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BEGINNINGS

Alison McMahan



Film history is characterized by certain grand narratives. For example, it has long been held that it took the earliest filmmakers almost twenty years to establish the basic principles of filmic narration; that silent cinema came first, and synchronized sound cinema came belatedly after; and that live-action cinema is the umbrella paradigm from which all other media, such as animation, are derived. Yet there is an alternative way of looking at film history, which we can refer to as the grand narrative of mechanization. The development of moving picture machines, most of which projected images (whether photographed or drawn) that gave an illusion of life by being shown rapidly one after the other, were the product of the industrial drive to mechanization, the drive to measure, quantify, and ultimately automate every aspect of life. Moving pictures were born out of a science called motion studies, with the immediate goal of understanding human and animal locomotion in order to devise exercises to perfect the human soldier and solve the mysteries of flight. The by-products of this effort were live-action cinema and animation, both products of the same drive to capture, store, and replay motion at will.

Motion studies

One of the most influential of the motion studies pioneers was Eadweard Muybridge (who was born in the UK but worked in the US), a still photographer who was commissioned by Leland Stanford, the President of the Central Pacific Railroad, to photograph a horse at

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full trot to demonstrate, once and for all, whether all four hooves left the ground at any one point. Muybridge worked on this problem for years. Finally, in California in 1877, Muybridge managed to line up twelve cameras that could take exposures in 1/1000 of a second, triggered when the horse broke the strings set across the track. These pictures showed definitively that all four of the horse's hooves did leave the ground in mid-trot. Muybridge continued these experiments and photographed many sequences of animals and humans in motion. He lectured in the US and Europe and projected his images on a screen using his Zoöpraxiscope projector. Muybridge's work especially influenced Marey and Edison (Herbert and McKernan 1996: 99–100).

Muybridge's photographs of birds contributed significantly to the advancement of aerodynamics. The idea that was popular in most aerodynamic circles was that of an ornithopter, or a flying device modeled on birds (although some favored the idea of a rotating blade that would screw upwards, as in a helicopter). In order to build an ornithopter it was therefore necessary to study the flight of birds. Such studies had already been attempted, including graphic studies by Étienne-Jules Marey in 1869 and 1870 that produced line tracings from the flights of harnessed birds.

Marey continued his work on locomotion by adapting the photographic rifle that the astronomer Pierre-Jules Janssen had developed to photograph the passage of Venus across the sun, and he was galvanized by the publication of Muybridge's photographs of Leland Stanford's racehorse. In 1883 he was awarded money to erect a building on his *Station Physiologique*, his center for the study of locomotion. The money also enabled him to hire an associate, Georges Demeny, whose work would become well known in its own right.

Cameras

At first Marey used single large fixed plates where a series of images would all be imprinted, but the overlap in these images made it difficult to decipher the motions he wished to study. By 1888 he had developed the *chronophotographe sur bande mobile*, a motion picture camera that could register up to twenty images a second on paper. Because the roll of paper was not perforated it was not possible to make the images equidistant, thus making it unreliable in the capture and projection of true motion picture images. Marey was not concerned about this because his interest was the study of locomotion and not motion picture projection. By 1890, celluloid (the result of research by inventors all over the world but mostly commercialized by George Eastman) had become widely available. Marey patented his camera for use with celluloid in 1890.

Now Marey and Demeny began to produce motion pictures in earnest, always with the purpose of studying locomotion. Until 1892 Marey studied his images of locomotion by

cutting them out and then attaching them equidistantly inside a zoetrope, a cylindrical viewing device. At this point, though, he began to feel the need for real projection. By November of 1892 many of his colleagues considered the projector he developed to have resolved the problems of projecting movement. However, Marey's projector, like his camera, did not use a perforated-film system, which made it difficult to ensure a steady movement.

Thomas Alva Edison, already well known as the inventor of the light bulb and the phonograph, among many other accomplishments, saw Muybridge present his zoöpraxiscope in Orange, New Jersey, in February 1888, and met with him privately two days later to discuss the possibility of connecting Muybridge's projection system with Edison's phonograph. This particular plan never came to fruition, but Edison continued to pursue the concept on his own. In 1888 and 1889 he first tried to have 42,000 images, each $\frac{1}{2}$ of an inch wide, imprinted on a cylinder that was the size of his phonograph records. These were to be taken on a continuous spiral with 180 images per turn. The spectator would watch the images through a microscope while listening to a phonograph. In June 1889, Edison hired Scottish inventor William Laurie Kennedy Dickson to pursue the second version of the project, now called a kinetoscope, which consisted of wrapping the cylinders with celluloid coated with a photographic emulsion. While Dickson pursued this approach, Edison went to Paris in the summer of 1889 for the *Exposition universelle* (World's Fair), and there he saw the *chronophotographe* and met with Marey. This showed him that his error was in a too-literal application of photographic principles to the kinetoscope. Edison was able to demonstrate a horizontal feed system (rather than the vertical feed system used today) by 1891. Dickson had switched to vertical feed and a wider strip of film by 1892. In 1893 in New Jersey, Edison built his film studio, 'the Black Maria', a small black room that could rotate to let in the light of the sun through the open roof. Dickson and William Heise, his partner on the kinetoscope project, then went on to film numerous scenes, usually vaudeville acts, that would be staged with a frontal presentation in the Black Maria; spectators would watch these films through a peephole in a box (Musser 1990: 64–78).

Projecting images

Robert William Paul built the first commercial film projector in England. An electrical instrument-maker, he became the British film pioneer when two Greek entrepreneurs asked him to build replicas of Edison's kinetoscope (which Edison had not bothered to patent in Europe). In addition to making the copies for his employers, he made a few for himself. The kinetoscopes could only be used for viewing the films, but with the

were taken with Marey's *chronophotographie* and then laboriously transferred to a glass disc, from which they could be observed through the *phonoscope* peephole or projected. Demeny also gave some thought to synchronizing his *phonoscope* images with a phonograph, but apparently never actually did so. Gaumont purchased the rights to Demeny's patents for the *phonoscope* (patented in 1891) and the *biographe* (patented in 1893) after Demeny had tried to interest the Lumière brothers in them without success. Demeny's patent of 10 October 1893 became the basis for the Gaumont 60mm camera, also called a *chronophotographie*, which would be perfected in the first few months of 1896.

In Germany, the Skladanowsky brothers had the same vision as Demeny: that film should be projected for the amusement of a paying audience. Max Skladanowsky began experimenting with 'living photography' around 1887, inspired by Joseph Plateau's Phenakistiscope. After a number of failures he managed to construct a workable camera, and shot his first film footage in August 1892: forty-eight single frames of his brother Emil. The construction of a projector, the *Bioskop*, however, was delayed because of financial difficulties. By November 1895, Max Skladanowsky had developed and built all the necessary apparatus for a public screening: a film camera, projector, printer, and perforation machine. Since he had worked in vaudeville showing lantern slides, chronotropes or kaleidoscope images, and even x-rays, he was well equipped to become a film exhibitor, as films were first shown at circuses and vaudeville fairs; nickelodeons, as the first store-front cinemas were called, did not appear until around 1905.

The first film performance to a paying audience occurred when the *Bioskop* of the Brothers Skladanowsky was introduced to audiences at Berlin's leading vaudeville house, the Winter Garden, as the final number of the new programme of 1 November 1895. The Skladanowskys used a double projector. The negative was cut apart into single frames which were then remounted on two strips consisting of alternating images (even-numbered frames on one projector, odd-numbered frames on the other). Positive prints of both strips were then projected simultaneously, using a synchronized worm-gear transport system with sprockets. A comb-like moving shutter projected only one motionless frame at a time, while masking the moving image on the other projector. The projector ran at 16 frames per second. In 1895 Skladanowsky patented the worm-gear system, already in use in his film camera of 1892, and received the official German patent number 88,599. Through this invention he solved the problem of transporting images through a projector, while simultaneously bringing them to a momentary standstill for the split second of actual projection. The Skladanowsky brothers toured widely—though in Paris, their month-long engagement was cancelled after the historic Lumière screening, at which they were present. But they toured all over Germany and had extended runs in Norway and Copenhagen (Lichtenstein 1990: 313–25).

assistance of Birt Acres, Paul designed a cinematograph, the Paul-Acres camera, with which they shot their first film in March 1895. Most of the films were actualities, but they did make a fiction film in June entitled *Arrest of a Pickpocket*. These films, the first made in England, were shown at the Empire of India Exhibition in Earl's Court that same year. Paul worked on a projection device and completed his Theatregraph by February of 1896, the first of various projectors he would build; later he incorporated the use of the Maltese Cross, a shutter device still in use in film projectors today. Paul also built the first film studio in England, where he employed G. H. Cricks, Jack Smith, and Walter Booth to make trick films, comedies, and actualities; all of these men went on to successful film careers. Paul himself stayed in the film business until 1920 (Herbert and McKernan 1996: 107–8).

Also in the UK George Albert Smith, a hypnotist and lanternist who ran his own amusement garden in Brighton, followed on the heels of R. W. Paul by obtaining a camera and making over thirty-one films in 1897 alone. Frank Grey credits Smith with 'the remarkable interpolative use of close-ups, subjective and objective point-of-view shots, the creation of dreamtime and the use of reversing and the development of continuity editing' (Herbert and McKernan 1996: 136). Smith's best-known films include *As Seen through a Telescope*, *Grandma's Reading Glass*, and *Let Me Dream Again*. Smith joined forces with Charles Urban in 1902 and focused his energies on the development of Kinemacolor, a two-tone color process, until he left the film business in 1915.

The first motion picture cameras appeared just in time to film the first successful flights of dirigibles and airplanes, as the same motion studies that had produced the cameras had demonstrated the futility of ornithopters and helped scientists conduct studies in drag, velocity, and wind tunnels that would lead to flight.

False starts

Meanwhile, Demeny continued to work on the improvement of Marey's inventions, and he was also eager to commercialize them. In July 1891 Demeny gave a demonstration of his *phonoscope* at the Musée Grévin, the Parisian wax museum.

The *phonoscope* was a projector designed to reproduce the living manner of a subject as s/he pronounced short phrases. (One film shows Demeny himself saying 'Vive la France'.) Demeny made a series of animated portraits of people, from women, children, and babies to workmen, each of which represents a character type. Sometimes he put these archetypal characters into scenes together, such as a man and a woman arguing, or a family group watching a child and grandfather play pat-a-cake. Though plotless, these *phonoscope* sequences can be seen as the first steps towards fiction film. The images

early 1895. The structural principles developed for the actualities were applied to the fiction films as well. In *L'arroseur arrosé*, for example, there is a clear beginning (the gardener is watering the yard with a hose), a middle (the boy steps on the hose and cuts off the flow of water, then releases it when the gardener is peering into the hose so that he gets a face full of water), and an end (the gardener chases the boy, then drags him back to center screen to spank him). Most of the Lumière fiction films were directed by Georges Hatôt. The Lumière brothers eventually sold their film concern to Charles Pathé in 1902.

Léon Gaumont, Jules Carpentier (inventor and Gaumont's mentor), and Alice Guy were among those invited to witness an early demonstration of the Lumière *cinématographe* on March 22, 1895, for the *Société d'Encouragement pour l'industrie nationale à Paris*. Carpentier immediately offered to build more machines for the Lumière brothers. He also designed a *Défendeur Carpentier-Lumière* that allowed longer bands of film to pass through the camera. The only film shown at the March 22 screening was the *Sortie d'usine*. (It is possible that as of March 22, 1895, *L'Arroseur* had not yet been made.) But this demonstration inspired Alice Guy to start her own filmmaking career; and she wrote, produced, and directed her first fiction film, *La Fée aux choux* (*The Cabbage Fairy*), sometime before May 1896, probably with the Demeny-Gaumont 60mm camera, thus becoming the first woman filmmaker. She taught herself the art by first remaking the fiction films released by the Lumière company, most of them one-minute, one-take, one-set 'cinema of attractions' films directed by Georges Hatôt. She also imitated Edison films and films by Méliès (McMahan 2002: 4–12).

The 'cinema of attractions' theory was developed by Tom Gunning and André Gaudreault (based on a term used by Eisenstein) (Elsaesser 1990: 56–61). According to this theory, the cinema of attractions dominated until 1902, and was characterized by frontal presentation, theatrical devices like entering and bowing, a lack of development of a diegesis (a story world), a lack of editing and montage, and no use of off-screen space. Other historians have developed counterarguments and alternatives to this theory (see, for example, Brewster and Jacobs 1997). In *Alice Guy Blaché, Lost Visionary of the Cinema*, I reached the conclusion (based on the work of Charles Musser, Edward Branigan, later essays by Gaudreault, and my own research) that the 'cinema of narrative integration', as early narrative cinema is referred to by scholars, existed from the very beginning of cinema; certainly it is present in single-shot films. I used three arguments to support this claim: that elements of the *mise-en-scène* of single-shot films can serve the same function as editing, such as the use of staging in depth or off-screen space; that certain single-shot films do suggest the passage of time; and that character development is clearly evident (McMahan 2002: 32–6 and 49–52). The cinema of attractions theory

At the same time as Demeny and the Skladanowskys were working on their cameras and projectors, the Lumière Brothers were busy working on a *cinématographe* of their own invention. The Lumière camera used 35mm film and had innovatively solved the problem of stabilizing the film as it unwound by perforating the celluloid with sprocket holes along the edges, using these to hold the film in place with a registration claw while each individual frame was exposed. Because the Lumières solved the registration problem, and because they were credited as the first to project films to a paying public, on 28 December 1895 (though in fact the Skladanowsky Brothers had done this somewhat earlier), and—last but not least—because they were better capitalized and better at promoting their film franchise, they are usually credited as the inventors of motion pictures. Although December 1895 is a convenient marker for the beginning of moving picture history as we know it, especially since their 35mm format is still the principal cinematographic format to this day, this date is not necessarily the most accurate marker of the birth of the medium.

Lumière vs. Méliès, and other fictions

For many years it was a given among film historians that the Lumières were 'the fathers of the non-fiction film' and that Georges Méliès was the 'father of the fiction film'. This idea was derived from the grand narrative mentioned earlier, namely, that it took early filmmakers almost two decades to develop the principles of classic cinematic narration, the standard today. It is true that the Lumières specialized in making actualities, as the earliest non-fiction films were called. These were usually one-minute, one-shot, one-location films with frontal presentation. The very first one, *Sortie d'usine* (*Workers Leaving the Factory*, 1895), was also the first commercial, as it showed workers leaving the Lumière photographic equipment factory. But, as Marshall Deutelbaum (1983) has shown, most of the Lumière actualities (all about 20 metres, or one minute long) display a narrational structure dominated by a linear, sequential process, a systematic series of events directed to some end, and closure that usually matches the film's opening. The Lumières actually directed few of the films themselves, but they turned their basic narrational structure into a set of principles that was imparted to the many cameramen they subcontracted to go all over the world making films and promoting the Lumière system. For many countries, a screening of Lumière films, including a handful taken in their own locales, formed their introduction to cinema.

Though more than two-thirds of the approximately 1,500 films produced by the Lumières were non-fiction films, a third of their output was fiction, including the very first fiction film, *L'arroseur arrosé* (*The Waterer Watered*, 1895), directed by Louis Lumière in

■ Alice Guy (1873–1968)

Alice Guy was working as a secretary at the Gaumont Company when she began making films in 1896. She mastered most of the techniques of special effects quickly, but preferred to make dramas and comedies over trick films. Her great contribution to film was the development of cinematic storytelling technique. From the beginning her films focused on the emotional perspective of individual characters and she used every filmmaking tool available to her to tell stories of character growth, whether it was a mattress-maker coming to terms with her desires, a father dealing with his new wife's abuse of his son, or a pregnant woman coping with her irresistible cravings for phallic foods. This last film, *Madame a des envies* (*Madame has her Cravings*), probably made in 1904, contains one of the earliest extant dramatic uses of close-ups in film; in fact, the whole story is structured around them. Guy's skill at communicating a character's psychological state, and maintaining dramatic focus on that state throughout the duration of the film, was unmatched by her peers. Even when Ferdinand Zecca at Pathé plagiarized her films, he would improve the effects or arrange for more spectacular staging but he would lose the psychological focus.

In addition to a steady stream of silent films, Guy made over 100 synchronized sound films for the Gaumont Chronophone from 1902 to 1906 (the sound was recorded first, the

◆ Alice Guy on set



picture filmed in sync with the sound playback, and the phonograph and cinematograph were synchronized together for exhibition). In 1907, Guy married Herbert Blaché, another Gaumont employee, and quit her job as head of film production at Gaumont in Paris to move with her husband to the United States, where her daughter was born in 1908. In 1910 she started her own company, Solax, and made silent films using the Gaumont studio in Flushing, New York. The Solax films were distributed by Gaumont through George Kleine. Guy built a \$100,000 studio plant for Solax in Fort Lee, New Jersey, in 1912, the same year she had her second child, a son. Once Gaumont joined the ranks of the independents, Solax had to negotiate for distribution on a state-by-state basis.

For the two years in which it was successful, Solax made stars out of actors like Marion Swayne and Billy Quirk and provided a rich growth and learning environment for designers like Ben Carré and Henri Menessier. But by 1914 it was clear that the day of the short film was over. Due to his multiple business setbacks and the outbreak of the war in France, Gaumont pulled out of the US, as did other French companies except for Pathé. The Blachés remained, but Solax had to borrow money from bankers, the Seligmans, who then owned the majority share in the company. Partly to avoid being controlled by Seligmans, Blaché started up his own company, and by the late 1910s both Guy and her husband were directing feature films for Blaché Features. After retooling themselves in various guises (US Amusement Corporation, etc.) Guy and Blaché began to join loose distributor coalitions with other filmmakers, such as Popular Plays and Players. Some of the films they directed for Popular Plays and Players were distributed by ALCO, the production entity that led to the formation of Metro-Goldwyn-Mayer in Hollywood. Guy also directed a series of 'painted woman' melodramas starring the great Olga Petrova, all of which appear to be lost. The couple divorced in 1920. In 1922 Guy chose to return to France, where for the next thirty years she lectured widely on film and wrote magazine fiction and novelizations of film scripts; but she never remarried, nor did she make another film. She died in New Jersey in 1968.

Alice Guy produced, or supervised the production of, thousands of films. She directed approximately 400 films herself, of these, 111 survive. Seventeen of her sound films survive, some of which are missing the soundtrack. Of her twenty-two features, only three survive, one of which is still unpreserved (*The Empress* at the Cinéma-thèque Française).

was developed to account for a more limited body of early films than we have available today, and primarily in relationship to the trick films of Méliès. However, Elizabeth Ezra has shown that the films of Méliès, used for years as the standard by which the cinema of attractions was defined, can in fact be categorized as narratives (Ezra 2000: 24–49).

Georges Méliès, a successful magician who had his own theatre, the Robert-Houdin, saw the first public Lumière screening at the Grand Café des Capucins on December 28, 1895, where *L'Arroseur arrosé* was screened. Immediately after the screening, Méliès

offered Antoine Lumière (the brothers' father) FF10,000 for a *cinématographe*. M. Lumière refused. Not to be dissuaded, Méliès went to London in February of 1896, where he bought a Bioscope, a motion picture camera developed by William Paul. In April he used this camera/projector to screen films produced by Paul and Edison Kinetoscope films at his Theatre Robert-Houdin. In May he returned to London and bought some Eastman unperforated celluloid film stock, which he cut into strips and had perforated by a mechanic named Lapipe. In May or June he shot his first 20m film, which was an imitation of a Lumière film, entitled *Une partie de cartes* (*A Game of Cards*, 1896), shot in May 1896 in the garden of his house in Montreuil and featuring Méliès himself. Méliès went on to specialize in a genre of 'fairy films' known as *féeries* (though he also made dramas, non-fiction films, and slapstick comedies in his long career); he became the undisputed master of the trick film, relying primarily on the stop-action substitution technique. The technical virtuosity in Méliès' trick films still dazzles today, especially in films like *Voyage dans la Lune* (*Trip to the Moon*, 1902), *Voyage à travers l'impossible* (*The Impossible Voyage*, 1904), and *A la conquête du Pôle* (*The Conquest of the Pole*, 1912). Méliès was successful enough—partly because he made filmed advertisements as early as 1898 and was the first to use product placements in his films in 1901—for his films to be copied everywhere, and he had his brother start an American branch of the company in the US. However, as audiences developed a taste for films with more complex narrative, and as the result of his inability to collect fees for the plagiarized films, he was forced to go out of business in 1915. His downfall can also be seen as a result of his inability to keep up with the drive toward mechanization: he stubbornly stuck to an artisanal, non-assembly approach to filmmaking that made it impossible for him to compete with more industrialized film manufacturers such as Charles Pathé.

Color and sound

In histories of the cinema, progress towards color film with synchronized sound is often interpreted as an unstoppable evolution toward increased realism. To the contrary, the drive to color and especially synchronized sound is another manifestation of the impetus to full mechanization. Synchronization and the optical soundtrack resulted not from audience demand for increased realism but from capitalist and industrial pressures to homogenize product and control distribution and exhibition. To put it another way, movies were never silent, they were only imperfectly mechanized.

Let's start by looking at the case of color. Many early films were actually made to be shown in 'color'. At first, color was applied by hand, then by stencil (the areas of the frame to be colored were cut onto matrix copies which were then placed on the positive

prints; each color was applied to the film through the outlines thus obtained, with brushes or pads soaked in the appropriate dye), two processes previously used on lantern slides. It was not until 1906 that Pathé began to use the ad-line 'cinematography in natural colors', thereby accelerating the company's drive toward standardization of the product by promising an increase in realism. Hand-coloring was gradually replaced by tinting and toning, but was still being used on certain films as late as the early 1920s.

Tinting and toning—the uniform coloring of the film base—started as early as 1901 and was employed into the late 1920s, and was used on approximately 85 per cent of total film production. However, producers did not have final control over colors used on films exhibited abroad, as negatives were sent with coloring instructions that may or may not have been followed. Although a combination of hand-coloring, stenciling, and tinting and toning was sometimes used on quality productions and achieved a beautiful effect, the demands of standardization and mechanization were hardly met by this procedure, which was too expensive to be used widely. It was not until the advent of Technicolor (Gaumont began experiments with three-color processes as early as 1912) and its perfection around 1930 that the goal was achieved. In between—from 1911 to 1928—there was much experimenting with additive (the projection of a black-and-white image through color filters) and subtractive (the subtraction of colors while filming so that only the desired colors appear during projection). Little is known about these processes now (Usai 2000: 22–34). What is clear is that film manufacturers aimed for standard, fast, and reliable methods of producing color film and continued to experiment until they were found. The search for color systems that will stand the test of time continues to this day.

A similar progression occurred with synchronized sound. The earliest known synchronized film to exist is the 'Dickson Experimental Sound Film'. The film was made in late 1894 or early 1895, or perhaps even earlier. The image has been known to film scholars and archivists for many years, but in spite of the film's name no one was sure it had ever really had a soundtrack. The successful preservation of the film in 1999 resulted in perfect sync between Dickson's violin as he plays an air from Pietro Mascagni's *Cavalleria rusticana* and the sound of the dancing men's feet on the wooden boards. And although Dickson succeeded in recording the sound and image of his film simultaneously, it is doubtful that the film was ever shown synchronized. The post-synchronized sound films such as the *phonoscènes* made for the Gaumont Chronophone, on the other hand, were recorded and filmed separately, but were exhibited regularly, properly synchronized, to paying audiences. (Pathé first did this in 1896, Gaumont in 1901, post-synchronized systems had commercial lives into the mid-1910s.) The Chronophone was not the only such device: in the US there was the Cameraphone, the Cort-Kitsee Device, and the Synchronophone. In England there was the Cinematophone, the Vivaphone, and, most

actualities, for example, into narrative sequences. Gradually, however, this process was taken over by film manufacturers. According to Richard Abel, Pathé-Frères took the lead in producing story films in order to wrest authorial and editorial control from exhibitors as it moved into mass production around 1904–5. The industrial switch from selling to renting films led to the standardization of length to one-reel and split-reels, setting the stage for the single-reel, pre-feature story film which dominated the film market from 1907 to 1911. With a running time of approximately fifteen minutes, one-reel films were long enough to tell complex stories, and many of the elements of what is now considered classic cinematic language were developed in the one-reel films before 1912 (Abel 1998 [1994]: xv).

The trend toward standardization and industrialization also led to the development of the star system. At first films carried no credits, apart from the title and the company logo (written or emblazoned directly onto sets at first to prevent the kind of pirating that ruined Méliès). Soon intertitles appeared to carry explanatory descriptions and, later, dialogue. As audiences learned to recognize certain actors and clamored to see their favorites again, credits with actors' names appeared, though credits for directors, producers, and screenwriters only came some time later. By 1912 the star system as we know it was in place.

From animation to digitization

When cinema and animation are looked at not in isolation, but in terms of the roles they play in the drive towards mechanization, it becomes clear that animation is not a sub-species of cinema; rather, cinema and animation were both born out of the same drive to capture, store, and replay motion at will. It also becomes clearer that cinema and animation were always much more intricately related than is commonly accepted. Even if their paths diverged after 1907 (though even this is debatable), there is no question that cinema and animation are merging again in the twenty-first century. By understanding how the drive to mechanization worked at the beginning of the last century, we can better understand the drive to digitization that already characterizes the current one; and in the case of certain nineteenth-century mechanized media, such as Reynaud's, we can see that digitization was already the goal.

Reynaud was making animated bands for his *praxinoscope* as early as 1877. From 1892 to 1900 he rear-projected more elaborate bands, which he now called *pantomimes lumineuses* (luminous pantomimes), onto a screen by means of a complicated mirror-and-lens system. The images were hand-painted on long strips of transparent celluloid and fitted into a leather band with perforations next to each frame; in other words, his

successful of all, the Animatophone, developed in 1910 from Thomassin's Simplex Kinematograph Synchronizer (mismanagement forced the Animatophone Company out of business in 1911). In Germany, F. N. Messter had successfully created his Biophon, Alfred Dusker produced a Cinephon, Karl Geeyr built the Ton-biograph for the company Deutsche Mutoskop und Biograph GmbH, and Guido Seeber developed the Seeberophon and later used Messter's Synchronophon as a technical model for the German Bioscop. After the demise of Messter's Tonbilder, synchronized musical films continued to be produced in Germany from 1914 to 1929 on the Beck system, the Lloyd-Lachman device, and the Notofilm system. The proliferation of devices was matched by placid expectation in the print media: for example, from around 1906 to around 1915, *The Moving Picture World* discussed widespread synchronized sound film production and distribution as if it were just over the horizon, an inevitable and natural occurrence.

For about a decade many of the individual systems, including the Gaumont Chronophone, were commercially very successful. In Germany alone, by 1914, 1,500 negatives from 60 to 85 metres in length and 500 Biophons had been sold in Germany; Gaumont recorded 1,000 films for the Gaumont-Messter system, totaling 60,000 meters. According to Harald, as many sound films were produced in England as in France. His estimate of sound films produced worldwide is 3,500–4,500, totaling 250,000 or 300,000 meters. That all of these systems fell out of favor around the same time, in the mid-1910s, suggests that by then these systems represented imperfect mechanization; they were gradually replaced by optical sound systems (the outbreak of World War I was also a factor) (McMahan 2002: 47–69).

If we accept that at least certain types of silent film, such as films with diegetic sound events like explosions, or dance films, were meant to be shown with sound added at the exhibition venue, then we can see these as films with a low level of mechanization, which might be raised by the addition of printed speeches for the narrator or arrangements or orchestral scores for the musicians. Seen in this light, early silent films and early sound films are part of the same continuum in a period of cinema's history when mechanization was the driving force behind technological changes. In other words, films produced with various degrees of mechanization, at the level of both color and sound, existed side by side.

Stories and stars

Mechanization, in the form of standardization, also had an influence on the development of editing and narrative. At first, film manufacturers such as Charles Pathé sold their films outright to exhibitors, who selected and re-edited the films they purchased—assembling

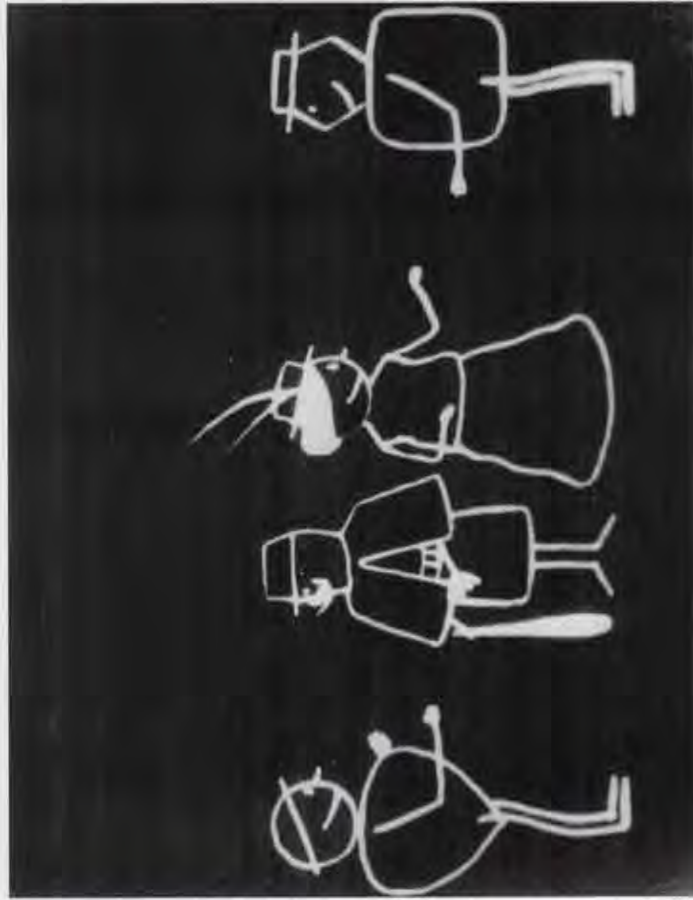
apparatus in many ways prefigured that of cinematic projection, though all the images were hand-drawn and hand-colored by Reynaud himself. Reynaud also supplied narration and vocal sound effects during his performances, with music played by a phonograph or live musicians. This was animation with almost no mechanization.

In 1896 Reynaud adapted Marey's *chronophotographe* to make a motion picture camera-projector and made a handful of films. The first of these was a classic vaudeville act by two clowns, Footit and Chocolat (black or in blackface), loosely based on an episode of William Tell: Chocolat has an apple on his head (and takes bites out of it) and Footit shoots it off with a water rifle, soaking Chocolat in the process. Once Reynaud had shot the film (at 16 frames a second) he took a few frames from one part and a few frames from another. These short selected sequences were then reproduced on the transparent celluloid, improved by drawing and coloring applied by hand and then strung into a sequential loop by joining them within a perforated flexible metal band. Reynaud repeated this process with at least two other films, one entitled *Le Premier Cigare* (*The First Cigar*), in which a university student tried his first cigar and found it comically sickening, and another vaudeville act featuring a pair of clowns, called *Les Clowns Price* (*The Price Clowns*), made in 1898, which was never shown to the public. These experiments can be seen as mechanical versions of what today is referred to as digitization, in the sense that Renaud was taking analog material, reducing it to units of information (the cut-up sections), manipulating and transforming them by coloring and re-editing, and putting them back together to make a new product. Reynaud's artisanal drive to develop mechanical methods to digitize his films in the late nineteenth century would flower into ubiquitous digitization across the media industries by the end of the twentieth.

Unfortunately, none of his early efforts survive.

By retouching cinematographic images so that the figures took on the appearance of cartoons or animation, Reynaud was applying a form of digitization similar to motion capture: the film provided him with the basic shape and motion, and he cut up the pieces to use as he wished, then drew and painted over them to give them a graphic appearance instead of a filmic appearance. A similar method was used in 1899–1900 by the Brothers Bing of Nuremberg, along with other German toy firms such as Planck, Bub, and Carotte, and the French Lapiere company, all of whom made cartoons for use in toy viewers by tracing from live-action films in a technique that became known as 'rotoscoping' (Robinson: 1991: 18).

The production of animation itself gradually became more mechanized. At first, artists like Emile Cohl, who began making animated films for Gaumont and Lux in 1908–9, and his US counterpart, Windsor McCay, produced every drawing for an animated film by hand. The laboriousness of this process was often highlighted in films, and live



● *Drame chez les Fantouches*

action and animation were combined in order to reach the one-reel standard length while still staying within budget. As a result the animator himself, or at least his hand, appeared in the cartoon, which was often framed with opening and closing live-action scenes.

But in 1910 the philosophy of Taylorism, or scientific management, became popularized in the US, and inevitably affected the art of animation. It was at this time that animation studios were being established in the US, and John Bray, an animator with a regular production contract with Paramount studios, patented a series of inventions and, most important, a system of scientific management for animation studios. The idea was to automate the process so that a maximum amount of unskilled labor could be used for smaller tasks, and to organize the work of the skilled labor in the most efficient way possible. Bray established a strict hierarchical chain of command, spelled out the daily tasks for everyone on his staff, penalized those who did not finish the assigned work, and rewarded with bonuses those who finished ahead of time. This was in sharp contrast to the earlier workshop arrangements, but since animation studios were just getting established, the system of scientific management became the norm, and remains so to this day (even though scientific management fell out of fashion in other industries by the late

1910s). Scientific management of the animation studio spread to Paris with Lortac in 1921, who had observed the process at work in New York. Two-dimensional animation suffered in Europe during World War I, although some animators such as Lortac managed to survive by producing commercials and public service films (Crafton 1993).

Trick films and special effects

Slightly more successful in Europe were stop-motion animation films. Trick films made before 1908 by artists such as Méliès, working in his own studio, and Zecca and Segundo de Chomón, working for Pathé, included techniques such as stopping the camera and replacing one object with another (a process known as stop-substitution); filming in slow motion, so that when projected at normal speed the film would appear speeded up; combining such fast-motion through superimposition with a regular speed sequence, so that some characters moved at comically fast speeds and others at normal speed; cutting alternate frames out of a sequence to speed it up; shooting with the camera hanging upside down, so that the film when projected normally would play the action backwards; superimposing a fade in and fade out of a figure to simulate the apparition and disappearance of a ghostly image; and using objects such as removable limbs, miniature sets, and miniature props. The list of special effects actually used is much longer, but this gives an indication of the creativity of the film manufacturers working in live-action cinema before 1910.

Similar tricks were adopted in Europe and applied to stop-motion animation, often using animatronic figures and puppets that could be remotely controlled, with cables, for example. Ladislav Starevitch, who was born in Poland but did most of his work in France, made animated films using the carcasses of real insects such as grasshoppers and beetles, as well as the corpses of birds and other animals. He later began to work with puppets, and continued to make animated films into the sound era.

Emile Cohl worked briefly for Pathé in France in 1911, where he was only allowed to make animated films in between live-action film assignments. By 1913 he had migrated to the US where he worked with other French filmmakers at the Éclair Studio in Fort Lee, New Jersey. According to Donald Crafton, Cohl was the one responsible for disassociating animation from the trick film genre (1993: 61). Unfortunately, the only films that survive from his years in the US are *He Poses for his Portrait* (1913), which used speech balloons, and *Bewitched Matches* (1913), a stop-motion film with matches as characters, an effect which was copied by René Clair in *Entr'acte* in 1924. Cohl's work also influenced another Surrealist filmmaker, Fernand Léger, who included an animated Charlie Chaplin cut-out in *Ballet mécanique* (1923–4). In spite of these efforts, Europe in general did not

succeed in producing a viable animation industry, though many individual artists managed to produce works of great beauty and ingenuity, such as Lotte Reiniger working with her shadow puppets in Germany from 1918 to 1936.

As Crafton notes, when it came to content, early animators were inspired by early stop-motion films (1993: 74–6); but we must not forget that animation itself is a product of stop-motion substitution, as each drawing is replaced by the next, shot on another bit of film, until the whole gives the impression of movement. We can consider J. Stuart Blackton's *Haunted Hotel* (1907), for example, both as live action film and as a trick, or animated film.

However we choose to look at the relationship between cinema and animation in the last hundred years, there is no question that the paths of cinema and animation were joined at the beginning of their history and are joining up again now. The prioritizing of cinema over animation has made it all too easy to overlook the real historical process that we are still engaged in—the drive toward mechanization, which in the twenty-first century has become the drive to digitization.

Conclusion

A reconsideration of the earliest technologies that led to the invention of cinema as we know it also leads us to conclude that live-action cinema and animation are more intimately related than generally thought, and that both are primarily the products of the industrial drive to mechanization. The drive to mechanization gives us a better explanation of the transition to sound, the use of color, the development of editing, and even the development of narrative and the star system. Looking at cinema and animation as the outgrowth of the industrial drive to mechanization that occurred at the end of the nineteenth century and gathered its full strength in the twentieth, we are forced to reconsider the grand narrative that gives live-action cinema the pride of place. Especially now, when the drive to mechanization has mutated into the drive to digitization, it is worth reconsidering the nature of animation itself, the place of special effects within animation and cinema in general, and the relation of both to live-action cinema. By learning about the earliest technologies, and how their inventors were influenced by each other, we can gain a better understanding of the cinema of the past as well as the future.

Further reading

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SOVIET CINEMA: THE OLD AND THE NEW

Denise J. Youngblood



'Cinema is for us the most important of all arts.' Attributed to Vladimir Lenin, this statement became the watchword of the Soviet film industry and was emblazoned in all Soviet movie theaters. The slogan signifies not only Lenin's interest in the potential of film as propaganda but also the centrality of cinema as a form of mass art and entertainment in the USSR. The motion picture industry had a considerable impact on culture, society, and politics throughout Soviet history, but at no point was it greater than during the 1920s. At this time, the influence of Soviet cinema spread far beyond its borders. Young Soviet directors like Alexander Dovzhenko, Sergei Eisenstein, Lev Kuleshov, Vsevolod Pudovkin, and Dziga Vertov literally revolutionized film art and earned themselves an enduring place in the history of European cinema.

Yet the achievements of this revolutionary avant-garde—and their eventual fall from grace—cannot be understood outside their historical context. Children of revolution, these filmmakers engaged in constant battles—with each other, the studio heads, the censors, and perhaps most of all with the 'old' directors of pre-revolutionary cinema—to win the hearts and minds of audiences. Their story transcends the politics of a bygone era and speaks to the transformative role of art on society. It also challenges the distinctions drawn between 'high' and 'low' culture, 'art' and 'entertainment,' and the 'old' and the 'new.'