DOUBLE THINK: THE CINEMA AND MAGIC LANTERN CULTURE

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The discussion of cinema and magic lantern culture in this paper forms a small portion of a larger ongoing investigation into the early years of film that looks at the invention and beginnings of the cinema with the help of new methodologies in the history of technology, in particular recent theories of the sociology of the history of technology elaborated by Wiebe E. Bijker, Trevor J. Pinch, and Thomas P. Hughes.[1]

In preparing my just-published chronology of cinema in the years 1889-1896, *The New Thing with the Long Name, and the Old Thing with the Name that Isn't Much Shorter*,[2] I quickly came to recognize that there are still many unresolved mysteries about the appearance of the cinema in the late 19th century, and that most of the work in this area that has been done to date rests on a very shaky foundation made up of dubious assumptions, hidden agendas, and outright misrepresentation of the data.[3] The most pervasive genuine error in accounts of the invention of cinema comes from the blithe use of *ex post facto* reasoning which argues from the later development of narrative film style and a vertically integrated industrial setting retrospectively back into the period of invention in a hopeless quest to define the 'first' source, or, in more modern work, sources, that somehow embody all of the later characteristics of the movies, and establish a single moment or artifact from which they may be derived.[4] This futile quest alone has drastically obscured our understanding of the invention of the cinema in the late 19th century; when, as so often, this fruitless argument is combined with a linear model of technological development, the result is to assume that the movies of Griffith and Feuillade and Pastrone were the inevitable outcome of the discovery of a viable method to reconstitute natural motion on the screen in front of an audience, with the result that we also lose contact with those subsequent distinguishing characteristics that make the cinema a unique medium of its own. In this paper, I would like to propose an alternative to the linear model of the invention of motion pictures, and to examine more closely some of

the influences on the early cinema, using in this short study examples drawn from the relationship of the cinema to magic lantern culture.

First, let me summarize some of the principles involved in contemporary work in the history of technology, particularly in the sociology of the history of technology as defined by the authors noted above. In abandoning both the defects of a linear model of technological development and the fallacy of looking at the beginnings of the cinema through the rear-view-mirror of its later evolution, we need to look at any technological artifact symmetrically, and not asymmetrically. That is, since no technological artifact is inevitable, or is the only possible solution to a particular problem, we must examine not only 'successful' artifacts, but also 'failed' artifacts with an equal care and precision if we are to have any answer at all to the question 'Why did this particular artifact succeed?' Since there are always number of possible solutions to a technological problem -- and the period of the invention of the cinema is particularly replete with the widest variety of actively promulgated and practically adopted resolutions to the central problems of achieving the representation of motion -- we need to look in detail at the social groups of users, inventors, promoters, manufacturers, exhibitors, audiences and commentators to see what individual, separate, and sometimes conflicting stakes they had in an artifact, and what influences they brought to the individual technological solutions required to achieve animated pictures.

For an example, one of the enduring problems of early cinema was the attempt to overcome flicker on the screen, an irritant to showmen, audiences and inventors alike caused by the interruption of the light source from the projector by the shutter whilst the film band was advanced from one frame to the next. Solutions to problem were aggravated by the strain put on the celluloid film by the tensions of starting and stopping each frame mechanically at the projector gate, and the mechanical problems of synchronously gearing the film transport and shutter apparatus; many of the wide variety of early intermittent movements were designed to ameliorate one or another element of this problem, for which an adequate solution did not appear until after 1902[5] for mechanical intermittents. But an alternative line of development was not only possible but also suggested from the very beginning in the 1890s: a continuously moving film band with the necessary intermittent projection of each frame provided by interrupting the optical path of the light -- instead of interrupting the movement of the film band -- by using revolving or alternating prisms or mirrors. Indeed, this

alternate path of development had the cinema's most substantively successful public antecedent, in Emile Reynaud's 12,800 presentations of his Théàtre Optique at the Musée Grevin that began in October 1892. And optical solutions to intermittent projection had the additional advantage of providing practical assistance in the solution of several other persistent difficulties in early film exhibition, such as the inordinate wear and scratching of films which degraded the image for both audiences and showmen, causing films to be rapidly unusable, and the constant breakage caused by mechanical inertia and by tensioning problems that frequently interrupted showings and degraded prints.

Why did optical solutions to the problem of intermittent projection 'fail', and why did mechanical ones, with their very evident drawbacks, 'succeed' -- and thereby themselves contribute strongly to the very retarded development of cinematic institutions in the period 1898-1901? We can begin to answer this question only by examining the artifacts of the intermittent movement, of intermittent projection, symmetrically. The historical literature as it stands analyses optical solutions only before December 1895, where they are considered as faltering experiments on the road to successful screen projection, as if mechanical intermittents were the inevitable and only possible solution to the issue.[6] Even the Lumières, whose work is perhaps the most intensively studied and voluminously published among all cinema inventors, fall prey to this historical asymmetry: two devices with continuously moving film and quite different optical intermittent movements developed by Auguste and Louis Lumière in 1898 and by the Lumière company in 1902 are nowhere discussed in any of the writings on this important firm from Lyons.[7]

Perhaps one part of the answer can be found in the concept of the interpretive flexibility of a technological artifact. As suggested by Bijker and Pinch[8] a given artifact has different meanings for different social groups, who attach a meaning to it in the light of their own experiences, goals, and needs. Some photographers considered the cinema to be a new kind of portrait photography, and like Georges Demenÿ prepared 'living portraits' as either film bands or mutoscope flip books,[9] while for magic lantern exhibitors it was the final culmination of two generations of ever more elaborate mechanisms for quickly changing slides and/or invisibly dissolving from scene to scene.[10] Importantly, the interpretive flexibility of an artifact is not limited to how social groups attach meaning to the artifact, but it also recognizes that there is flexibility in how the artifact is designed, and that social groups

of non-engineers can influence that design. The influence of lanternists on the technological artifacts of the cinema can be seen in mechanisms like Cecil Wray's Kineoptoscope, intended to fit in the standard slide stage of a normal magic lantern. The quick inclusion of lightweight and simple cinema apparatus in the offerings of magic lantern supply firms like Riley Brothers in England and Eduard Liesegang in Germany, amongst many others, encouraged the development of particularly portable and elegantly concise apparatus clearly intended as an adjunct to the magic lantern.[11] Each of these separate interpretations of the meaning of the cinema had a traceable influence on the technological design of individual artifacts, on their usage in the marketplace and on their longevity as a part of the overall institution of the cinema.

Here, I want to introduce Bijker's concept of the technological frame. He defines a technological frame as "the concepts and techniques employed by a community in its problem solving,"[12] specifying that problem solving is a broadly inclusive concept which encompasses the recognition of what counts as a problem as well as the strategies available for solving the problem, making a technological frame "a combination of current theories, tacit knowledge, engineering practise...goals, and handling and using practice."[13] Inclusion in a technological frame is not limited only to inventors, engineers or scientists, but is extended to all social groups with a stake in the artifact: it applies to the *interaction* of the various forces that determine technological construction, and *clarifies* both how technology structures the social environment and how the social environment structures an artifact's design.

Using a technological frame can give us a clue about how mechanical projection systems, with all of their drawbacks, dominated the early days of the cinema. Among the early user groups gathered around the new artifact, who formed a primary market and first circle of negotiants for the cinema, were inventors and mechanics, fairground showmen, variety and theatrical impresarios, magic lanternists, lecturers, photographers, magicians, lantern and photographic manufacturers and suppliers, and photographic journalists. Debatably, the social group of professional travelling magic lanternists *may* have been the largest of these groups; more certain is that a major part of the experience of many members of each of these groups was familiarity with the technical operations of the magic lantern, its manipulation as as an instrument of showmanship, and the magic lantern culture that surrounded it.

As has been noted, magic lantern technology had been edging toward ever-faster, smoother, and more elaborate representations of fluid motion since the 1860's.[14] To see a quiet country mill wheel slowly turning in the late Autumn, to see winter approaching, the snow falling as the mill wheel stills, the outbreak of spring at the mill pond with a flock of swans proceeding across the fresh water and gracefully bending their elegant necks for food -- to describe only one of the most widely-known dissolving slide sets of the last third of the 19th century -- is to recognize that the invention of the cinema was inevitable. For all of these lantern practitioners, the lantern represented centuries of solid evolution of a finely tuned optical instrument. For everyone included in this technological frame, the problem of motion was primarily mechanical one: the optics already existed.[15] It is not surprising, then, that a high value was placed on developing a mechanical device which could be used in conjunction with a proven optical pathway that included highly evolved powerful light sources and sharp projection lenses capable of providing a bright image in large halls and venues.

I would argue here that the magic lantern was not so much a 'precursor' of the cinema, as it was the environment into which the cinema was born, the *milieu* which nursed it through its extended period of invention to about 1903, the institution which provided its early business practises,[16] and a medium with which the cinema coexisted for about two decades, not achieving its 'independence' as a separate medium (through its own venues, its own specialist personnel, its own aesthetic language, its own economic institutions, its own themes and subjects for films) until well after the turn of the new century. As Henry V. Hopwood wrote in 1899, "A film for projecting a living picture is nothing more, after all, than a multiple lantern slide."[17]

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Magic lantern culture and the concept of the technological frame are also helpful in analysing some otherwise problematic phenomena in early filmmaking practise. In his article "'Primitive' Cinema: A Frame-up? Or The Trick's on Us"[18], Tom Gunning presents an account of the 'splice of substitution' in the work of Georges Méliès. Examining this 'hidden' splice in relation to his concept of non-continuous editing in early film, Gunning comments that "This discovery of a previously unperceived process of film cutting raises enormous problems of definitions for the film historian."[19] From Gunning's point of view, reaching back into early cinema and exploring its uniquenesses from his awareness of the later

development of classical editing and its practise of 'invisible cutting', Méliès 'splice of substitution' does indeed present problems. But not quite in the way that Gunning states when he comments Méliès' splice shows that "early film-makers were concerned with issues that traditionally they are thought to have ignored, those of precise continuity of action over a splice."[20] I would contend, instead, that at the time of making *The Terrible Turkish Executioner* in 1904, Gunning's exemplar for Méliès' regular editing practise with the 'splice of substitution', Méliès had little or no engagement with the idea of narrative continuity across a splice -- as evidenced in others of his 1904 productions like *Faust and Marguerite* or *The Impossible Voyage*. In his relation to the cinema, Méliès would have a high inclusion in a technological frame of magicians who were early users of animated pictures, a position that would include strong prohibition against 'giving away the trick'. But for our discussion, it is Méliès' inclusion in a technological frame of magic lantern culture that is more interesting: in *The Terrible Turkish Executioner* Méliès is reproducing the two hundred year old transformation effect of a slipping slide. Along with a jumping figure or a juggler, severed heads and transforming heads probably accounted for by far the largest number of these comic illusions, whose proper manipulation by the lanternist was itself a practised and refined art of showmanship which required adeptness and skill so as not to 'give away the trick' and to produce on the screen an instantaneous and surprising effect. The traditions of this basic illusion were so firmly and fully established for both showmen and audiences by the time of Méliès, especially against the still tentative and unsettling concept of spatial continuity across the splice, that his film must be read as having a high inclusion in a technological frame of magic lantern culture, rather than as an aberrant problem derived from the retrospective importation of a narrative film aesthetic.

The audience, too, if we include them in relation to the same technological frame, would have been thoroughly familiar with the effect, a shared experience across both magic lantern culture and the new film culture that again argues for an analytical perspective that Charles Musser has called 'a history of screen practise'.[21] From this vantage point we can legitimately ask why Méliès chose to bring forth yet another version of an age-old comic scene in this new medium, when in doing so he needed to spend a considerable amount of time and trouble in technically manipulating his camera, negative, and prints to hide the origins of his trick and invent his 'spice of substitution.' Only part of the answer comes from

the often-cited rationale of the economies of permanently fixing an elaborate stage effect on film and then inexpensively reproducing it again and again. In this case, the cinema provided Méliès with a technological development that allowed a continuous repetition and variation of transformations within one scene that were not possible with the magic lantern. Where an expertly handled slipping slide could sever a single head or a single group of heads in a single motion and make a single substitution, *The Terrible Turkish Executioner* severs four individual heads with a single blow, each of which is separately animated and then separately restored, before the victims turn on the executioner himself and cut him in half as well. Reassembling himself, the executioner flees the stage, pursued by his erstwhile victims. In the film, the essential 'trick' appears six times, a set of variations beyond the capabilities of the lantern, and this elaboration negotiates a space between familiarity and freshness for its audiences.

Another, earlier example of films existing within the established magic lantern frame might be taken from the Lumière film *A Boat Leaving Harbor* (*Barque sortant du port*) of 1896, about which Dai Vaughan has written so eloquently.[22] Vaughn's articulate examination of the many resonances of this title which, in his words, "begins without purpose and ends without conclusion,"[23] begs the question of the film's aesthetic origins; his celebration of the film's spontaneity, and his use of spontaneity as the decisive factor in why "we consider Lumière cinema and Edison not"[24] is insufficient all the way back to that most spontaneous of Edison productions, *Fred Ott's Sneeze*. The fragment of reality represented by *A Boat Leaving Harbor* is directly derived from panoramic magic lantern slipping slides -- as opposed to the quickly moved transformation slipping slides -- that were used in magic lantern shows throughout the 19th century to represent views of various types of boats and ships, fleets back from naval engagements, and depictions of the harbor scenes. With its seemingly randomly chosen framing, complete lack of any tensions or compositions against the edges of the frame, and wholly incomplete 'action' of rowing out of the harbor, Lumière's film which "begins without purpose and ends without conclusion" is constructed as a familiar static slide thrown upon the screen[25], this time using the apparatus of a moving film band to reconstitute, in today's jargon, the 'full motion graphics' of the exertions of the rowers against wind and waves. It is "an attachment to any standard lantern" again mediating for its audiences a representational space between the comfortably familiar and the dynamically

new; it is on the basis of this negotiation that the first cinema audiences were so startled, as Vaughn and many contemporary reporters noted, by the gentle fluttering of background leaves on trees, and other non-central 'inessential' details of the first films. Today, even as scholars watching early films, these 'non-central' movements are not a primary or pre-emptive call on our attention as they were for contemporary audiences; they are noticeable, shocking, attention-grabbing only for an audience with a high inclusion in a technological frame of magic lantern culture, where motion was not at all the new experience, but where motion had always been centralized and limited, presented within the repetitive limitations of a mechanical slide. Cinema did not bring motion to the screen; it brought the duration of motion, it brought the elaboration and variation of motion, it brought an unlimited motion of nature, of the natural world, that astonished audiences and was so often noted in press reports of early film showings.[26]

From 1896 to 1904, from *A Boat Leaving Harbor* to *The Terrible Turkish Executioner*, the resonance of magic lantern culture is vividly present. So it is also for the Lumières in their design of an optical intermittent projection movement in mid-1902. The period of invention of the cinema does not end in 1895, as suggested by Georges Sadoul in the first part of his classic **Histoire général du cinéma**. The magic lantern was not a precursor of the cinema; rather, the cinema was in its beginnings an extension of the magic lantern, one which later outgrew the lantern's technical boundaries and aesthetic vocabulary to speak with its own voice and develop its own technical artifacts. We can find out how much later only by deserting the linear model of the early development of the cinema, by abandoning retrospective importations of later developments, and by examining the period symmetrically and with precision.

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1. See: Wiebe E. Bijker, Thomas P. Hughes, and Trevor J. Pinch, eds, **The Social Construction of Technological Systems. New Directions in the sociology and History of Technology** (Cambridge, MA, 1987: The MIT Press) and especially the articles *The Social Construction of Bakelite: Toward a Theory of Invention*, by Wiebe E. Bijker (pp 159-187); *The Social Construction of Facts and Artifacts: or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other* by Trevor J. Pinch and Wiebe E. Bijker (pp. 17-50); and *The Evolution of Large Technological Systems* by Thomas P. Hughes (pp. 51-82). See also: Thomas P. Hughes, **Networks of Power: Electrification in Western Society, 1880-1930** (Baltimore, 1983: The Johns Hopkins University Press).

2. Deac Rossell, *"The New Thing with the Long Name and the Old Thing with the Name that Isn't Much Shorter": A Cinema Chronology, 1889-1896*. **Film History**, V. 7, No. 2. (Special Issue), Summer 1995.

3. For an example as recent as April 1995, see Jacques Rittaud-Hutinet, **Les frères Lumière. L'invention du cinéma.** (Paris, 1995: Editions Flammarion). This is Rittaud-Hutinet's fourth major book on the Lumières over a period of twenty years, apart from numerous articles. In this Centennial publication he mis-states both the dates and contents of their French patent for the Cinématographe of 13 February 1895; distorts the factual history of the Edison Kinetoscope in France and its influence on the Lumière invention; ignores the prior public projections of Max Skladanowsky in Berlin (as well as of the Lathams in America); misrepresents the first work of Méliès; and makes numerous other errors. For an insightful and perceptive review, see Laurent Mannoni, "baisse un peu l'abat-Jour..." in *La Quinzaine littéraire*, No. 668, 30 April 1995, p. 28.

4. These attempts still plague otherwise sane film historians: at a press conference for the 100th Anniversary of the cinema packed with over 1300 film journalists from around the world, and hosted by the Minister of Culture and the Cinémathéque Française, among others, filmmaker and respected historian Bertrand Tavernier declared in his most forceful manner that the sole, true, original inventors of the cinema were Auguste and Louis Lumière, contending that "Edison with his peep-show kinetoscope is the precursor of television. Pick any date you like for the Centennial of television, and you can celebrate the work of Thomas Alva Edison. The true inventors of the cinema are August and Louis Lumière and the birth of the cinema was on 28 December 1895." The author was present at this event, and witnessed the strenuous arguments that ensued both during and after the press conference, and Tavernier's unrelenting pursuit of his original thesis.

5. The solution around which this problem was resolved was the introduction of the three-bladed shutter, still in use today. By interrupting the light from the projector not just whilst the film band was being moved from frame to frame (necessary to prevent blurring of the image on the screen while the image was in motion), but also interrupting the steady light on the screen during the projection of the image at rest in the projection gate, the variation in light intensity is evened out, resulting in a (at first seemingly paradoxical) great reduction or complete loss of flicker in the image on the screen. The three-bladed shutter was developed by Theodor Pätzold for his own Messter projector, and brought into Messter's production by Max Gliewe with the Model XI apparatus manufactured from 1902; in that same year John A.

Pross patented a three-bladed shutter in the United States on behalf of the American Mutoscope and Biograph Company (USP 722,382 of 19 January 1903, issued 10 March 1903) which was first used by Biograph on its 35mm Urban Bioscopes and apparently shared with Urban in England, becoming a key part of Urban's successful apparatus.

6. Of the more than 200 patents in America, France, Germany, and England issued between 1895 and 1910 suggesting a plethora of solutions to optical intermittent movements, none are discussed in the historical literature and the vast majority not even listed. The example of a 'failed' artifact being used here, the optical projection intermittent, is not an imaginary alternative to mechanically intermittent film bands: one solution was brilliantly proposed by Emil Mechau in 1912 with his Model I projector using a ring of mirrors to intermittently break the optical path of projection. With Mechau's Model III of 1922 the Leitz photographic firm began manufacturing the projector commercially, building a factory in Rastatt, Germany, for its production. Over 500 examples were made (by AEG after 1929) through 1934, and the apparatus was widely used on the Continent and in England, where it was known as the Arcadia. It was a superb machine, very gentle in handling its continuously moving film and providing a bright and steady picture on the screen. After 1945 it had a revival in television studios, as it was particularly suited to originating broadcasts of film with the flying-spot television system.

Perhaps the most interesting early cinema optical machine was the Mutagraph of the magician John Nevil Maskelyne, an experienced mechanic and illusionist who constructed much of his own unique magic apparatus. The Mutagraph was a device with continuously moving film and a series of fixed and rotating lenses providing the intermittent, patented in the United Kingdom as early as 28 May 1896 (No. 11,639), in France on 1 April 1897 (No. 265,582), and in Germany on 15 April 1897 (No. 100,559). The machine was in use in Maskelyne's presentations at the Egyptian Hall, London, for several years after its introduction in 1897, but despite patenting in three countries, Maskelyne evidently never brought the apparatus to the open market. As readers of his autobiography will be aware, he placed a very high value on the magicians' traditional injunction to 'never give away the trick', and perhaps this habit inhibited him from proselytising a fine apparatus.

7. As Bijker and Pinch state, "...a historical account founded on the retrospective success of the artifact leaves much untold." In 1898 August and Louis Lumière filed patents in France (No. 278,347 of 31 May; addition of 22 July) and Germany (No. 103,314 of 3 August) for a projection apparatus with a steadily moving film band whose intermittent was provided by a wild flexible liquid-filled prism whose dimensions were mechanically varied. In 1902 the Société Anonyme des Plaques & Papiers Photographiques A. Lumière et ses Fils filed patents in France (No. 323,667 of 12 August) and Germany (No. 157,698 of 19 August) on a projection apparatus with a steadily moving film band whose intermittent was provided by oscillating mirrors in the optical path. There is no discussion of these devices in any of the Lumière studies by Sadoul, Rittaud-Hutinet, Bernard Chardère, or Maurice Bessy and Lo Duca. They are non-existent (Chardère does include the patent number of the first device in a list in **Les Lumières**). Although both devices are illustrated and discussed in Forch (**Der Kinematograph und das sich bewegende Bild**, 1913), there is also no discussion of the apparatus in any of the other technical literature, such as Coissac (1925) or Gosser (1977).

What is most interesting about these patents, however, is perhaps not their technical contents but the questions they raise, elsewhere ignored, about the intentions and the work of

the Lumières at this time. By Summer 1898 they were well on their way out of the film business. Did they think that by developing a radically new system for the cinema that they would be able to revive the publicity and commercial successes of 1896? That they could recover a prominence that they had clearly lost? And why was the company still working on cinema apparatus for normal exhibition in 1902? And seeking protection for the work in at least two countries? Here, the exercise of looking symmetrically at the period of invention uncovers a few intriguiging clues to the ongoing life of an important firm and helps us raise previously unforseen questions about its involvement with the cinema.

8. Wiebe E. Bijker and Trevor J. Pinch, *The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other*, in Bijker, Hughes & Pinch, eds, op. cit., p. 40-44.

9. The Lumières also defined the future market for cinema as a home consumer market at an early point, patenting their Kinora home flip-card viewer on 10 September 1896 in France (No. 259,515) and also in other countries. It became a popular device manufactured in several designs, and had a flourishing revival after the turn of the century that brought the Lumière and Biograph companies together for collaborative production and marketing of the apparatus. Charles Urban was a proponent of this device in England. For a full account, see Stephen Herbert, "Kinora Living Pictures" in **Photo Historian** (U.K.), No. 95, Winter 1991, pp. 104-113.

10. Henry Langdon Childe produced his dissolving views in London in 1807. Professional lanternists in the 19th century produced at first double, then triple, then magnificent quadruple lanterns as the intricacy of their dissolving apparatus increased. Throughout the century there were many devices for automating the changing of slides, both as a way of aiding a lecturer to manipulate his own lantern and as a means of increasing the rate of the projection of images; methods included using slides attached to flexible bands (Simpson, 1893), cassette trays (Duncan, 1884), chained stacks (Hudson, 1894), and bins or hoppers. In 1888 Walter Poynter Adams patented his Roller Slide (UK 16,785), a long flexible transparent strip of gelatine or algin with an automated gearing system to advance the band. The most famous of these devices was J. A. R. Rudge's automated lantern of 1889, which William Friese-Greene demonstrated and for which he and Mortimer Evans designed their camera of the same year; the rate of operation of both machines was four or five pictures per second.

11. British film pioneer Robert W. Paul recalled in 1936 that his first cinema projector was intended "to be capable of attachment to any existing lantern." Robert W. Paul, *Kinematographic Experiences*, in Raymond Fielding, ed, **A Technological History of Motion Pictures and Television**, (Berkeley, 1967: University of California Press), p. 43. [reprinted from the **Journal** of the Society of Motion Picture Engineers, Vol. 27, November 1936.]

12. Wiebe E. Bijker, *The Social Construction of Bakelite: Toward a Theory of Invention*, in Bijker, Hughes & Pinch, op. cit., p. 168.

13. Ibid., p. 168.

14. Particularly through combining dissolving slides and mechanical slides that provided motion by means of pulleys, rackwork gears, ratchets, levers, or sliding elements. Some of these slides could be extremely ingenious and complex, as with double rackwork astronomical slides to show the movements of heavenly bodies, or Beale's Choreutoscope of 1866, which projected a disk of painted figures representing phases of movement and motivated by a near-Maltese Cross spur gear. The effect was startling, and was revived by William Charles Hughes in 1884 with great success in England and on the Continent. Many specialized slides became quite elaborate in their representations of motion. Fantoccini slides, also made by William Cheffins in England (from 1891), fit in a standard lantern slide stage and held jointed metal figures, between two sheets of glass; the tiny puppets could be manipulated by thin rods projecting below the slide-holder and made to jump, run, walk, sit, or engage in a sword-fight or other animated scene, bringing the repertoire of the shadow puppet theatre and the magic lantern wholly together.

15. To some extent, the present state of research would suggest that this description is more pertinent to the European experience than to the American one. Magic lantern culture seems to have been more dense and more pervasive in Europe than in America; Europe seems to have more intimate links between lantern culture and the cinema in its first decade than was the case in America. This would seem to be indicated by the limited range of apparatus that appeared in the U.S. in the period 1896-1900; for which patent office policies and the aggressive stance of the Edison organization also bear an influence. The early dominance of vaudeville theatres as a major exhibition circuit, as recorded in the historical literature would also be an influence; together the result was a climate of invention, or technological frame, in which American inventors needed to deal with optical and illumination issues in devising their apparatus which in Europe were provided by a widespread foundation of experience amongst magic lantern manufacturers, inventors, and practitioners. A caveat to this seemingly divergent experience is the extreme scarcity of historical magic lantern research on American topics. Very little is known about the extent, range, and practise of magic lantern culture in the U.S., which remains a fertile ground for further investigation.

16. Again there is a divergent practise in the United States: first with the Kinetoscope and again, briefly, with the Armat/Jenkins Vitascope, the Edison organization franchised the dissemination of the apparatus, a business practise which Edison modelled on his experience with the gramophone and one that was not known in Europe. See Charles Musser, **The Emergence of Cinema: The American Screen to 1907** (New York, 1990: Charles Scribners' Sons), pp. 57-62, 81-89.

17. Henry V. Hopwood, **Living Pictures: Their History, Photoduplication, and Practical Working**, (London, 1899: The Optician and Photographic Trades Review), p. 188. Compare also C. Francis Jenkins, **Animated Pictures** (Washington, D.C., 1898: By the Author), p. 100: "The fact is, the moving picture machine is simply a modified stereopticon or lantern, i.e., a lantern equipped with a mechanical slide changer."

18. Tom Gunning, "'Primitive' Cinema: A Frame-Up? Or, The Trick's on Us" in Thomas Elsaesser, ed, **Early Cinema: Space, Frame, Narrative** (London, 1990), p. 95-103.

19. Ibid., p. 98.

20. *Ibid.*, p. 98. If this were true, then the history of the 'splice of substitution' would need to begin with Max Skladanowsky in mid-1895. Skladanowsky's Bioskop projector was a double-lens, double-film-band apparatus whose conception was wholly derived from dissolving magic lantern practise; the machine projected alternate frames from each of the two film bands when in use. Skladanowsky prepared his first film bands by photographing moving subjects on his chronophotographic camera which used a paper film band with no perforations, and produced inconsistent registration of the images. The negative original was then developed, the individual images cut up, and painstakingly laid out individually and in alternating order on sheets of cut celluloid 1.5 metres square where they were printed as positives. This produced strips of images 1.5 metres or 48 'frames' long, which themselves were then glued together to make each of the two film bands for the Bioskop double-projector. Clearly, Skladanowsky was working here on a purely technical/inventive process; while he was concerned to create proper registration of his images for projection and create technical or mechanical continuity (a problem that equally faced chronophotographers like Ottomar Anschütz, Georges Demenÿ and others in mounting their images on their projection apparatus), he was hardly concerned with the splice in its incarnation as a device for narrative continuity.

21. Charles Musser, op. cit., pp. 15-54. This chapter of Musser's history presents not only concise, thoughtfully written argument for a history of screen practise across the nineteenth century and into the twentieth, regardless of the technological mechanisms of projection, but also a responsible and often well-researched précis of magic lantern history in America which exists itself as almost the major work on the subject now in print. What is curious about this opening chapter to his book, is that after its end, the magic lantern, and lantern practise, is nowhere mentioned in the succeeding 440+ pages of text. There are no referential integrations of screen practise at all after Musser sets out on his motion picture history, which somewhat undercuts and dilutes his eloquent arguments for a 'history of screen practise', once again relegating magic lantern culture to the role of a 'precursor'.

22. Dai Vaughn, *Le There Be Lumière*, in Thomas Elsaesser, ed, op. cit., pp. 63-7.

23. Ibid., p. 66.

24. Ibid., p. 65.

25. My comment here somewhat diminishes the compositional quality of lantern slides; here I wish to emphasize the centrality of the image and its motion as the elements being taken over from lantern slide practise; without the familiarity of this lantern material as a foundation, there is no earthly reason why this film should have been taken or why it should have affected audiences so strongly. We cannot here retrospectively argue a 'home movie' aesthetic.

26. For a few examples, see George C. Pratt, **Spellbound in Darkness. A History of the Silent Film** (Greenwich, CT, 1973: New York Graphic Society), p. 15-18. "...all the bustle incident to affairs of this kind was shown to perfection...." (*The New York Dramatic Mirror* on The Arrival of a Train, 4 July 1896, p. 17 [Pratt, p. 16]); "...the pretty background of trees and shrubbery, whose waving branches indicate that a stiff breeze is blowing...." (The

Rochester *Post Express* on Feeding the Baby, 6 February 1897, p. 14 [Pratt, p. 18])