Early Cinema and the Technological Imaginary

Punt, M.J.

Citation for published version (APA):

General rights
It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations
If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: https://uba.uva.nl/en/contact, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.
CONCLUSION

As a consequence of biographically-based “Romance” accounts, the invention of the cinematograph and the early period of cinema have been mainly regarded in the context of entertainment and this has overlooked cinema’s role as a site of the interplay between technology and culture. With their massive investment in the power of the individual to shape history, they have, not surprisingly, regarded technology as a determinant of culture and as subordinate to science, despite the evidence that the cinematograph was the outcome of collaborative, and even collective, participation in invention. In film studies the most provocative question that “Romance” histories force to the fore is the concern over how a technology emerged from the laboratory in one form yet engaged the public as something quite different. The answer to this question usually draws on research into the activities of other individuals who exerted influence over the inventors and transformed the cinematograph into what it is today. These range from studies of neglected inventors, opportunist visionaries and inspired entertainers who saw ways of making money, to accounts of more sophisticated entrepreneurs, committed to a measure of control over the industry by monopolising patent rights and/or securing distribution networks. At best, this research has the tendency towards economic determinism and to producing stories which either become ever more complex as the data expands or ever more distant from the cinema.

In view of the state of early film history, and the difficulties of reconciling the objective state of technology in a causal relationship with the range of opportunities at a given moment, the idea that technology leads culture is all the more seductive. However, Section 2 of the thesis raised some objections to hard technological determinism which, if they are acknowledged, leave something of a vacuum as the idea of the single inventor as the inspired genius working independently of social determinants dissolves. While the majority of film scholars have long since recognised the deficiency of technological determinism, little progress has been made in reconciling the state of technology at a given moment with a larger network of determinants. In order to remedy this, Section 2 opened up a, more socially-symmetrical power relationship than the “Romance” histories offer, by revisiting some of the discussions around the cognitive act itself. Carlson and Gorman regard invention as a series of personal actions by the individual inventor which involve an initial mental model, a process of learning and a representation (drawn from existing working technologies). On the basis of empirical evidence which shows that during the 19th century the process of invention was inextricably bound up with modes of representation, it was possible to extrapolate from Carlson and Gorman’s model to the condition of a generalised participation in science and technology, and shift the emphasis of the practice of invention from the inspired individual to a more collective process, involving communities of artisans. This directed our attention to the precise relationship that the broader constituency that participated in the invention of the cinematograph had with technology. In particular, it revealed how the complex philosophical and practical claims of science were fused with technology and entertainment in institutional forms of display that, by definition, had to engage the exhibitor and spectator in a stable relationship of mutual intelligibility.
The concept of the technological imaginary provided the basis for specific data to be matched with the generality of objections to technological determinism. Proceeding from the assertion that modern science was inextricably bound up with gathering a consensus for its claims, Section 3 described how new scientific knowledge was diffused through institutionalised forms of display, whose appeal included the presentation of the philosophical aspects of experiments. The progressive social cascade of engagement in displays intended to promote consensus and intellectual ownership encouraged widespread participation in the project of acquiring new scientific data. In as much as science was made most available through technological representations of new insights, the spectacles and pleasures of large-scale displays such as world’s fairs and amusement parks were not simply distractions for a bemused public, but places where new knowledge was socialised. Entrepreneurs and investors, however, had to be sensitive to the necessary balance of knowledge and pleasure that each event offered; time and again ventures failed because they assumed that the public were merely passive consumers to be placated. Where new forms of technological display integrated new knowledge with new pleasures, as in the amusement parks, there was massive participation in a socially-interactive exchange between individual and collective interpretations.

Although many inventions and machines circulated between countries, for the greater part of the 19th century the technological imaginary was locally specific, as each national community had quite different relationships with professional scientists. In the last quarter of the century, however, the ownership of, and responsibility for, new knowledge became the prerogative a professional elite; in Britain scientists whose professional structure had been delayed by the need for public participation; in France through increased centralisation; in America by the opening of a profession for an aspiring middle class. Whereas previously in the 19th century, the intellectual achievements and the direction of scientific enquiry were strongly influenced by the historical background of a generalised participation in the project, by the 1890s the scope for this activity was undergoing a significant transformation. A growing international exchange of data and publication habits corresponded with the demarcation of science and technology as professional fields. Although by the close of the century the non-professionals were becoming uncoupled from the sources of authority, the interpretation of data and the engagement with new ideas was not confined to a professional class, but concerned a socially heterogeneous community who had well-developed attitudes towards science and technology. As the format of world’s fairs and especially popular scientific journals show, by the close of the 19th century, a general convergence upon a hierarchical model had taken place despite popular sentiment as a consequence of the separation of scientific practice the popular technological imaginary became of a more international influence.

Factoring the technological imaginary into the history of the emergence of cinema resolves a number of outstanding problems in film history. In the first place, it provides a framework for answering questions about the different technological solutions which were patented at more or less the same time, without imposing an artificial goal for the project. From the detail of the invention of the cinematograph set out in the first section, it is clear that inventors had remarkably divergent functional and personal aims for the devices they
marketed. As we saw, not only did many of them use moving pictures to represent different mental models, but they also functioned publicly in a prevailing cult of personality which placed a burden of representation on their patents that had little to do with making pictures move.

Situated within a substantial tradition of display, the Kinetoscope and the Cinématographe represented distinct aspects of scientific knowledge. The American machine drew on a known optical effect which gave the illusion of movement and combined precision machining with advanced electrical engineering. The Edison films were merely supporting material, completing a representation of the current state of American technology. The Lumières however, had a little device built which, given its European context of scientific display, not unnaturally posed as many questions as it answered. Against a background of the philosophical and scientific debates about vision, photographic representation and the nature of movement, the Cinématographe was used to make images of the world in which the very questions it posed existed. The impression of historical isolation the first films initially give dissolves once they become understood in terms of how they served the technological imaginary, and the subsequent transmutation of film form can then be understood as though the cinematograph were a completely different machine – reinvented in a public space to satisfy the different imperatives made known to exhibitors through the “box-office”. The appearance of moving photographic images in a purpose-built machine was as a peep-hole device called the Kinetoscope. This invention stimulated a world-wide craze for the device, which waned more quickly in some countries than others. In America in particular, the apparent satisfaction that it gave was only displaced when a European invention for projection began to circulate. Even then, Thomas Edison was unwilling to change his idea which, given that he understood the Kinetoscope project in terms of representing the state of American science and technology, now seems perfectly sensible. The dissatisfaction with the Kinetograph in Europe was not merely a consequence of difficulties in obtaining films from the Edison Company, but also because, on the whole American attitudes to technology were still somewhat at variance with those in Europe. The issue of a single viewer versus public exhibition becomes situated in a discussion of what each machine was intended to represent in a public arena, rather than in a story of competing individual visions for the cinema.

The people best placed to be in touch with public attitudes were those in the field, demonstrating the devices. As we saw with the phonograph, exhibitors and salesmen observed the public reaction and were able to modify the meaning of the technology through adjustments to the modes of display and engagement. The fact that the Lumières were better placed to readjust their own understanding of what they had done than Edison, is directly attributable to the different distribution systems that each had in place, and the intellectual position that they felt they had to preserve, relative to the mainstream of scientific and technological activity. The intervention of the likes of Doublier, and Raff and Gammon, but most particularly Robert Paul (who devised machines in response to the demands of entrepreneurs and exhibited them himself), is evidence of similar processes of representing the mental models formed outside the laboratories. This insight not only resolves the issue of an over-determining individual, but also reconciles much of the data which recent
extensive patents, chronologies have unearthed, in a way that is consistent with the methodologies of "new film history" — that is, by reconciling the creative actions of individuals and groups with specific social, economic and intellectual contexts.

The economic structure of early cinema exhibition, and the rapid appropriation of the invention by conjurers and showmen, outlined in the first section of this thesis, provided an ample opportunity for audiences to reinterpret the apparatus to suit their own mental models. To more fully understand how the audiences used moving-picture machines in a cognitive act of representation, a closer study of the interrelationship of science, technology and entertainment showed that an important determinant of the 19th century technological imaginary was the steady redefinition of the Enlightenment ideal of science. Initially, a democratic and all-inclusive project, it was abruptly ruptured to become three distinct modes of enquiry as theoreticians increasingly regarded themselves as professionals distinct from those scientists who were involved in practical experiment, including the large constituency of amateurs. Resistance to this trend became difficult and after bitter disputes between theoretical scientists and practical technicians over control of the discourse, separate institutions were developed. Popular participation, however, was simply excluded by both parties in the course of the struggle for professional supremacy.

The discontinuity between science’s earlier relationship with the public and its reconstruction as something closer to entertainment in the late 19th century, invited plural interpretations of many of its technological inventions, and these provided opportunities for profit. In the heady environment of the amusement park, science was regarded as, on the one hand, a project to gather knowledge, in which ordinary people had a varying stake — depending on which country they lived in — while on the other, new technologies, and especially instruments used to support assertions about the world, were reminders of the redefinition of the audience as a passive witness to the march of science. Some instruments were temporarily seen as both professional and public property before they were either withdrawn into the laboratory, as with the X-ray which started life as a fairground attraction, or rapidly abandoned to popular entertainment, like the phonograph and moving picture devices. As the discussion of a number of entertainments and attractions based on technology as an educational spectacle in Britain and the United States reveals, there was a significant contradiction in public attitudes. Each new invention was greeted with enthusiasm while at the same time there was also deep-seated apprehension about machines which challenged social and economic norms. Moreover, as the review of popular scientific societies and journals has revealed, while there was a genuine thirst for new knowledge and a willingness to seriously participate in the project of scientific enquiry, the forms that this engagement took were often of a critical nature and opened opportunities for impresarios to devise entertainments which degraded the high ideals of the scientists.

As Chapters 6, 7 and 8 reveal, however, a quite noticeable shift in attitudes to technology and display took place across the period of the development of the Kinetoscope and Cinématographe. One of the consequences of this was that technological displays were used less as opportunities for active intellectual participation than occasions for the passive
consumption of thrilling spectacles and bodily sensations. In particular, a flippant, even subversive, attitude to high science replaced the sense of engagement that most people apparently felt in the previous decades. Audiences responded to the exhibitions of the latest technology, not within the historically-accustomed framework of serious enquiry, but rapidly began to insist that the cinematograph séance become a source of frivolous pleasures and “nefarious” services such as prostitution and criminal conspiracy. Cinema technology was reinterpreted to accommodate and represent technological imaginary that had become uncoupled from Edison’s personal ambitions as a technologist and the high scientific ideals of the Lumières. Moving-picture machines occupied, for a brief period, an unaccustomed cultural space as professional demarcation redefined science as a technology and entertainment, and the machine’s meaning was publicly negotiated through a collective process of invention. Audiences were drawn as much by the prospect of moving images — which they were quite used to seeing in magic lantern shows and in the Mutoscope and Kinetoscope — as the particular machine-ensemble that gave a different sort of moving picture. Unlike the earlier devices, the Cinématographe projected onto a screen an illusion of movement in all planes of recession, seeming to replicate the viewer’s perception of the real world. The technical foundations for this device were understood by audiences, either due to prior acquaintance through journals or, as is widely reported, by a preliminary explanation given by the presenter — much as Muybridge did before showing his photographs. The Cinématographe’s fascination for the scientists and the lay public rested in its own uncertain claims about its relation to the real. The film image, like the photograph, seemed at moments to write itself by virtue of the co-existence of its different meanings as science and technology. It produced both a visual analogue and an instrumented reality; on the one hand it replicated vision, while on the other it stood in for it as a more reliable observer than the human being. This placed the experience quite firmly in the antagonisms between scientists and technologists, disenfranchising the non-professionals in the field. Audiences, however, had an intimate relationship with exhibitors, who were often directly responsible for production. Even when they were subject to the economic regime of franchises and agencies, the software of cinema was changed by pressure from concession-owners anxious to make a profit. Their audience’s reactions to the images and the mode of exhibition were either directly voiced or impacted on the owners indirectly through their takings. Through this conduit, the cinematograph was inflected by the popular technological imaginary that was ambivalent to the claims and inventions that excluded their voice. Expressed at its most polemical, audiences reinvented moving picture technology to conform to their own mental models of a technological future. During the period around 1895, these mental models were expressions of both a fascination with science and a deep resentment of it. The ease with which the many moving-picture machines that emerged at the time were relatively quickly collapsed into a single apparatus, is a measure of the universality of feeling, as the scientific journals show, and the interpretative power of the ultimate users.

In the preceding chapters, the model of historical change which has been outlined has much in common with one of the least scientific of apparatuses — the Ouija board. As the planchette or glass moves between the letters, no single determining force can be identified. Its movement is the product of a network of competing desires and pressures from the
participants as well as the undeniable forces of gravity, humidity and the resistance between
the surface of the board and the planchette. Isolating one of the vectors will not only fail to
explain the ultimate sentence that is spelled out, but will inevitably lead to a misleading
etiology. Moving picture technology originates in a dynamic convergence of pressures that
are represented finally in the cinematograph and its institutions. If any particularly powerful
force can be identified in the network of determinants manifested in the invention of the
Kinetoscope and the Cinématographe (and all the associated technical paraphernalia without
which projected moving images would not have been possible), it is the fact that, during the
closing years of the 19th century, the relationship between the professional discourses of
science, technology and entertainment, that for a century had been intimately entwined,
became differentiated. Put at its most strongly, the insistence on the determining power of
the technological imaginary argues that the very instability of meanings and interpretations
of science, technology and entertainment, as well as individual inventions and artefacts, was
a necessary condition for the 19th century moving-picture devices to become a popular
entertainment that we call the cinema.

There has been, for some time, a widespread acceptance in contemporary film studies that
invention is a complex process and that moving picture technology does not have precise
origins. In the light of this, it might appear that this thesis may be pushing at an open door,
but beyond that door is something of a vacuum of uncertainty that threatens to impede
further work. However, interpreting cinema technology and films in the context of the
technological imaginary — the intellectual space from which mental models of technology
emerge as representations — offers some advantages. First, the complex interaction of the
diverse personal and cultural imperatives which drove some of the principle figures can be
acknowledged as productive determinants of the machines they invented. Second, in as
much as the technological imaginary is both specific to individuals and shared by
communities, it restores some determinining power to human agency in a process of
transmutation that the cinematograph underwent as its interpretation moved between
exhibitors and audience in a continuing process of representation.

Finally, as the first generation of new film historians taught us, the films produced before the
turn of the century were not merely primitive attempts to understand a new form of
expression. The long-established tradition of moving-picture shows that preceded the
 cinematograph allowed for moving film to be integrated with magic lantern séances, theatre
and vaudeville. However, the meaning of the films produced at the time is often opaque, as
the precise context has become obscured and the necessary interpretative skills have
atrophied. Moreover, much of the material that survives is of variable quality; as in the
industry today, some products were merely ill-considered opportunist exploitation.
However, the network model of how entertainment technologies interact with the mental
models of the popular audience is a valuable interpretative tool for decoding those remaining
film texts preserved in the archives that were thoughtful and alert to the desires of the
audience. This thesis suggests that, to enrich our understanding of the meaning early films,
the task of the historian enquiring into cinema technology should not be confined to ever
more finely dividing the events up to, and after, the first public displays of moving images
to paying audiences, but should include a more detailed dissection of the ways that
technology and culture were interacting at a given time, and especially of the processes of invention through which the machines and systems that do endure achieved a mutual intelligibility.
2 See for example the recent centenary of cinema celebrations which extended over the period 1994-1996.
4 A number of studies have drawn attention to this possibility but, whereas each has referred to the cinema audience reductively as either ideologically constructed or as passive consumers used to habitual modes of entertainment, in this thesis the approach will be to argue for higher levels of determination in the popular interpretation of technology. See for example Charney, L. and Schwartz, R., eds. 1995. *Cinema and the Invention of Modern Life*. Berkeley: University of California Press.
11 Among the many studies covering this see Coe, B. 1981. *The History of Movie Photography*. Westfield: Eastview Editions.
12 There are many accounts which suggest this, see for example Cook, O. 1963. *Movement in Two Dimensions*. London: Hutchins and Co.
14 These debates, especially around the work of André Bazin seemed to dominate Anglo-American film studies during the late 1970s and 1980s.
19 Some of the technical achievements that are often cited as prefiguring cinema are
directly attributable to Thomas Edison's technicians.


20 Ottomar Anschütz, too stood on the boundary between science and entertainment. The demonstration of his machine — the Electrical Tachyscope — which he invented in 1887, was predominantly as a technological spectacle rather than a scientific instrument.

21 This was especially true in the case of developing a projection system that could engage large audiences. This was arguably the most significant contribution to the Lumiére success since it combined a camera printer and projector in a single lightweight machine called the Cinématographe. Other influential figures in this aspect of the development of cinema are R.W. Paul in England, who developed a projector, and a number of showmen who, having bought the Edison Kinetoscope under license, were losing money as the technological novelty wore off and the films became predictable and unreliable.


23 Ibid., p92.


26 *The Edison Motion Picture Myth* was followed by *The Beginnings of the Biograph* in 1964 and *The Kinetoscope* in 1966.

27 The trace of this debate is also evident in the work of Charles Musser and Tom Gunning who have turned to other sources and methods to reclaim the pre-eminence of America in the formation of cinema.


29 Ibid., p. 321.


32 The first caveat, which was filed on 8 October 1888, was a legal precaution that advised other inventors of an intention to patent a device. This confirmed a certain protection, which lasted no more than a year, new ones were filed 3 February and 5 August 1889. The preliminary patents filed early in August 1891 were for a camera and a viewing apparatus.
Edison also developed a picture making machine the Kinetograph. This was a vertical feed device using 35 mm perforated film and in these respects resembles the current system. However Edison was committed to the use of electrical power in his inventions and as a consequence the Kinetograph with its accumulators could weigh as much as 500 pounds. This camera was used to make films for the Kinetoscopes and it was as an extension of this film production activity that Edison became financially involved in the foundations of the industry, eventually attracting Griffith to the Biograph studios in 1908. Musser, C. 1990. *The Emergence of Cinema: The American Screen to 1907*. New York: Charles Scribner’s Sons. p8.

Moreover the institutional arrangements at West Orange were such that a small-scale personal device was more likely to be the outcome of the research of individuals, rather than a vast collective entertainment which, in any case, would require large investment in real estate as well as software.

The media management that was intrinsic to this aspect of his life has presented some difficulties for film historians as publicity strategies, patent litigation, and what appears to be a certain reconstruction of the evidence by Edison himself has proved misleading and difficult to unravel. Nonetheless the Kinetoscope did emerge for the laboratories at West Orange and appears to have been a product of a research process which allowed one machine ensemble (a rotating drum with data encoded) to provide the starting point for the final model which used a celluloid strip and stroboscopic illumination.


These were subsequently withdrawn as it realised that they constituted a grave health risk.

Read, O., and Welch, W. *From Tin Foil to Stereo; the Evolution of the Phonograph*. New York: Howard Sams and Co.

These reports are regarded as something of an exaggeration.

The phonograph itself prefigured the domestic gramophone and a very different economic structure that was based on selling multiple copies of the ‘software’ for individual consumption. In this way the Kinetoscope has been suggested as a prehistoric form of the domestic VCR.


Dickson left Edison in April 1895 and in the following months Heise took over production. This signaled something of a change as he made a number of films, some of which might be classed as narratives (for example *The Execution of Mary Queen of Scots*), although they were in effect more like a re-staging of newspaper photographs or comic strip histories and not so distant from the masculine genres of the earlier films.

Lynn Kirby, for example, has quite recently argued that audiences were prepared for the perceptual and aesthetic effects of the cinema by the panoramic perception of train travel. See: Kirby, L. 1997. *Parallel Tracks: The Railroad and The Silent Cinema*. Exeter:
In fact this first idea was immediately compromised since they had to acquire film stock from various sources in order to meet the demands of exhibition.


On December 28 1895 they used an electric light (a Molteni arc lamp) and thereafter it was the preferred arrangement, although some operators also used ether lamps.

The Lumières were also anxious to develop a reliable commercial film stock in collaboration with a number of other manufacturers. Their stock however was perforated with a single round hole either side of the frame whereas the ‘Edison’ stock, which quite quickly became the standard, had four radiused perforation.

Even if one considers the numerous private screenings that the Lumières arranged throughout 1895, the Cinématographe considerably post-dates the Kinetoscope.


There is some agreement however that included in the programme were; *Workers Leaving the Factory, Mounted Gymnastics, Fishing for Goldfish, Blacksmiths, The Gardener, Feeding the Baby*, and *Le Débarquement du Congrès de Photographie à Lyon*.

Marshall Deutelboom has suggested that there was considerable thought given to the structural patterning of these films, which increased their legibility as narratives of contemporary everyday life. Deutelbaum, M. 1979. ‘Structural Patterning in the Lumière Films’. *Wide Angle*, 3 (1), pp.28-37.


In 1903 the Lumières exhibited photographs produced with this new system.


The Société Anonyme Antoine Lumière was established in 1892 and the brothers’ commitment to Lyon ensured that the philosophical, scientific and commercial facets of their lives were entirely coextensive.

This was at a time when 80% of the companies in France employed less than four people.


In 1838 Charles Wheatstone used two slightly different drawings which when viewed through his device produced the sensation in the observer of an image in three dimensions.
Cameras and viewers copied as far as possible the physiological configuration of vision. The eyepieces and taking lenses were two and a half inches apart, and the apertures were 0.2 of an inch, which was equivalent to the iris.

Marta Braun has pointed to the popularity of Bergson and his celebrity status to the extent that his students were obliged to insist on seats set aside for them at the Collège de France. Braun, M. 1993. *Picturing Time, The Work of Etienne Jules Marey (1830-1904).* Chicago: University of Chicago Press. p.278.

Charles Musser reminds us that, ‘... the Lumière initially addressed a bourgeois, sérieux, technically informed public. They used the lecture circuit to explain their experiments not only in cinematography but also in colour photography (with lantern slides). Their subject and the ways that they were shot were well suited to these occasions, although the audience attention was focused less on the subject of these images than on the apparatus that produced their lifelike quality.’ Musser, C. 1990. *The Emergence of Cinema: The American Screen to 1907.* New York: Charles Scribner’s Sons. p.136.

Although some of its most creative use by ‘third party developers’ with theatrical backgrounds, such as Georges Méliès, was in a purpose built studio, the Lumières approached the Cinématographe business from the grounded point of view of...
photographic inventors.

82 Alexandre Promio, the principal Lumière agent in Europe was typical of the flair and resourcefulness of the men commissioned to spearhead the commercial exploitation. Promio traveled throughout Europe taking scenes of notable events including, most famously the funeral of Queen Victoria. Standing on a ledge above the crowd he was able to take a clear view of the scene thanks to portability of the camera.


84 There is some suggestion that there was considerable thought given to the structural patterning of these films so that even the most documentary film might be regarded as narrativised If this was so and the audience was sufficiently sensitised to detect this then it would inflect some particularity and distinction in the use of the apparatus at least as early as La Sortie de l’usine Lumière à Lyon, if not earlier.

85 Other competitors included Skladanowskys, Charles Pathé, and Leon Gaumont.

86 This approach of vertical integration was one that persisted, and subsequently also shaped popular cinema.

87 Although Edison sold over 1000 Kinetoscopes, the Kinetograph remained under the control of the West Orange production team.


91 Felicien Trewey presented the Cinématographe to an invited audience at Marlborough Hall, Regent Street Polytechnic on February 29 1896. At the same time Paul was showing the Theatographe at Finsbury Technical College.

92 Le Prince apparently disappeared while en-route to demonstrate his apparatus, and Friese Greene was involved in several bankruptcies.


94 According to Charles Musser he created an enormous hit with his Rough Sea at Dover when it was shown in America and for a time he was a dominant presence in the U.S. market. Musser, C. 1990. The Emergence of Cinema: The American Screen to 1907. New York: Charles Scribner’s Sons. p.18.


96 Barnes notes that London manufactures and dealers that subsequently produced cinematic apparatus in 1896-97 were situated in that district. (After 1897 it is noticeable that as the devices become commonplace there is some dispersal towards less defined regions of the city). It was here that Cecil Hepworth took a small shop to sell lantern lamps of his own design and became interested in Paul’s work with film. The two men apparently met at the Olympia demonstration where Hepworth attempted to interest Paul in his new design.
Possibly Edison felt that they might be difficult to defend in the light of work by Marey and Muybridge, or else he was not convinced of its long-term future.

Maguire and Baucus opened a Kinetoscope parlour in Oxford Street, London in October 17. By November there were five Kinetoscope shows in London (these were not using pirate versions of the machine). Hendricks, G. 1961. *The Edison Motion Picture Myth*. Berkeley: University of California Press. p. 113.

Edison’s commercial arrangement for production of films insisted that exhibitors bore the costs involved to have their ideas shot at West Orange and then the films were inscribed with the agents marque.


It seems from Barnes that Paul and Acres were able to use a camera that they had devised as early as March 1895.

The new machine was demonstrated to the management of the Alhambra Theatre on March 22.


(In fact this is the only one Paul recalls in his 1936 article).


Paul’s seriousness towards his activities in the cinema business is reflected in his involvement in the developing industry and his decision to discontinue production. He became active in British and then international attempts to agree industry standards and regulate the industry to the advantage of producers. In 1910, however he ceased trading in films and returned to his previous profession. In 1936 he described this decision as an economic consideration. ...the expense and elaboration necessary for the production of any saleable film had become so great that I found the Kinematograph side of the business too speculative to be run as a sideline to instrument making. I then closed it down and destroyed my stock of negatives, numbering many hundreds, thereby becoming free to
devote my whole attention to my original business, now a part of the Cambridge Instrument Company. However he had maintained and active interest in scientific issues and returned to what he described in the same presentation as ‘my original business’. During the First World War he worked on instrumentation devices and was particularly concerned with the technical aspects of mines. Subsequently his own company merged with Cambridge Scientific Instruments where he became more involved with financial policy, but also with air conditioning projects, loudspeaker design, and replicas for the Faraday centenary. Ibid., p. 48. Even in these projects there is a curious bricolage of the scientist and entertainer as well as the parallel careers of Edison and the Lumières.

114 Michael Chanan, Richard Abel, and Robert Allen have also approached this issue from an entertainment point of view.
117 According to Frazer (Ibid., p.60.) this is the first example of Méliès using this photographic technique and not ‘the suspect story of the accidental bus and hearse transformation in front of the Paris Opera’.
118 Ibid., p.48.
119 Ibid., p.222.
122 He remained in the film business throughout his life and, as a consequence, other equally significant figures to cinema of this period have a tendency to be overshadowed since they unnecessarily complicate the basic questions of the cinema’s transition to a popular entertainment as a storytelling medium. They include Charles Urban, who collaborated with Hepworth, Louis Gaumont, Charles Pathé who dominated the international industry until the first world war, and Edison’s own occasional collaborations with projectionists and cameramen.
123 He missed the first showing of the Cinématographe at the “New Polytechnic”.


Examples of this are the mid century prediction that by the end of the twentieth century machines will do all the work and unemployment would be the norm, or that paper will cease to be used in offices etc.


Ibid., p.xiii.

Ibid., p.xiv.


Allen, R. and Gomery, D.1985. Film History, Theory and Practice. New York: Knopf. Providing a satisfactory explanation for the use of colour in feature films presents a similar problem. Coe concludes the story of sound with the example of Fantasia and the eight channel optical recording system in 1941. He then returns to R.W. Paul and the hand coloured film of 1896 called Eastern Dance to show how, in cinema’s embryonic, stage there is evidence of the final form. Similarly his account of aspect ratio and wide screen returns to the magnificent cycloramas of 1895 and 1900. He suggests that here was the model of greater realism to which cinema technologist returned once other more pressing problems of realism had been overcome.
One strand of new film history is determined to shed light on this question by examining the films that still remain to be viewed. As John Fell puts it describing the preoccupations of the new history, ‘Whatever commendations it warrants, The Life of An American Fireman is shedding its uniqueness. As more early films surface, the committed scholar begins to understand how (and less often why) the story forms emerged that are today simplistically described as the dominant narrative codes.’


Faint traces of this polemical interpretation has persisted to the present day barely concealed in the high culture-low culture debates about realism.


Ibid., p.124.


Ibid., p. 8.


Ibid., p. 5.


166 In a telling contemporary example, Ferguson points out that the Pentagon’s agreement to invest in manned space flight first required that senior figures in the government had a shared idea of what might be the eventual outcome. In order to arrive at this shared idea, according to Ferguson, Eisenhower arranged for screenings of Disney cartoons. Ferguson, E. 1992. *Engineering and the Mind’s Eye*. Cambridge, MA: MIT Press. p. 2. Se also: Latour, B. 1987. *Science in Action*. Cambridge, MA: MIT Press.

170 Dickson’s role in the invention and development of the Kinetoscope is detailed in his own account in Dickson, W. 1895. *History of the Kinetoscope and Kinetophonograph*. New York: Dickson. See also Dickson, W. 1933. A Brief History of the Kinetograph, the Kinetoscope and the Kinetophone. IN: Fielding, R. *A Technological History of Motion Pictures and Television*. Berkeley: University of California Press, pp. 9-16.


180 Darwin wrote a description of the air pump in an epic poem *The Botanic Garden*.

181 It is thought that Wright attended some of these demonstrations and based his scientific paintings on them.


183 The most famous of these are: A Philosopher giving a lecture on the Orrery, in which a lamp is put in place of the Sun, dated around 1766, in which a demonstrator shows to an assembled group a kinetic model of the solar system. It is generally assumed that the demonstrator is moving a candle to show how the shadows of celestial bodies can fall upon other planets in the system.

184 For a study of Enlightenment entertainment and its relationship to science, see Stafford,
The painting measures 72 inches by 96 inches wide and is painted in oils on a canvas support. The style of the painting is the one that has become typically associated with Wright of Derby. The fall of a dramatic light emanating from a single source is carefully rendered to maximise the plasticity of the figures, and the diverse materials of the objects and fabrics. The composition is artful, in this case based on a circle, without appearing contrived. This enable Wright to bring a great range of figures, surfaces and objects into a unified image which appears to be continuous with our perceptions of the real world.


Although some historians have identified the figures in the painting there is no evidence that *An Experiment on a Bird in the Air Pump* depicts a particular gathering.

The style and subject of the painting is not unlike many other work by Wright, especially *A Philosopher Giving a Lecture on the Orrery*, (c 1763-1765) *Two Boys Fighting Over a Bladder* (c 1765-1770) and *A Blacksmith's Shop* (1771).


Richard Altick has traced the origins of these in the French initiatives of the Conservatoire National des Arts et Métiers which was founded in 1796 and quickly included in its presentations new industrial machinery as a showcase for the manufacturers. The British declined to imitate the French and, in any case, were convinced that their manufacturing and engineering superiority needed no further promotion. The closest British equivalent to the Conservatoire was a private society which bought the best examples of British ingenuity and stored them in a rudimentary and somewhat inaccessible archive.


205 Ibid., p.98.
207 Ibid., p.68.
210 Ibid., p.68.
214 Ibid., p.37.
216 Ibid., p.41.
217 Henry Adams, reflecting on his own education and historical causality referred to the conflict between technology and the humanist ethos of the Virgin Mary, as The Virgin and the Dynamo.
221 Ibid., p. 44.
223 In France and America there was a similar pattern of growth although it began slightly later
226 In particular it detailed research on the dangers of ear boxing, a topic that had personal significance for Bell.
227 Consistent with its position of the social integration of science and technology, under Bell’s guidance *Science* reflected on the meaning of new technologies. A feature in a 1887 edition is entitled ‘The “Act of God” and the Railway Company’ which proposes that the human mind must now change.

Nature for example ceased to cater for the amateur and although it remained relatively easy to read until after the Second World War, by 1960 its articles required a lexical competence beyond all but the specialist.

After 1860 the unstable cycle of declining wages and increasing food prices, that caused great waves of poverty, was over.


The April 16, 1892 issue features Londe’s phonoscope illustrated with engravings of the apparatus, and the twelve heads mouthing the words ‘vive la France’.


Studies into the nature of experiment have, it is claimed by Collins and Shapin, dominated the new history of science during the 1980s. Although Holmes (Holmes, F. 1992. ‘Do We Understand Historically how Experimental Knowledge is Acquired’. *History of Science*, 30 (88), pp.119-135.) challenges this oversimplified overview by pointing to earlier work on the history of experiment.


For a discussion of these competing paradigms see Holmes, F. 1992. ‘Do We Understand Historically how Experimental Knowledge is Acquired’. *History of Science*, 30 (88), pp.119-135.


Ibid., see chapter iv ‘the Embodiment of Science in Technology.


Ibid., p. 225.