a social world. Electrification is not an implacable force moving through history, but a social process that varies from one time period to another and from one culture to another. In the United States electrification was not a "thing" that came from outside society and had a social "impact"; rather, it was an internal development shaped by its social context. Put another way, each technology is an extension of human lives: someone makes it, someone owns it, some oppose it, many use it, and all interpret it.4

Unlike electricity, which captured the scientific and popular imagination for over a century before its diffusion as a distributed source of power, moving images — such as those thrown onto the screen by the Lumière — appeared to arrive quite suddenly. Moreover, the rapid diffusion of the technology across the continents as a relatively consistent system gives the impression that cinema arrived as a ready-made invention, not subject to a process of widespread interpretation. Consequently, the topic of cinema technology has remained focused on chronologies rather than embracing the kinds of conceptual revisions that have occurred in other fields.

The inadequacy of the existing histories of the cinema will be demonstrated by considering the accounts given of a number of important figures in film historiography: Thomas Edison,
the Lumière brothers and Robert Paul. This will show that although there is evidence that each inventor had knowledge of the others’ work, there are important discontinuities in their intentions. These differences were, however, very quickly fused into a relatively universalised understanding of the various pieces of apparatus for which they claimed responsibility. The speed of universalisation has meant that this minute but significant rupture in the history of early cinema is easily overlooked. To remedy this the thesis proceeds from the view that there is another layer of determination, occluded in this matrix of individuals and interpretations, which lies in the cultural interaction between the invention and its public incarnation. The intention is to redress the deficit in early cinema histories by focusing on the popular engagement with technology during the closing years of the 19th century and emphasising particular aspects of active negotiation between the various inventors’ artefacts and their social meaning.

The work of this thesis will be to attempt to make this process of interpretation less opaque by looking beyond the usual boundaries of film studies. The discussion will address film historiography from the vantage point of the present day, using insights unfamiliar in film studies about the way machines and inventions are perceived, culturally experienced and used as both functional machines and ideas. Rather than seeking first causes, it will propose that the invention of cinema was the consequence of a complex convergence of individual and generalised forces which temporarily found a meaning in a particular machine ensemble; a process that might be described as its “mutual intelligibility”. This term, used to describe a particular shared meaning for a technology, be it the cinema or electricity, is especially useful in as much as it admits other kinds of meaning as simultaneous and coexistent with a more generalised understanding. For example, it will be apparent in Chapter 2 and Appendix 1: that each of the main contributors to cinema technology, according to orthodox film histories, not only had quite individual ideas about what they had invented but also harboured, in parallel, a generally shared understanding. Their processes of invention involved, among other things, the reconciliation of these two spheres of interpretation. In as much as the popular use of moving-picture technology appeared to satisfy many agendas, its mutual intelligibility can be attributed to the quite special relationship early producers had with its consumers; a topic developed in Chapter 3. The direct feedback from audiences to exhibitors transformed and modified the meaning of the particular apparatus so that it was used in ways that were consistent with the vision and expectations audiences had of both entertainment and technology. In this sense, the cinema can be said have undergone a further stage in the process of invention which was quite independent of the putative inventors. This relocation of at least one aspect of invention in the public domain raises important questions about the relationship between technology and culture.

Chapter 4 will discuss the issues of this relationship and consider some radical interventions in early cinema history which respond to objections to technological determinism. Given the particularity of early cinema as a technological spectacle in which exhibitors were able to respond to intuited demands with either improvisation or direct intervention with the inventors, a further exploration of what audiences understood by “technology” is called for. This more dynamic model of the interaction between various forces leads to a
reconsideration of invention as a cognitive process in which some mental models are represented by technological artefacts. By considering the origins of cinema, not as sequence of individual hardware inventions, but as a protracted convergence of individual and collective perceptions and experiences of technology in general, the determination of priority and patent rights is dissolved around what is called here the “technological imaginary”. This extends the limits of a contextual study of early cinema, which situates the invention in the economic and social environment that prepared audiences for moving pictures, to a broader field of engagement which suggests that the processes of imagining technology in the public sphere is significantly implicated in the processes of invention.

In itself, however, this concept does not explain the historical moment of the cinematograph, and for this it is necessary to consider the emergence of both the historically general and the quite specific engagement with technology. Chapter 5 identifies the beginning of this engagement in the 17th century project of modern science. The broad consensus necessary to establish the truth-claims of experimental scientists required a certain level of involvement by ordinary people who not only actively participated in the project of acquiring new knowledge, but also found new pleasures in the intellectual challenges that science posed. The ext two chapters look at how these pursuits and their attendant pleasures were institutionalised for profit in the 19th century by responding to an emerging struggle between a number of groups participating in the scientific project. However, the organisation and forms of large-scale entertainment, which were dependent on science and an emerging differential field called “technology”, were not shaped by the simple desires of a passive public any more than early films were primitive efforts intended for the naive viewer. On the contrary, public lectures, world’s fairs, amusement parks and scientific journals were sophisticated design solutions to a popular demand for active engagement with science; a demand that, as we see in chapter 8, conflicted with the desires of the scientific elite who attempted to eliminate the participation of the general public in their profession. The resulting forms of these public amusements, as with the cinema technology, were a historically specific, if temporary, stabilisation in a large-scale interpretive process, involving a network of influences.

The discussion of the “technological imaginary” and early cinema is in no way intended to propose a complete account of the invention of cinema. It does, however, more fully round out the film scholar’s understanding of the technological origins of the cinematograph in such a way as to overcome an impasse in the current debates about the origins of cinema, as it also enriches the reading of the images. With the concept of the “technological imaginary”, the story of cinema can begin in *media res*, since each apparently determining instance can be shown to be mitigated by other influences. Moreover, early films can now be understood as more than mere technological attractions. As is evident from some earlier published case studies by the author – referred to where appropriate in notes – the dynamics of the interaction between late 19th century audiences and technology in general can form a significant, if concealed, feature of the films that were evidently very popular.
The Key Terms

The key terms of "mutual intelligibility" and the "technological imaginary" are important to the progress of the argument. The first, in this context, is taken to mean a persistent, stable interpretation ascribed to a particular technology that is shared by significant sections of society — one that may not, however, necessarily exclude other meanings for an individual. The second refers to the ways in which technology was thought about both in terms of its hardware and as a representation of cultural aspirations — imagined and actual.

The first term accounts for one of the ways in which technologies acquire meaning and is particularly important in understanding early cinema. Since the scientific and technological pioneers of the cinema did not initially concur over its meaning as a cultural object, there was no mutual intelligibility among scientists working with moving-image devices until it had entered the public domain. The second provides a framework to factor in both rational and irrational ideas to the processes of invention in order to accommodate and consolidate the range of understandings that surround new ideas. Without the inherent negotiability of the concept of the technological imaginary, it becomes difficult to account for technology as anything other than a hard cultural determinant — something it evidently is not.

As far as early cinema is concerned, the premise of this thesis is that the technological imaginary, made manifest in the popular interpretation of the various devices that inventors made public, was one of a number of determinants that brought about their mutual intelligibility as a projection apparatus. This did not correspond with the inventor's imagined uses for the machine. Consequently, it is important to remember that there are two spheres in which the technological imaginary is simultaneously operating throughout what follows. The most visible is directly related to specific devices such as the cinematograph and the films, the second is the interpretation of technology in general as a distinct determining feature of the cultural environment that 19th century audiences both created and inhabited. This principal idea has a number of advantages for the current state of scholarship in the study of cinema. In the case of the invention of cinema, the discrepancy between what the various individuals thought they had produced and what cinema as an entertainment machine actually became, will be of especial significance. Emphasising this will show that the interaction between the public technological imaginary and the technological determinants of the cinema is more complex than linear histories can acknowledge, especially in the epistemological relationship between science, technology and popular entertainment during the closing years of the 19th century.

Some terms in this thesis are used in quite particular ways. As a convenience, where the cinematic apparatus is referred to generically it will be called the cinematograph. However, where the text refers specifically to the Lumière machine it will be called the Cinémagraphe. Although it is acknowledged that Edison's Kinetoscope and Kinetograph may have had precedence, and provided the inspiration for many of the devices that followed, the cinematograph best describes, in a single term, the collective apparatus for taking, printing and projecting images. Secondly, it is central to this thesis that until the latter part of the 19th century the terms "science" and "technology" signified aspects of a continuum and, consequently, the meaning of the terms up to that date are close, if not
sometimes interchangeable, when referring to the enterprise of rationally explaining aspects of the world through observation, experiment and theory. Some differentiation is made during the 18th and 19th century and, where appropriate, this will be made clear in the text.