2

Birth

Some film historians trace the origin of movies to cave paintings, to Balinese shadow puppets, or to Plato's mythic Cave of the Shadows in Book VII of the *Republic.* Many theorists find a valid conceptual model in Plato's mass of spectators, entranced by the flickering shadows of objects on the cave wall that are merely projections of the light behind them, diverted from the real objects they would see if they could only ascend from the shadow-show to examine them in the light itself. The nonmetaphoric history of the movies, however, begins with the steps leading to the invention of the movie camera and projector.

The 19th-century mind created machines for travel, machines for work, machines for the home, and machines for entertainment—and the light bulb. By the end of the century, three developments had combined to create the motion picture: research into persistence of vision (wrongly thought to be the reason movies appear to move), the invention of still photography, and increasing public interest in glass-slide shows and mechanized entertainments.

Frames per Second

Movies are an optical illusion. We believe we are watching a completely continuous, fluid motion on the screen, while all we really watch are short, discontinuous bits of the motion, mere 24ths of a second of action.

To create the cinematic illusion of motion, a series of stills must be presented rapidly to the eye, which sends the information to the brain. Each picture in a movie, whether photographed or drawn, is perceived as a clear, stable, unmoving image, as individual as a page in a flip book. But the brain does something with the information received from the eye, something that will not be fully understood until more research has been done into the neural and cognitive aspects of the perception of cinematic movement. Given certain conditions, we see the elements of one picture appear to move to their positions in the next picture. To discuss how that phenomenon has been explained, we need to understand a number of concepts and terms.

When images that present tiny changes in the photographed or drawn subject succeed each other at a rate of more than 11 or 12 per second, the viewer imagines seeing the subject move. That is, to be sure, a jerky movement. At 16 pictures per second, the apparent movement begins to seem fluid and normal, so that was the speed at which most of the first movies were photographed and projected. What we see in a movie is called *apparent movement* because no *real movement* is shown; there are only stills. Creating apparent movement from still pictures is the *cinematic illusion.*

Pictures on Film

Because each picture in a movie is an individual, rectangular image, or *frame,* on a strip of film—we'll address the digital cinema later in this book and refer until then to movies shot and printed on celluloid—the rate at which film images succeed each other is expressed in *frames per second* (*fps*) or in feet per minute (*fpm*). Most sound movies run at 24 fps, or 90 feet of

35mm film per minute, though many run at 25 fps to work with the PAL video format. The professional, theatrical standard around the world, *35mm film* is 35 millimeters wide (its *gauge*) and holds 16 frames per foot.

Film stock—unprocessed or *raw* film—consists of a base coated with an emulsion. The *base* is made of celluloid: originally cellulose nitrate (*nitrate film*), which was extremely flammable and deteriorated (shrank, dissolved, and worse) within a few decades, and then cellulose tri-acetate (*safety-base film*, also called *acetate film*), introduced in 1949, which burned slowly and would not deteriorate for a few hundred years. Nitrate film gave a better image but was kin to nitroglycerin. Safety-base film, which began as a cellulose acetate marketed by Eastman Kodak in 1908, was used for some 16mm and other small-gauge stocks. The improved version, cellulose tri-acetate, was adopted exclusively soon after it appeared, and since 1951 every film has been shot on safety-base stock. The exact formula has been continually improved.

One side of the base is coated with the *emulsion*, a layer of photosensitive chemicals. When film is processed, it is the emulsion that is developed. The most important chemical in a black-and-white emulsion is silver nitrate, which turns black when it is exposed to light, creating a *negative* (film that has black where the photographed subject was white, dark gray where the subject was light gray, and so on). The black-and-white values of a negative are reversed to *positive* values when it is copied onto blank film to make a projectable print. Because the printer's light shines through the negative onto raw stock that also turns black when it is exposed to light, what is white in the negative becomes black in the print. Some color emulsions —whose negatives are in the complements of the colors on the print—consist of several layers and include microscopic globules of dye. While most professionals shoot negative film and then strike positive prints, *reversal* film, whether black and white or color, can be processed to yield a positive image.

All movie film has a line of rectangular *perforations* (informally, perfs) or *sprocket holes*, which are rectangular with slightly rounded corners, running just inside one or both of its edges. The holes are engaged by the teeth of *sprocket wheels* (or *sprockets*), which hold the film as the wheels advance and stop it. The base of 35mm film is perforated with sprocket holes just inside its left and right edges, one every 3/16 inch. There may also be *edge numbers* alongside one line of sprocket holes, printed every foot or so, which help identify where a particular shot is on a roll. There are four sprocket holes on the left side of a 35mm frame and four on the right; this standard configuration is called "8-perf 35" because there is a total of eight perforations per frame. See Fig. 19-5 for a short strip of modern 35mm film.

The frame itself, which appears once the film has been processed, consists of microscopic bits of silver and dye that are sometimes described as minimal picture elements (*pixels*). In most sound films, an optical soundtrack runs between the frame and one line of sprocket holes. (The film may also have several digital soundtracks printed in otherwise unused areas—even between the perforations; see Fig. 19-6.) Before the optical soundtrack was invented, a full frame was as large on a print as it was on the camera negative: approximately 1 inch wide and 3/4 inch high. In 1931, to make room for the soundtrack, the size of the frame on most 35mm prints was officially reduced to the *Academy aperture* of .868 x .631 inches. All along, the proportions of a full frame have been, or been very close to, 4 units wide by 3 units high—which can be expressed, as a TV engineer would put it, as 4:3 or 4x3; with the height reduced to a constant, it is properly expressed, in film terms, as an aspect ratio of 1.33:1. Wider frames can be created by anamorphic squeezing and unsqueezing, as in CinemaScope, or by the equivalent of letterboxing (using an *aperture plate*—a piece of metal with a rectangular opening the dimensions of the desired frame, which can be slid into most cameras and projectors just in front of the film—to shape the exposed area so that it is less high than normal), as in flat widescreen. For these terms and many related ones, please see the Glossary.

Speed

Sound speed is usually 24 fps, but there are exceptions: Todd-AO, for example, ran at 30 fps in the 1950s. *Silent speed* was approximately 16 fps—conveniently, 1 foot/sec—from 1895 to the late 1910s, but it often passed 20 fps in the 1920s.

Many silents ran at 20.5 or 22 fps, and Edison's early films were shot at an average of between 30 and 40 fps. Because the first cameras were hand-cranked rather than run at a regular speed by a motor—and because there was no soundtrack running at a fixed rate that the film had to match—silent speed was always flexible.

Today's silent projectors run at 18 fps, which is a compromise. The problem is that if a film is shown too rapidly or too slowly—if the projector's rate differs from the camera's rate by as little as 2 or 3 fps—the movie loses its original pace and much of its impression of reality. A silent movie shown at sound speed loses its timing, its expressiveness, and even the connection one feels with its characters; what it gains is the unrealistic, comical effect of fast, silly movement. Projecting too slowly is just as bad. Fortunately, variable-speed projectors can show a film at the rate at which it was shot—and if that rate is unknown, the projector can be adjusted until natural movements look natural. The makers of the best DVDs are scrupulous about issuing silent films at their original projection speeds (which might vary within a single movie).

For the illusion of normal motion, then, the projector has to show the pictures at the same rate as the camera photographed them. The camera can shoot *slow motion* by exposing more than the normal number of frames per second; when the frames are projected at normal speed, the movement takes longer on screen than it did in the real world. For *fast motion*, the camera exposes fewer frames per second than normal.

By opening and closing a *shutter*—so called because it can shut out the light and also because window shutters open and close only to admit or block light completely—a movie camera exposes one frame at a time. Each frame is a still photograph, blurred a bit if the subject or the camera has moved. To take each picture, the camera stops the film and opens the shutter for about 1/50th of a second. To record a second of action at sound speed, it exposes and advances 24 frames during that second. The shutter on a conventional movie camera—or a very simple projector—resembles a hemisphere joined halfway down its base to the end of a rod; like all movie shutters it revolves once for every frame, letting the light in when the film has stopped moving and shutting the light out while the film is being advanced. It is called a *single-bladed shutter* because it uses a single flat piece of metal (the blade) to block the light. The one open area might be 180° (hemispheric), but the *variable shutter* found on the best movie cameras can be set, for example, to a 140° or 120° wedge of light for a sharper exposure.

Flicker and the Continuous Signal

The shutter comes between the lens and the *film gate*, the windowed metal sandwich where film is exposed or displayed. While a camera's shutter is closed, no light reaches the film. While a projector's shutter is closed, none of the projector's light passes through the frame onto the screen. The alternation of light and dark caused by the opening and closing of the projector's shutter causes an unpleasant distraction, termed *flicker*. If it takes about 12 fps for us to perceive motion and 16 fps for the motion to begin to look smooth, it takes 48 fps or more (the human eye's CFF or *critical flicker frequency*, the point at which the stuttering light fuses) to get rid of the flicker that produced one of the cinema's early names, the flicks. *Flicker fusion* occurs when one perceives interrupted light as an uninterrupted or *continuous signal*. Below the CFF, flicker is very noticeable, and it plagued early films.

The solution to flicker, arrived at during the silent period (by Biograph in 1903), was to shoot at 16 fps and show each of the 16 frames three times, using a *three-bladed shutter* that had three blades to block the light and three open areas. That gave a flicker rate of 48/sec at a projection rate of 16 fps, with still less flicker at 18 or 20 fps. For a 24-fps sound film, which also has a normal flicker rate of 48/sec, a *two-bladed shutter*, resembling a bow tie, flashes 48 images per second, 24 of which are different. The shutter has two open areas, so every time it turns, it shows each frame twice. (A three-bladed shutter is also often used at sound speed for an even smoother effect; some shutters have five blades.) The film is advanced from one frame to another only during the last part of the shutter's revolution, so the frame remains stable no matter how many times it is displayed during its almost 1/16th or 1/24th of a second ("almost" to allow time for the film to be advanced while the shutter is closed—which can be as long as half the projection rate, but which can also be as short as the time it takes one blade of a three-bladed shutter to cross and block the light: about 1/150th of a second).

The periodic starting and stopping of the film in the gate of a camera, printer, or projector is called *intermittent movement,* and it is responsible for the sharpness of the immobilized image as well as for the shutter's alternating instants of light and black in a dark theatre. Although we see no flicker at 48 images per second, the dark periods between images are still there. There is an interrupted, off-and-on, discontinuous signal, which may be represented graphically as - - - - - - - - - -. But our minds fill in or ignore the blanks, linking the fragments, and we perceive a continuous signal, which may be represented as __________. Ironically, about half of the time we spend watching a movie, the screen is literally blank, devoid of any image at all.

Persistence of Vision and Other Phenomena

When darkness follows a bright image, the light receptors in the eye (whose action diminishes rapidly but does not instantly shut off) retain the image for a fraction of a second, so that the retina briefly continues to send the last visual information it received to the brain.

This optical phenomenon is known as *persistence of vision* or *retinal retention.* It accounts for the way that a flashlight—or a glowing orange coal at the end of a stick—when swung around rapidly in the dark appears to produce a circle of light. In the darkness, the retina retains the individual points of light long enough to make a circle.

For many years it was assumed that persistence of vision accounted for the way we perceive apparent movement when a series of slightly different, successive images is shown to us at a certain rate. It was assumed that each image that was flashed in the dark left its imprint on the retina long enough for it to be combined with the next image. It was also assumed—before the discovery of flicker fusion—that retinally retained images were necessary to keep us from too distinctly noticing the darkness between the bright images, when the shutter is closed.

However, research begun as early as 1910 and continuing to the present has made it clear that the illusion of motion is created at a higher level of processing in the brain. Even if the retina retains an image under certain circumstances, that is not why we see movies move.

Seeing with the Brain

After the retina has delivered its information to the optic nerve, visual data are processed at a number of way stations (visual nuclei) in the brain. As the information travels, every aspect of it is interpreted by highly specialized nerve cells. It can take milliseconds, even hundreds of them, for us to become conscious of what we are seeing.

One familiar, instantaneous function offers an example of how the brain constructs what we see. Because the image on the retina has been inverted by the lens of the eye and because most people have two eyes, the brain normally receives two upside-down, two-dimensional (*2-D*) images of the world at the same time. Using the distance between the eyes and the differences between the two images, the brain computes parallax and sees one three-dimensional (*3-D*) image, which it has turned right-side-up. That final image is presented by the brain as what the eyes see. Generating a 3-D mental picture of the world is a normal example of processing and interpreting visual information before what is seen by the eye can be "seen" by the brain.

Visual Masking and Retinal Retention

Images are interrelated in the brain. Successive fragments of movement, like those shown in a series of movie frames, can be read by the brain as continuous action well after the pictures have entered the visual system. Images don't wait on the retina to be compared or combined. If they did, we would see a blurry mess of overlapping stills—not just two combined stills but many, because a retinal afterimage can last much longer than 1/20th of a second, even several seconds in the case of a very bright image. Far from accomplishing it, persistence of vision gets in the way of the cinematic illusion. The brain needs to stop perceiving one image to perceive the next. Only then can it notice and process any differences between the images. Late 20th-century research found that when a frame is followed by a fraction of a second of visual noise—a period of no information or random information—the brain stops processing the frame and clears the mental slate. (In some experiments this works only if white, not black, is flashed between frames.) This crucial phenomenon, called *visual masking*, defeats any image-confusing effects that might be caused by persistence of vision.

Although retinal retention is responsible for some images—for example, the afterimage produced by staring at a candle at night—it generally produces *unmoving* ones, like that circle made by the spun flashlight or like the apparently curved, frozen spokes of a turning wheel if it is viewed through the upright bars of a fence—the phenomenon addressed by Peter Mark Roget, the English physician best known for his thesaurus, in an 1824 paper that influenced most later discussions. (Roget's paper, "Explanation of an optical deception in the appearance of the spokes of a wheel seen through vertical apertures," responded to a query posed in 1821, probably by John Murray.)

Persistence of vision has been a persistent explanation of the cinematic illusion, and that is why it remains part of film history: because generations of scientists, camera makers, and film historians thought the explanation was accurate. It is part of the history of thinking about the cinema. Furthermore, early research into persistence of vision and the invention of devices designed to exploit it were inseparable from the invention of movie cameras and projectors. The machines based on the incorrect assumption that persistence of vision was responsible for the cinematic illusion turned out to be movie machines.

Early Observations

Under many names, persistence of vision has been known about and discussed for millennia, though it was not until the 1820s that a great deal of scientific experimentation and writing about it began in Europe. In the ancient world, Aristotle wrote about the implications of the eye's retaining an afterimage of the sun (don't try it); he thought it might be a key to the physiology of dreams, positing that many organs retain vestiges of what they have experienced or perceived and that dreams could be prompted by those fragments of sensation. Concerning persistent colors and lines, Leonardo da Vinci drew conclusions from lightning. (For the quotations and for the best history of the discovery of cinema, see Laurent Mannoni's *The Great Art of Light and Shadow*.) Burning sticks were swung around and written about at least as early as 1667. No one knows who might have been the first musician to observe that a plucked string forms an oval. In Germany in 1740, Johannes Segner was the first to try to determine how long an image persists on the retina. And in 1824 Roget mentioned retinal retention in a discussion of the shutter-like slats of a fence.

A simple experiment was proposed by the English astronomer and photographic chemist Sir John Herschel in 1825. He bet his friend that he could show the head and tail of a shilling at the same time. Then Sir John spun the coin, and the head and tail appeared as one image. This combining or overlapping of two distinct images was long considered an example of persistence of vision, but it is not. The rapidly recurring images were combined in the brain, not on the retina.

Told of Herschel's experiment, Dr. William Henry Fitton designed a cardboard disc with a different picture painted on each side and with strings attached to opposite edges. The strings could be twisted to make the card spin. When the disc turned quickly, the images on each side—in this first case, a bird and a closed, empty birdcage—were seen together as a single, unmoving image of the bird inside the cage. A version of this "scientific toy" was marketed—and long thought to have been invented—by Dr. John Ayrton Paris later in 1825. Paris called it the Thaumatrope (from the Greek "wonder turning"). Many different images were designed for the Thaumatrope; engraved drawings were printed on each side, or face, of this very popular amusement. With the invention of the Thaumatrope, the history of research into persistence of vision joins the history of entertainment. Before going on to look at the heirs of that spinning card, however, we need to consider what does generate the illusion of motion.

Separating and Integrating Frames

Although persistence of vision is not responsible for the cinematic illusion, the devices designed to exploit persistence of vision *did* produce an illusion: One did see the images move. Even if the real reasons for the perception of apparent motion were unknown, something in the persistence-of-vision experiments and toys tricked the brain correctly. They created the conditions for perceiving intermittent motion as continuous motion.

We can be sure that one of those conditions was the rapid, sequential presentation of images that were drawn or photographed to show successive parts of movements. Another condition was some kind of blank interval or imageless instant between the pictures. Yet another was the distinct space in front of the viewer, defined and occupied now by a screen but once by an eyepiece or a mirror, that allowed the images always to appear in the same place, where the viewer was already looking.

That blank interval—created by a closed shutter, by the distance between the viewing slits on a turning toy, by the flipping of a page in a flip book, by the edges where turning mirrors are glued together, by the "field blanking" in a TV, and by other means—*separates* images so that the brain processes each one as a distinct still. (When a revolving set of mirrors directs one image after another into the eye, there is no *dark* interval, only a very briefly glimpsed, image-free line where the edges of the mirrors meet, but the illusion of motion is the same as that created by a theatrical projector.) As a separator or border, the interval between stills is read by the brain as a period of non-information—allowing the phenomenon of visual masking to work, rather than functioning as a darkness in which to watch the lingering image of a previous still. Beyond being recognized as a border or as an instruction to stop looking at the previous picture and get ready for the next one, the interval is ignored, much as the brain expects no information from the darkness that briefly descends when our eyelids blink.

Another relevant image-free area is the darkness that surrounds the picture, which can be the black rim of the screen or a whole movie theatre. The human brain can subliminally process an image—a flashed sentence, for instance, or a fleeting reflection—that lasts less than 1/1000th of a second. The dark theatre may be valuable not just for contrast so that images made of light can be seen, but also to keep us from noticing anything else, to keep the outside world out and to make it hard to see anything inside the theatre except the screen. It is possible that we see 24 images as a second of smooth motion because we have been looking *only* at those 24 images for that second. This may be the case even if theatres were designed to be dark for a different reason: so that flashed images could be seen clearly and persist on the retina.

Much of the cinematic illusion depends on our seeing and processing stills as limited parts of a whole, sequential views plucked from a movement. The stills are limited by the edges of the frame, limited in time, kept separate as different images, kept together by their recurring subjects (the things that show up in every frame), and displayed in a dedicated atmosphere that encourages the viewer to concentrate while facing in a fixed direction. If there is a neural function that allows us to process frames distinctly (an essential part of which is visual masking), another neural function that misreads some stills as moving, and a neural or even preconscious function that encourages us to integrate the frames into a perceived continuity, that would be an effective combination—and one that appears to apply. Modern research suggests that many forms of processing apparent motion, including these, combine to turn separate, related pictures into a single imaginary vision.

The Phi Phenomenon and Beta Movement

A mental function that makes us *see light move* from one place to another when it does not move at all is a necessary element of the cinematic illusion. The first experiment concerning the brain's ability to see—or generate a mental image of—fixed lights moving was carried out in 1910. Max Wertheimer, a German psychologist, found that if two lights were flashed at a certain intervals and in fixed positions a certain distance from each other, the viewer would see only one light, and it would move between the two positions; he called that the *phi phenomenon* or *phi effect*. He called it *beta movement* if the light appeared to move the whole distance from one position to another; he had other names for free movement (phi) and partial movement. If the distance or the interval was different, the viewer saw one light flash after the other. Wertheimer published his results in 1912, and Hugo Münsterberg applied them to film theory in 1916. Seeing apparent movement between positions (beta movement) is closely related to another aspect of the phi phenomenon: filling in the blanks between successive fragments of motion, imagining and perceiving what a closed shutter never allowed to be photographed. In either case the brain generates an imaginary whole from discrete parts.

The phi phenomenon's beta movement makes certain distinct lights appear to be one moving light; in film, it might account for our thinking that we see parts of the first frame move to the positions they occupy in the second—even if, paradoxically, we can't know what those movements are until we've seen the second frame: an example of the brain's constructing experience after the fact.

Beta movement is perceived involuntarily—perhaps when the brain is presented with stills exposed at the proper rate, with the distances between the successive positions of, say, a moving arm similar to those between the lights in Wertheimer's instrument. Late-20th-century research found that, in terms of our angle of vision (and regardless of whether the phi phenomenon is involved), the difference in a subject's positions from one frame to another has to be a quarter of a degree or less for apparent motion to occur. The spatial intervals between that arm's positions and the temporal intervals between the flashing of frames might both begin to be correct for beta at the 12 fps or so at which a film image begins to move. (Both intervals are involved because the distance between a subject's positions in adjacent frames depends partly on how many frames are shot per second.) Or they might be the right intervals to activate a different mental process.

Short-Range Apparent Motion

One important explanation for our seeing an illusory movement as real, posited by Joseph and Barbara Anderson in 1993, is based on research that suggests, first, that the brain processes short-range and long-range apparent motion differently and, second, that it may be unable to tell the difference between *short-range apparent motion* (whose displayed positions are spaced close together) and real motion. Therefore, because of the short distances apparently moved by figures between frames—their closely spaced positions in consecutive stills—the brain perceives the cinema's form of apparent movement as real movement. No beta movement is involved.

Another explanation concentrates on how the brain may read an interrupted signal or a set of discrete signals as a continuous signal—when it sees a flicker-free image, for example, and when it misreads short-range apparent motion as continuous motion. Real movement is correctly perceived as a continuous signal. Flicker fusion, by the way, starts at 48 fps and does not produce the illusion of motion, which begins at roughly 12 fps. Several kinds of continuous signals may be involved in seeing continuous motion.

We share some of these involuntary mental processes with cats—whose brains have been dissected more than humans—as well as dogs, who watch TV (30 fps in the U.S., with two scans per frame and a flicker frequency of 60) and react to what they see. Reading a glimpse as part of a moving whole could even be a survival mechanism, allowing us to react when we do not have a continuous view of a moving object or being.

In any case, there *are* neural functions that allow us to see certain types of apparent movement, whether short displacements are read as real motion or beta movement is perceived from successive stimuli. These functions may trick the brain to ignore discontinuity.

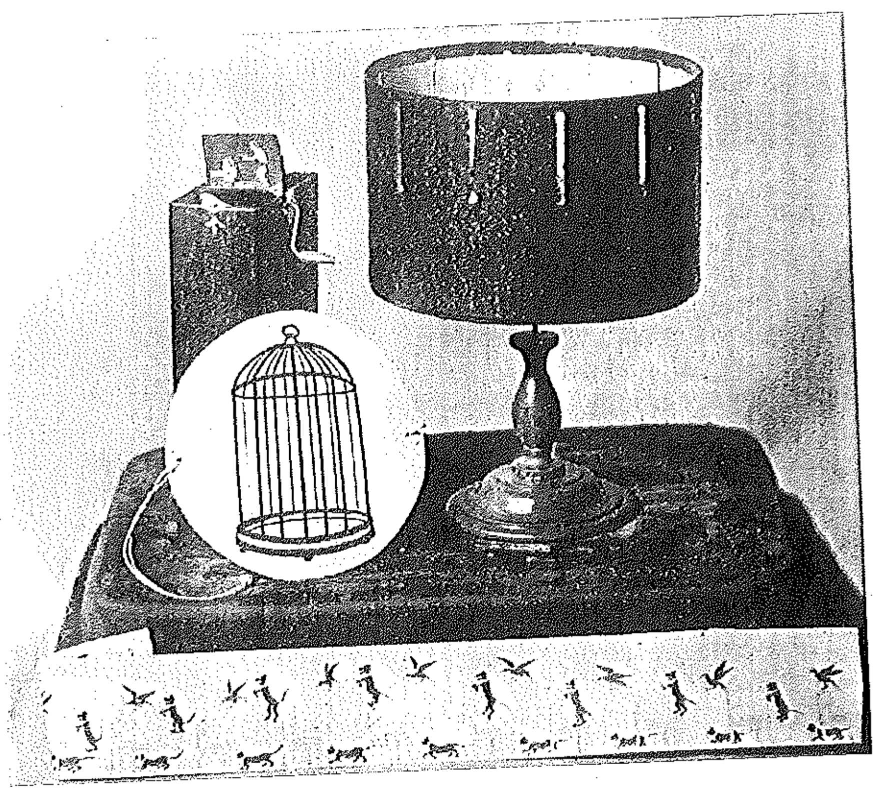
Constructing Continuity

On the other hand, the cinema might force the brain to *deal* with discontinuity, a discontinuity that may well be perceived. One aspect of the phi phenomenon, alluded to earlier, is that the brain fills in the action gaps between frames. This may happen preconsciously or neurally; no one knows yet. It may be a way to make sense of illusory movement or of the jumps between frames. The phi phenomenon helped Münsterberg to argue that a series of pictures requires the effects of consciousness to move, that the cinema is a psychological event in which things happen not as they do in physical reality but as they do in the mind, and that we regularly supply what is missing from a film.

The phi phenomenon implies that we perceive apparent movement in the cinema at least partly because the brain compares the successive positions of the subject and makes us see it move between those positions. This might happen because the brain decides that the arm, in the example used earlier, *must* have moved between the two photographed or drawn positions. The instantaneous leap from one place to another is a paradox like the quantum leap, whereby an electron is now at one distance from the atom's nucleus, now at another, without having crossed the space between those positions. The brain may deal with the leaps between frames, which contradict its experience of the world, by creating out of discontinuous parts a continuous whole—or a continuous signal—and seeing that imaginary, constructed whole rather than a series of motion fragments. (Parts and wholes are basic to Gestalt psychology, which Wertheimer helped to create. Like the systems theory of the 1970s, the continuous signal may be a more up-to-date way than Gestalt to explain how a whole can be more than the sum of its parts.) The brain has milliseconds to construct our visual reality—quite enough time to decide whether something is moving before letting us see it. The brain is certainly able to generate a mental event from partial visual data, especially if it is gathered as regularly as that in a movie. It is already hard-wired to recognize, interpret, and organize the retinas' two flipped worlds to prepare a 3-D image to be seen only by the brain. There is so much that we only think we see.

Scientific Toys

In 1829, four years after the appearance of the Thaumatrope, the French inventor Joseph Antoine Ferdinand Plateau published his investigations on persistence of vision, and in 1832 he created his own toy to demonstrate his theoretical research. Painted on a flat, circular piece of board were individual designs in slightly varying positions. When the board was grasped by a handle, held up in front of a mirror, and then spun, the individual designs became a continuous, animated sequence. To see the designs moving (rather than as a blur), the viewer looked into the mirror through little slits cut into the circular board. Sales of Plateau's toy began in 1833 under various names chosen by the manufacturers. Although Plateau preferred "Phenakisticope," the name that stuck was Phenakistiscope (from the Greek "deceptive viewer"). Plateau's research was important, for in the course of it he discovered that 16 images per second was the optimal rate for producing continuous movement. In addition, the Phenakistiscope required instants of darkness, without an image (when one saw the dark or blank side of the turning card instead of the view, through a slit, of the mirror and its reflected drawings), to make the images appear to move. Perhaps the eye needed resting time to soak in the images. A successful projector would not be invented until an analogy to Plateau's slits was discovered.



Early persistence of vision toys: the Thaumatrope, a Zoetrope wheel with paper strip, and (left rear) a primitive version of what would become a Mutoscope.

Fig. 2-1

A German inventor, Simon Ritter von Stampfer, developed a machine similar to Plateau's Phenakistiscope in the same year; he called it the Stroboscope (light and dark in rapid alternation, from the Greek "alternating viewer"). Based on the same principle as the Phenakistiscope and Stroboscope, many refined versions of this toy appeared throughout the 19th century. In 1834, William George Horner created a stroboscopic machine that used a circular drum rather than a flat circular board. Exchangeable paper strips fit inside the circular drum. When the viewer looked through the slits in the spinning drum, which allowed instants of darkness, the pictures on the paper strips appeared in delightfully sequential motion. Horner first called his toy the Daedelum, then the Zoötrope (or Zoetrope, from the Greek "life turning" or "wheel of life").

In 1843, English inventor T. W. Naylor adapted a magic lantern (a 17th-century glass-slide projector) to project a Phenakistiscopic disc. Apparently aware of Naylor's work, Baron Franz von Uchatius built his own Projecting Phenakistiscope in 1845 in Austria, and soon he was experimenting with multiple and sequential images. It is said that he once lined up a series of projectors side by side and focused them on the same screen. In each lantern was a glass slide with a slightly different phase of movement. By running with a torch from lantern to lantern, Uchatius threw a sequence of animated apparent movement on the screen.

Émile Reynaud

The Praxinoscope was invented by Émile Reynaud in 1877. It resembled the Zoetrope, but the drum had no slits. Instead, the viewer looked over the edge of the drum at an inner, central wheel on which mirrors were set at angles to one another. The mirrors reflected the images Reynaud had drawn on Zoetrope-like paper strips and set inside the drum, and in the instant that each mirror directly faced the viewer, it reflected that image into the eye. Between images, nothing was seen but the angled edge of a turning mirror. Reynaud soon created the Projection Praxinoscope (1880), which added the magic lantern to his mirrors, and the image-combining Praxinoscope-Théâtre (1887), in which the reflected moving image was combined with the reflection of a miniature set or a painted or printed background. These inventions finally led him to design the Théâtre Optique, a complex device, patented in 1888 and first exhibited in 1892, that showed long animated tales. Reynaud's image sequences were not limited to short repeated actions—because they were painted not on turning cards or paper loops but on long transparent strips, some of them over 100 feet long and wound on a reel.

The three strips that Reynaud prepared for the Théâtre Optique between 1888 and 1892 were painted on a transparent, flexible, celluloid-like gelatin that had one perforation per frame, lasted as long as 15 minutes (the shortest was 6), were projected back and forth as well as straight through, and were integrated with other projected or reflected images. In the 1888 patent, Reynaud mentioned that the pictures on the long strip could be drawn, printed, or "obtained from nature by means of photography." With Reynaud, the theatrical, projected, perforated, and (even if he painted his frames) photographed cinema had been envisioned. Reynaud should also be recognized as the maker of the first animated movies. He didn't use a camera to put his paintings on film, but neither do many 21st-century digital animators.

By the end of the 19th century, hundreds of variations on these toys and shows abounded. All these heirs of the Thaumatrope were designed to exploit persistence of vision. Most were stroboscopic in the sense that they presented bright images and darkness in rapid alternation. And most of them shared several traits that were to continue as trends in later movie history. Most striking was the inventors' passion for fancy Greek and Latin names: Choreutoscope, Viviscope, Zoetrope. (There was also a Getthemoneygraph!) This passion would later dominate the first era of motion pictures—Kinetoscope, Cinématographe—and beyond it, to the age of Technicolor and CinemaScope. Also striking is the simultaneity of discoveries in different countries, primarily in France, England, Germany, and the United States. Even today these four countries each claim to have invented the motion picture. The validity of each claim depends on whether the motion picture was invented when it was conceived, when it was patented, when it was photographed on film, or when it was projected in public.

The early stroboscopic experiments, entertainments, and toys used drawn figures. Before the movies could become moving pictures of the natural world, the means to record the visual world had to be discovered.

Photography

Before there could be motion pictures, there had to be pictures. A moving picture was born from the union of the stroboscopic toys and the still photograph. The principle of photography dates back at least to the Renaissance and Leonardo da Vinci's drawing of a *camera obscura.* This device—literally translated as "dark room" or "chamber"—was a completely dark enclosure that admitted light only through a small hole. The *camera obscura* projected an inverted reproduction of the scene facing it on the wall opposite. After a lens was put in the hole to brighten and sharpen the image, all the *camera obscura* needed to become a camera was a photographic plate to replace the back wall. Inventors and scientists set out in pursuit of this plate that could fix the inverted image permanently.

As early as 1816, Joseph Nicéphore Niépce, a Frenchman, used metal plates to capture rather fuzzy images—the first photographs. He called them Heliographs, because they were drawn by the sun. (Photography, also from the Greek, means "light writing.") But it was another Frenchman, Louis Jacques Mandé Daguerre, the late Niépce's partner, who in 1839 determined the future of photography by making clear, sharp, permanent images on silvered copperplate. The very first Daguerreotype, a picture of the artist's studio, was taken in 1837, but the invention was announced and verified in 1839. The exposure time required for an image was 15 minutes, so the first sitters for Daguerreotypes had to pose motionless for 15 minutes, their heads propped up to keep from wiggling. Before photography could become more practical, exposure time would have to be cut. There obviously could be no motion pictures, which require multiple exposures per second, until the photographic material was sensitive enough to permit such shutter speeds. (Indeed, the first still cameras used the lens cap as a shutter.) It was also in the 1830s that the English inventor William Henry Fox Talbot began his research in paper printing—the principle of the photographic negative, and with it, the reproducible photograph. After Daguerre's and Talbot's perfecting of the basic principles, photographic stocks became *faster* (more photosensitive), permitting a 3-minute exposure by 1841. Before 30 years had passed, the shutter had been invented, and faster photographic plates allowed exposures of a fraction of a second.

Muybridge and Marey

The first attempts at motion photography were posed stills that simulated continuous action. But a real motion picture required a continuous live action to be first analyzed into its component units and then resynthesized, rather than a simple synthesis of static, posed bits of action.

The first person to break a continuous action into discrete photographic units was an Englishman transplanted to California, Eadweard Muybridge. Muybridge was a vagabond photographer and inventor. In 1872, he was hired by the governor of California, Leland Stanford, to help win a $25,000 bet. Stanford, an avid horse breeder and racer, bet a friend that at some point in the racehorse's stride all four hooves left the ground. In 1877, after faster exposures became possible, Muybridge set up 24 cameras in a row along the racing track. He attached a string to each camera shutter and stretched the string across the track. He chalked numerals and lines on a board behind the track to measure the horse's progress. The horse then galloped down the track, tripping the wires, and Mr. Stanford won the $25,000 that had cost him only $40,000 to win.

For the next 20 years, Muybridge perfected his multiple-camera technique. He increased the number of cameras from 12 (in the earliest experiments) to 24 and even to 40. He used faster, more sensitive plates. He added white horizontal and vertical lines on a black background to increase the impression of motion and to study human and animal movements more precisely. He shot—and published—motion sequences of horses and elephants and tigers, of nude women and wrestling men and dancing couples. He mounted his pictures on a Phenakistiscope wheel and combined the wheel with the magic lantern for public projections of his work in 1879. Unfortunately, what he mounted and projected were not his photographs but drawings made from them. He called his invention—

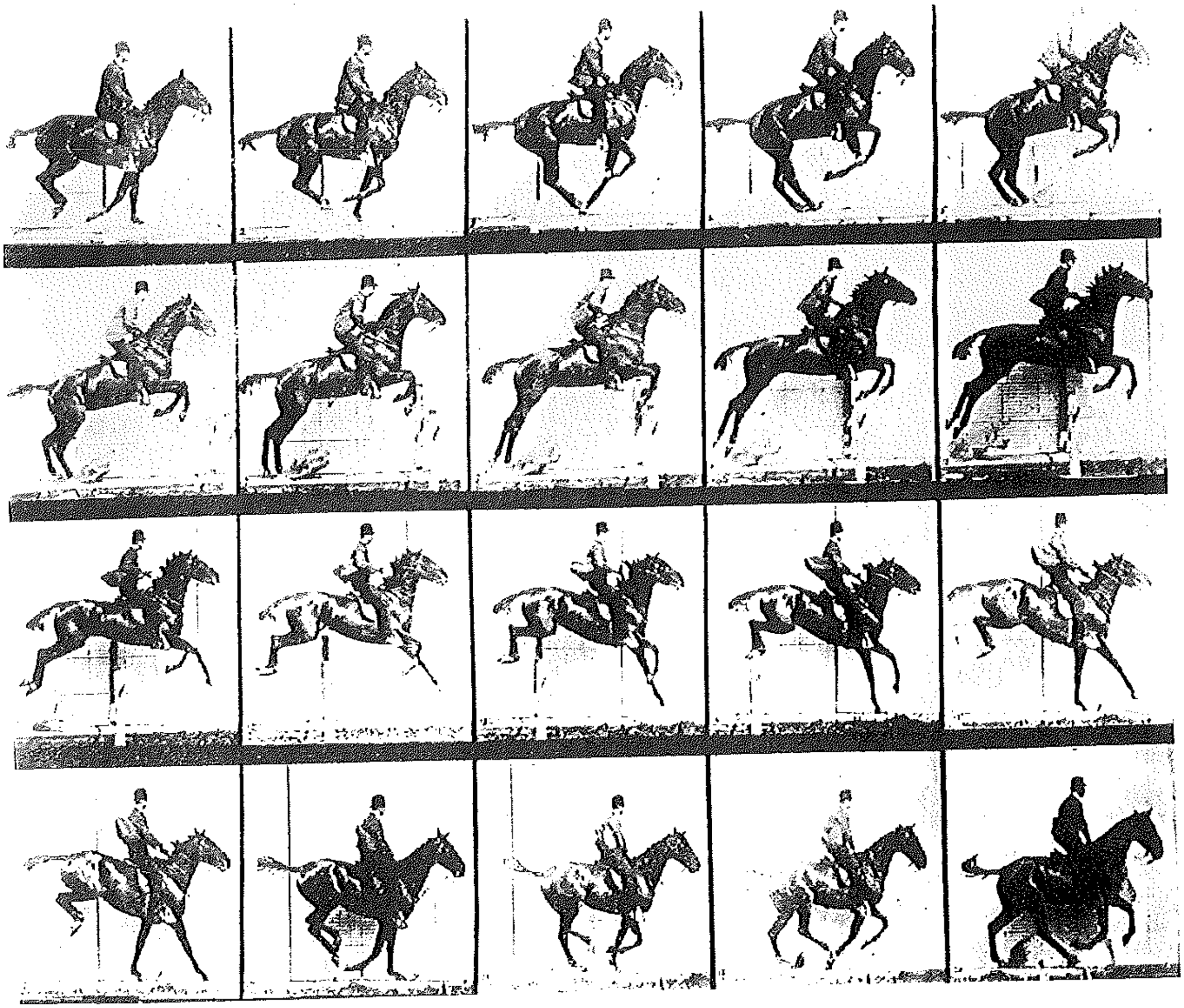


Fig. 2-2
Muybridge's leaping horse.

a variation on the Projecting Phenakistiscope—the Zoöpraxiscope (from the Greek "life-constructing viewer"). Muybridge traveled to Europe, where he gave special showings of the Zoöpraxiscope to admiring scientists and photographers. Years later, in February 1888, Muybridge suggested to Edison that they combine the phonograph with the Zoöpraxiscope—or a newer apparatus on which he said he was working. Edison rejected the idea but soon began making notes for another way of integrating moving pictures and sound.

Muybridge's "series pictures," as he called them, were a major advance over a series of drawings or posed stills because they were photographs of actual movement, taken rapidly one after the other. Their limitation—aside from the fact that Muybridge couldn't figure out a way to project the actual photographs—was the need for a separate camera to shoot each picture. Muybridge's pictures were serial photographs—not fully achieved motion-picture photography but on the verge of it—and they were of very brief actions, as short as anything in a Zoetrope loop. Continuous motion had been divided into distinct frames, but it had not yet been photographed by a single camera.

One of Muybridge's hosts in Paris in 1881 was another student of movement, the physiologist Étienne-Jules Marey, who also was experimenting with serial photography. In 1882, Marey was the first to shoot multiple pictures with a single camera. "Shoot" applies quite literally to Marey's experiment, for his camera looked like a shotgun. The photographic gun ("fusil") used a long barrel for its lens and a circular chamber containing a single glass photographic plate. The circular plate rotated 12 times in the chamber per second of shooting, leaving all 12 exposures arranged in a ring around the glass plate. Whereas Muybridge had gone from one camera to another, each loaded with a glass plate that had been coated with a light-sensitive emulsion, Marey moved one plate through one camera and maintained a single point of reference; Muybridge's point of view had moved horizontally, from camera to camera. Like Muybridge, Marey photographed people and animals: runners, fencers, trotting horses, falling cats, gorgeous flying birds. But Marey's Chronophotographs produced a much more fluid analysis of motion, the finished print resembling a surreal multiple exposure. He shot most of these sequential exposures not with the Photographic Gun of March 1882 but with a very heavy camera, shaped like a box, which produced a better image and which he patented only a few months after the gun. Marey introduced this new camera, the Photochronograph, in July 1882; it revolved a glass plate 10 times per second and exposed one picture with each revolution. In 1888, Marey redesigned the camera to use coated paper film; this new, lighter camera was called the Photochronograph until 1889, when Marey changed its name to the Chronophotographe or Chronophotographic Camera. It exposed 20 fps, though it could also run as slowly as 10 fps and—to catch the movement of flying birds—as rapidly as 40 fps. Marey called the medium Chronophotography, emphasizing its ability to photograph time (or to "write light" as time progressed). Paper film could hold many more frames than a glass disc. Photography had reached the threshold of cinematography.

Because the photosensitive paper strip, wound on a spool, could be any length, Marey's 1888 camera, demonstrated to the Academy of Sciences in Paris in October, was free of the problems of the repeating loop and of the short unrepeated action. That same year, Reynaud had begun painting his extremely long strips for the Théâtre Optique. The crucial element of Reynaud's apparatus that Marey's Chronophotograph lacked was the line of perforations to help control the strip's movement. What Reynaud's perforated strip lacked was what Muybridge had brought to the project of inventing cinema: photographs.

The first paper-film movie camera was invented not by Marey in October 1888, however, but by Louis Aimé Augustin Le Prince in January 1888. Operating on unique principles, using six lenses and multiple strips of paper film, it was part of an integrated camera–projector that survives. Between January and October, Le Prince invented a single-lens camera for paper film, but it has not survived. In October 1888, the same month that Marey unveiled his own paper-film camera, Le Prince made two paper films with his single-lens camera, and they do survive on paper rolls. Le Prince also invented a three-lens projector that used perforated celluloid (March 1890)—the first celluloid-film projector. It is not known whether he made the movies for this projector by running celluloid strips through his paper-film camera or by designing a new camera—in which case he would have invented a celluloid camera before Marey did. But late in 1890, Le Prince disappeared from a train between Dijon and Paris, and nothing ever came of his work. In June 1889, English inventor William Friese-Greene patented a paper-film movie camera that took superior photographs; he also patented an integrated celluloid camera–projector in 1893, but if any movies were made with it, they haven't survived. In Germany, Max Skladanowsky began work on his apparatus in 1892.

In 1890, Marey made the first known movie camera designed to use celluloid film instead of paper film. It was his fourth camera—after the 1882 glass-disc gun, the 1882 glass-disc box, and the 1888 paper-film box—and he called it the "complete" version of the Chronophotographic Camera. He presented a movie taken with that camera, a strip of celluloid 90mm wide and about 30 frames long, to the Academy of Sciences in November 1890, after patenting the camera early in October; the subject was that perennial favorite, a moving horse. He went on to make over 600 films. (The first Edison celluloid cameras, discussed below, were at work soon after: in November 1890, one that used a sheet of film, and in May 1891, one that used a strip.) In 1892, Marey completed his Chronophotographic Projector, which threw images from a strip of celluloid onto a screen, using electromagnetic pads to clamp and hold the film behind the lens, then release it; even with his unperforated film, Marey became the inventor most responsible for the use of intermittent movement in film cameras and projectors. By 1892, then, Marey was the first to have invented and demonstrated both a camera and a projector for celluloid movies. If Le Prince did build and use such equipment first, he did not demonstrate it as publicly as Marey did, or we would know more about his achievements.

Edison, still thinking about what he had learned from Muybridge, met Marey while attending the Paris Exposition in 1889, and from Marey—whose lab the trusting scientist invited Edison to visit—he got the idea to use a single camera loaded with celluloid that would stop in front of the lens long enough to be exposed. Edison described this idea for an invention in November 1889, 13 months after he wrote his first notes about motion pictures. (These notes were called *caveats*, notifications to the U. S. Patent Office that one was working on an invention and might later apply for a patent on it.) Because the post-cylinder cameras invented in the Edison Laboratory between 1890 and 1892 used perforated film, it is possible that Edison saw the Théâtre Optique in Paris too.

To produce a movie that was more than a snippet of activity, a material had to be developed that could hold thousands of images and pass through machines without tearing. Coated-paper film was an option only until celluloid—which produced sharper, richer pictures and was much stronger and more flexible—was perfected. An early version of celluloid was patented in 1872 in the United States, even though a similar product had been invented in England as early as 1855. True celluloid was invented in the United States in 1887–89.

In 1884, George Eastman began his own experiments with celluloid and with paper-roll film, the latter for use in his Kodak still camera. (Eastman perforated the still paper film, not to advance it but to mark the positions of the frames.) By 1888, photography, which had been the sole property of professionals, had become any person's hobby (Kodak's slogan was "You push the button, we do the rest"). Eastman's 1889 celluloid film became the natural material for further experiments in motion photography. The American discovery of celluloid film shifts the history of the movies back across the Atlantic from France.

Thomas Edison

Appropriately enough, the American father of the movies is the ultimate representative of the ingenious, pragmatic American inventor–businessman: Thomas Alva Edison. In 1888, after inviting Muybridge to his lab and seeing the Zoöpraxiscope in action, the supreme tinkerer wrote his first caveat, describing "an instrument which does for the Eye what the phonograph does for the Ear, which is the recording and reproducing of things in motion, and in such a form as to be both Cheap practical and convenient." His second and third caveats concerned cylinder films, but the fourch, influenced by Marey's work and written in 1889, called for a strip of film.

It was in February 1889 that Edison assigned employees and laboratory space to the project of inventing motion pictures, but he did not personally invent them. He did, of course, invent the incandescent lamp (1879), without which most of the cinema would be impossible, and the phonograph (1877), which led to the soundtrack. Edison's original idea—in effect, a kind of music video that allowed one to see and hear a singer—was to accompany his wax phonographic cylinder with another wax cylinder on which microscopic photos were etched; one machine, invented in 1889 or 1890, did play the two cylinders in sync. Edison also ordered work on a single cylinder ringed with pictures and with grooves of sound. From the very first, he wanted to reproduce operas. But the tiny pictures looked very poor when enlarged. In addition, only their centers were in focus because they were shot on a curved surface, a cylinder coated with photosensitive chemicals.

In 1888, George Eastman produced his own version of the celluloid film that had been invented and patented in 1887 by the Reverend Hannibal Goodwin. (In 1913, the courts found that Eastman had infringed on Goodwin's patents.) Its cellulose nitrate base was perfected in 1889 by an Eastman chemist named Henry M. Reichenbach, and Eastman began to produce and market celluloid film that same year. The film was

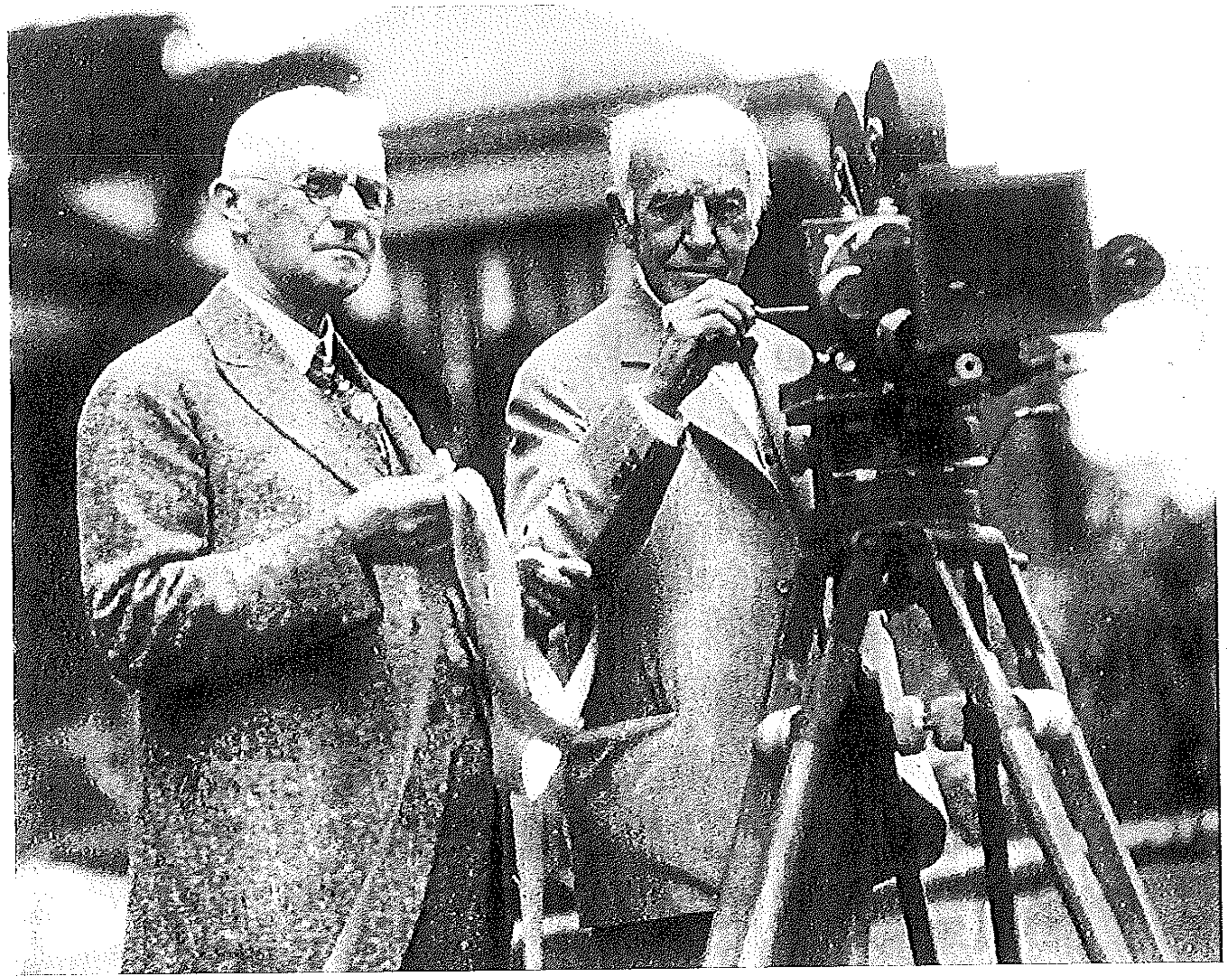


Fig. 2-3
The business of invention: George Eastman (left) and Thomas Edison, posing in 1927.

transparent, thin, strong, and of the same width and quality from one batch to another, thanks to George Eastman's great skill at designing efficient, effective means of manufacturing. In 1892, the Eastman Dry Plate and Film Company (founded 1881) took the name by which it is still known, the Eastman Kodak Company.

W. K–L. Dickson and William Heise

Edison's director of the motion picture project was William Kennedy–Laurie Dickson. He was the primary inventor of the Edison cameras and viewers, and with his associate, William Heise, he made the first American films. The story of Dickson and Heise's work for Edison and the order in which the films were made have been scrupulously established by film historian Charles Musser, notably in his filmography *Edison Motion Pictures, 1890–1900.*

From early 1889 to late 1890, Dickson worked on the pinpoint-photo project with his first associate, Charles A. Brown. In October 1889, when Edison returned from the European tour during which he had met Marey, he saw the cylinder movies and agreed that they looked bad. After writing the fourth caveat, Edison told Dickson to invent a camera that used a strip of film. Dickson soon began experimenting with celluloid, but he also kept working on cylinders.

At first, Dickson bought sheets of celluloid film from inventor John Carbutt and cut them to size. (For several years, film was sliced and sometimes perforated by the purchaser.) Late in 1889, Dickson placed his first order with Eastman. He also bought 35mm film from other manufacturers—in 1893, for example, from the Blair Camera Company—but Eastman eventually became Edison's sole supplier.

Edison assigned William Heise to work with Dickson in October 1890. Dickson and Heise began wrapping sheets of coated celluloid around the cylinders instead of coating them directly, and they took bigger pictures. The first of these sheet-films survives in its entirety; called *Monkeyshines, no. 1*, it was shot in November 1890. Two other Monkeyshines survive only in part. After that, Dickson and Heise stopped working with cylinders but kept working with film.

Early Cameras and Films

By May 1891 Dickson and Heise had built a camera that used perforated celluloid (a single row of perfs) that was 3/4 inch wide; the film ran horizontally through the camera. Only a fragment of the first film shot with this camera—the first American movie shot on a strip of film—survives. Called *Dickson Greeting*, it starred Dickson and was shot by Heise sometime before May 20, 1891, for it was on that date, that Edison showed this film to members of the Federation of Women's Clubs when they visited his lab. Looking in the eyepiece of a boxy viewer, each woman saw a man who bowed, smiled, waved his hands to demonstrate natural motion, and gracefully took off his hat. When he showed that film to reporters a few days later, Edison described his plan for "a compound machine consisting of a phonograph and a kinetograph" that could reproduce an opera in one's parlor.

Edison decided the apparatus had a commercial future and applied for his first camera and viewer patents in 1891. In mid-1892, Dickson and Heise built a camera that used film that was 1½ inches wide and ran it vertically. By October they had perfected the vertical-feed camera, which now used film that was 1 9/16 inches wide (a bit wider than 35mm) and had two lines of sprocket holes, with four perfs to the left and right of each frame. Film moved evenly and reliably through the October 1892 version of the huge, heavy camera, the completed Kinetograph. The next major improvement to an Edison camera, portability, would come in May 1896.

In April 1893, Dickson and Heise began using this camera to make 35mm films that could be shown to the public. These first pictures were shot on film made by the Blair Camera Company. The first of these—called *Blacksmithing Scene* or *Blacksmiths*—was the 16th Edison film (a count that includes the first three sheet-films); it showed a blacksmith and two assistants passing around a bottle, then forging a piece of iron, and like most of the first commercial Edison films it was 50 feet long and lasted less than half a minute. The 17th, in which one man shod a horse while another heated iron in a forge, was *Horse Shoeing*. These were the two films shown in the vertical-feed 35mm "peephole" or eyepiece viewer, the Kinetoscope, at its first public exhibition—on May 9, 1893, at the Brooklyn Institute of Arts and Sciences. The last of the known 1893 films, made in August or September, was *The Barber Shop*, a comedy in which a man gets the fast shave the barber has advertised and customers laugh at a joke. Unlike the previous two, it was more than a picture of a job being done—on a set made to resemble a workplace; *The Barber Shop* made up a little story about a job and became the first narrative film (or the first American one, if Reynaud's unphotographed strips, shown in 1892, are considered films). The next major narrative film was made by the Lumières in 1895: *The Gardener and the Little Scamp*, discussed later.

After *The Barber Shop* came *Fred Ott's Sneeze*, also known as *Edison Kinetoscopic Record of a Sneeze, January 7, 1894*. The 19th Edison film—and only the 4th to survive in its entirety, after *Monkeyshines, no. 1; Blacksmithing Scene;* and *The Barber Shop*—this two-second picture was the first movie ever copyrighted. It was shot to appear in the pages of a magazine, *Harper's Weekly*, where it illustrated an article on Edison's work. According to legend, one of Edison's mechanics, Fred Ott, was a comical fellow who could sneeze on cue. Dickson decided to film him, and Heise ran the camera. After a few more experiments, in March 1894 Dickson and Heise turned entirely to films designed for commercial exhibition. They began with *Sandow* (Edison #26), which showed Eugen Sandow, "the strongest man in the world." During the next 12 months, Dickson and Heise made about 100 more of the 50-foot films.

Worried about the poor quality of projected images, Edison decided on direct viewing. Rather than seeing an image projected for large groups, the customer would look through an eyepiece into a machine and view the single filmstrip inside it. Edison's decision was based on his

Fig. 2-4
Fred Ott's Sneeze, ***one of the earliest surviving, complete films.***

integrity as an inventor as well as his greed. He saw the greater clarity of reproduction in the peephole machine, and he was sure he would make more money from the novelty if it were displayed to one person at a time rather than to a hall full of people. Although he was wrong about the commercial potential of projection, he made up for it a few years later by marketing an Edison projector. But another decision, made at the same time, was impossible to reverse. Perhaps because he was aware of similar work in Europe, especially Marey's patented machines, Edison decided not to spend $150 to extend his American patent rights overseas. This "oversight" (if it was a mistake rather than a legitimate decision—no one knows) meant that outside America, the Kinetoscope could legally be cloned: broken down to discover its secret, then manufactured and sold under another name, perhaps with an improved design and perhaps with a camera to make films for it.

The Kinetoscope

When he applied for their patents in 1891, Edison called the camera the Kinetograph (from the Greek "motion writer") and the viewer the Kinetoscope ("motion viewer"). Previously he had been calling both machines the Kinetograph, to complement his phonograph. When the patents were finally granted in 1893, Edison allowed the Kinetoscope to be demonstrated in public—and soon after that was charging the public a nickel apiece.

By 1894, Edison was marketing his own machines through a firm fronted by Norman Raff and Frank Gammon. The first Kinetoscope Parlor opened in New York City on April 14, 1894; soon many more sprang up across the country. The Kinetoscope also debuted in Europe in 1894. Ancestors of the late 20th century's video arcades, the parlors offered not only phonographs, but also rows of handsomely made, nickel-in-the-slot Kinetoscopes, beckoning the customer to look at the new marvel of mechanically recorded life.

The design of the Kinetoscope strongly influenced the films Dickson and Heise shot for it. Wound around spools inside the Kinetoscope, the film's ending led continuously into its beginning, exactly as the Phenakistiscopic wheels or Zoetrope strips had done. The difference was that although the film itself had its head spliced to its tail, the *movie* could begin and end with very different images. Electronically powered, the Kinetoscope ran the loop of film only once per nickel, rather than over and over, so it was free to develop a record or narrative that moved from A to B to C . . . rather than from A to B to A. The space inside the Kinetoscope box limited the length of a filmstrip to 50 feet, and since Edison's cameras and viewers often ran at 40 fps, the 800 frames on the 50 feet of film might last only 20 seconds. Edison almost always said that both machines ran at 46 fps, but most of films were shot and shown at between 30 and 40 fps, down to the rarely used low speed of 16 fps. The continuous strip of film seemed suited to a single shot—anyway, no one had yet thought of editing—so what Dickson and Heise shot became the finished movie. The most popular filmstrips were views of famous people, like Sandow or Annie Oakley (who were the movies' first stars and human spec-

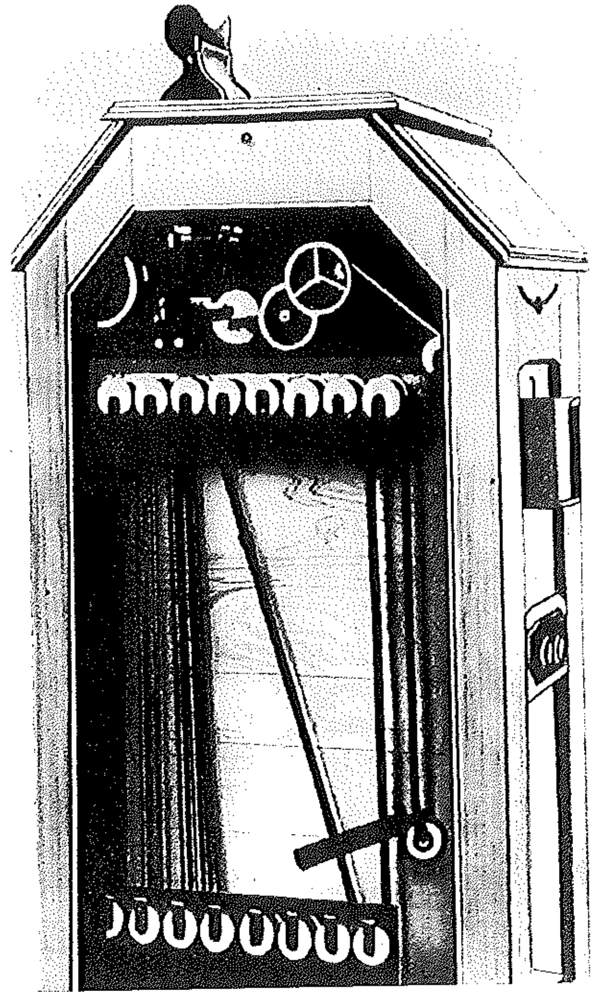
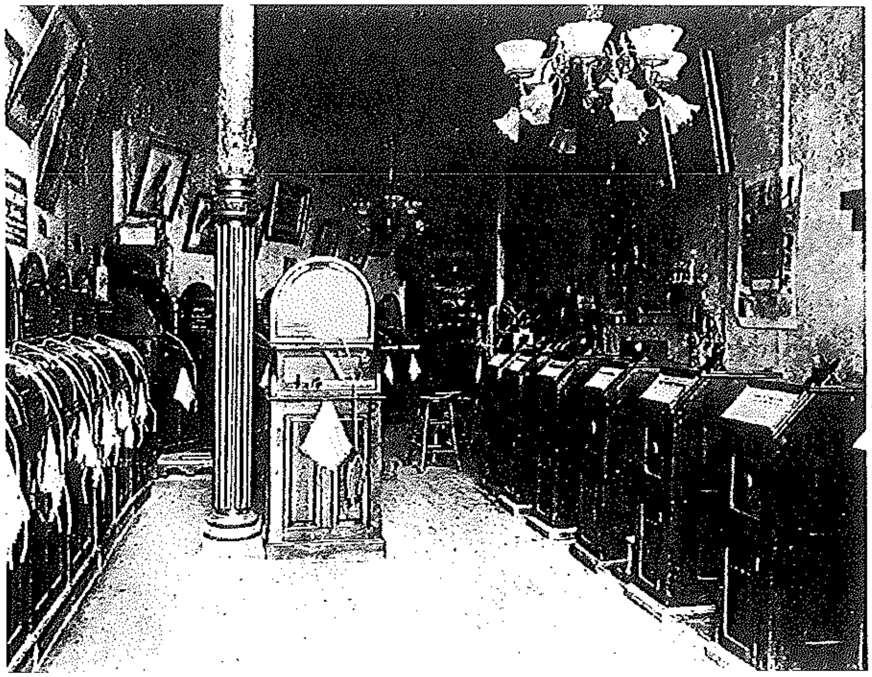


Fig. 2-5
The Kinetoscope mechanism.



A Kinetoscope Parlor: phonographs on the left (complete with handkerchiefs for wiping the earpieces), Kinetoscopes on the right.

Fig. 2-6

tacles, attractive and accomplished people seen up close); other spectacles and attractions interesting to watch in themselves; animal acts; bits of dancing or clowning; and even some staged historical and news events.

A Sound Film and a Studio

One of the later movies Dickson made for Edison—before resigning in April 1895 to pursue his own career—was a picture of two male employees dancing while Dickson played a violin into a funnel that gathered sound into a recording phonograph. That picture, which survives as *Dickson Experimental Sound Film* (Edison #125), was synchronized with the music the camera shows being recorded. We know that because in 1964, the long-lost recording was found: a broken wax cylinder labeled *Violin by W.K.L. Dickson with Kineto*. That 40-foot, 16-second movie, played in sync with a phonograph cylinder, was the first sound *film* (earlier experiments had synchronized a sound cylinder with a picture cylinder), and it was made sometime between September 1894 and April 1895. The cylinder was started before the camera; about two minutes in, one can hear Dickson saying, "Are the rest of you ready? Go ahead." Then Heise started the camera at 40 fps, and the rest of the sound is in sync with the picture. Dickson called his apparatus the Kineto-phonograph (from the Greek "motion-sound writer"); in 1889, he had shown an early version to Edison, apparently with a recorded greeting, but there is no surviving evidence of this. For reasons unknown, Edison decided not to pursue the Kineto-phonograph. Heise went on to shoot films for the Kinetoscope himself, notably *Annabelle Serpentine Dance* in 1895 and *May Irwin Kiss* (or *The Kiss*) in 1896; he also shot *The Execution of Mary, Queen of Scots* (1895) for Alfred Clark—the first film with two shots—and *Fatima* (1896) for James White, before leaving Edison and the film business in 1898.

Despite his mistake about projection, Edison certainly left his mark on the future of film. Most influential were Edison's artificial illumination and sound recording—as well as his later cutthroat behavior as a leader of the film business—and Dickson and Heise's decision to puncture the sides of movie film with sprocket holes.

The Edison–Dickson–Heise perforations quickly became the standard throughout the world and were known as the American Perforation. By the time Dickson left Edison, the experiments of Muybridge, Reynaud, Marey, and others had been integrated into a sturdy, reliable camera; motion pictures had become a viable entertainment business even without an Edison projector; and "8-perf" celluloid (that is, with four sprocket holes on the left and right sides of each frame) approximately 35mm wide had become what most people meant by movie film. (The Lumières standardized film width at 35mm and shooting speed at 16 fps, but even they were forced to adopt the American perforations in 1897 so that their films could be shown on "normal" machines. Originally they had had one circular perforation on each side of the frame.) Beyond all that, Edison and Dickson also created the movie studio.

In December 1892, at Dickson's request, Edison authorized construction of a small building that was designed for the exclusive purpose of making motion pictures. Among other things, it had to absorb the vibrations of the camera, it had to allow the subject to be adequately lit, and it had to be a dedicated space in which a single task could be done well without interruption. Built on the grounds of the Edison Laboratory in West Orange, New Jersey, it was finished in February 1893. A few months later, Dickson and Heise made the first films ever shot in a studio, *Blacksmithing Scene* and *Horse Shoeing*.

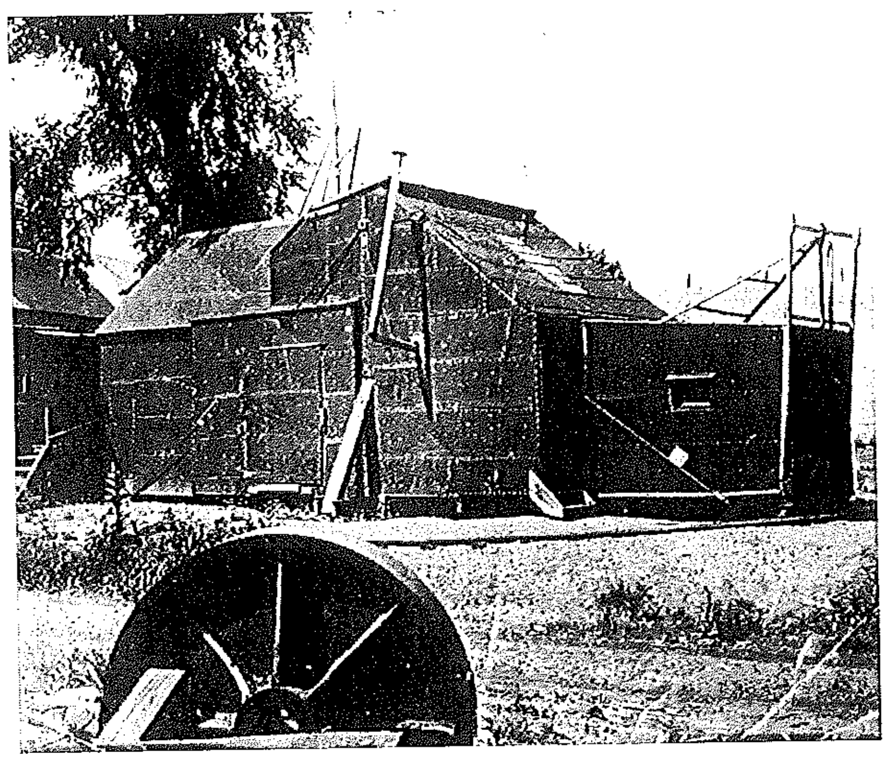
Because the outside of the studio was protected with black tar paper (to exclude unwanted light), the room became known as the Black Maria, at that time slang for paddy wagon. Dickson mounted the camera on a trolley inside the Black Maria so that it could move closer or farther away, depending on the subject of the picture. The camera never changed position during the shooting. To light the action, the roof opened to catch the sunlight. The whole one-room studio—actually a shooting stage—could be rotated to catch the sun, so that the scene would always be sufficiently lit.

The disadvantages of the Black Maria are obvious. The room was really a small sunlit theatre with the camera as single spectator. There was even a specified stage area for the performer. Mobility was further curtailed by the bulky heaviness of the camera—the result of Edison's insistence on using electricity rather than a hand crank to run it, so that the machine remained perpetually indoors and inert.

To free the camera from its cage and the filmstrip from its viewing box were the next essential steps in the evolution of the movie machine. For these steps the history of film travels back across the Atlantic.

Projection

The problem of projecting motion pictures was surprisingly difficult to solve. After the principles of motion photography had been discovered and a camera developed to demonstrate the principles, one would have thought that projecting the im-



The first movie studio: Edison's Black Maria (1893). The first studio with glass walls and roof was built by Méliès in 1897.

Fig. 2-7

ages would come easily. In fact, early projection attempts produced blurry images, ripped film, fires, and a great deal of noise. Edison's initial decision to shelve projection was as much a realization of practical difficulties as a business error. But it was clear to other inventors that a projected motion picture was the next step. For hundreds of years audiences had delighted in projected-light shows. Even before photography, audiences had sat in darkened rooms and watched puppets' shadows or projected images on a screen.

The Magic Lantern

The invention of the magic lantern is attributed to Father Athanasius Kircher who, in 1646, made drawings of a box that could reproduce images by means of a light passing through a lens. It is likely that the first working model was invented by Christiaan Huygens in 1659. That box was similar to today's slide projector and the ancestor of all projectors.

In the 18th century, showmen trooped across Europe giving magic lantern shows, projecting glass slides with drawings, paintings, and, much later, photographs for paying customers. From the beginning, the magic lanternists sought to make their static images move. They developed lantern slides with moving parts and moving patterns. They used multiple lanterns to give the impression of depth and sequence. The most famous of these multiple-lantern shows was the Phantasmagoria (or, in French, the Fantasmagorie), in which ghosts and spirits were made to move, appear, and disappear with the aid of moving lanterns and mirrors. All the projection equipment was behind the screen, not in front of it. The showman who, overstating his role, claimed to have invented the Phantasmagoria in 1798 was Étienne-Gaspard Robert, a Frenchman who called himself Robertson. (The original inventor is unknown, but similar shows first appeared in the 1770s.) Around 1770, a "nebulous lantern" projected images of ghosts on smoke. The stroboscopic toys of the 19th century further enlarged the lanternist's bag of motion tricks.

One of the most significant of the pre-movie projection entertainments was the Photo Play. In the late 19th century, an American author and lecturer named Alexander Black combined the magic lantern slide, photography, and narration to produce a complete play with live narrator, live actors, and pictorial slides. The goal of the Photo Play was not to reproduce motion, nor to weave moving lights, but to realize the same stories and dramas that drew audiences to the live theatre. One of Black's plays lasted a full two hours and contained as many as four slides a minute, based on the same kind of melodramatic plot and suffering characters that the early movies (which were often called "photoplays") would themselves use.

By the late 19th century, several other audience entertainments combined visual images, the play of light, and the telling of a story. The Panorama, invented by the English painter Robert Barker, was first exhibited in London in 1792 and remained popular for a century; it presented a huge painted mural that turned around the audience and that evolved from day to dusk to night to dawn to day again, while the action—the history of a great battle, for instance—moved across the variously illuminated surfaces of the picture. (Cinematic homages to the Panorama include the lighting changes on scenic backdrops in Chaplin's *Monsieur Verdoux*, 1947, and Hitchcock's *Rope*, 1948.) The Diorama, invented by Daguerre, debuted in Paris in 1822. Like the Panorama, it varied the light on and behind an immense painting—but the Diorama had more than one painting, and it was the audience that did the turning. Capable of presenting two different pictures—and therefore capable of scene changes—the Diorama rotated the seated audience, and the proscenium-like frame through which it looked, from a view of one large mural to the other. As we have seen, Reynaud combined a Praxinoscope with a magic lantern in 1880, and in 1892 he exhibited his Théâtre Optique, which reflected as well as projected images and whose moving pictures were painted on a celluloid-like strip that had one perforation per frame. Note that even if projection rather than reflection carried the day in the late 19th century, the chips in many 21st-century digital projectors use microscopic mirrors to reflect or block bits of light.

Even the late-19th-century live theatre was devoted to spectacular visual and mechanical effects. The conversion from oil lighting to the more controllable gas and, finally, to totally malleable electricity, coupled with the invention of elaborately mechanized scene-changing devices, led to such visual effects on stage as chases, last-minute rescues, dazzling transformations of one scene into another, and even the rapid shifts of visual setting that the movies would later codify as the cross-cut.

The Loop and Other Solutions

Such predecessors clearly indicated the potential popularity of projected movie shows. The problem was to develop a machine that could project the filmstrips. Two specific difficulties had deterred Edison: The projector needed a light source powerful enough to make the projected image clear and distinct, and the film needed to run past that light source without ripping, rattling, or burning. Flicker, Edison felt, presented no difficultly at 46 fps—very close to what was later found to be the critical flicker frequency of 48—but he never developed a projector that ran at such a high rate. The problem of flicker was not actually solved until 1903, with the invention of the three-bladed shutter.

One of the first successful projections was made by a Virginia family of adventurer–inventors, the Lathams. Major Woodville Latham, former officer in the Confederate Army and former chemistry instructor, together with his two dashing sons, Gray and Otway, invented a camera and a projecting machine in 1895. The Lathams were helped significantly by their friend W. K.–L. Dickson and his friend Eugène Lauste. Dickson was unhappy at Edison but had not yet left the company. In an attempt to dodge Edison's patents, Dickson and Lauste doubled the size of the film—producing a brighter, sharper image—and devised a nonintermittent way to move film through a projector. (The movement in the camera they built to go with it was intermittent.) The Lathams showed the press their projector, the Panoptikon, on April 21, 1895, and a month later they showed movies for money. By 1896 their projector was called the Eidoloscope. The most important element of the Latham projector was, as we shall see, a slack point, a curl of film called a *loop*, that Dickson and Lauste introduced into the film path (after they had put two loops in their camera, one on either side of the gate). Although the Lathams' exhibitions in New York and the urban south were very important and rewarding, the tempting life of the big cities converted the younger Lathams from scientists to playboys. The Lathams and their invention ended in the obscurity of financial disaster.

A successful projector had to do more than just enlarge the image. It had to feed and take up film on reels rather than run the film as a necessarily short, continuous circle, and it required a totally new principle of moving the film past the gate. The new principle, discovered and developed in Europe rather than America, was to move film intermittently through the projector: to stop each frame in front of the lamp. Thanks to Dickson and Heise's perforations, the Kinetograph had used intermittent movement to stop the film during exposure, but the Kinetoscope had moved the film continuously—behind a rotating, slotted shutter that allowed a glimpse of each frame as the film rolled by. Intermittent movement in the projector allowed a clear, sharp image, for the stationary frame used the available light more economically.

The intermittent movement of film past the shutter was, in principle, precisely the same as the slits in the Phenakistiscope; rather than a continuous succession of whirring images, each image was separated from the others into an individual piece of the whole. Although the intermittent movement of frames through the projection gate solved the problem of insufficient illumination, it could not cure the disease of ripping film without a tiny adjustment to take the tension off the jerkily speeding filmstrip. That adjustment was to create a small loop of excess film just before the gate, easing the tension from the feeding reel. Because the initial loop was first used—and patented—by the Lathams (although it was invented for them by Dickson and Lauste), it became known around the world as the *Latham loop*, a version of which all movie-film cameras and projectors still use, in most cases both before and after the gate. The loop also provided a key legal loophole that allowed Edison—once he bought the rights—to drag his competitors into court for almost a decade.

The worst problem caused by intermittent projection was the possibility of burning the highly flammable nitrate film that remained momentarily stationary in the gate. To solve this problem, the intermittent-motion projector—with its hot, bright, arc light, much fiercer than the Kinetoscope's electric bulb—required some kind of cooling system or fan to protect the film. Today, despite all the changes and improvements in movie equipment, film projectors are the same in principle as those invented in the final years of the 19th century.

The early film projectors of Le Prince (1890), Marey (1892), Skladanowsky (1892), and Friese-Greene (1893) were mentioned above, along with their cameras. Two inventors discussed below, Charles Francis Jenkins and Thomas Armat, built in 1895 the machine that became Edison's projector (1896). Another important inventor—who worked for several years with Marey—was Georges Demenÿ, whose Phonoscope (1891) was a Projecting Phenakistiscope—like Muybridge's except with a disc of actual photographs—and who invented a film projector in 1894 (modified for perforated film in 1896). As crucial as all of these inventions were, the two most significant projectors were developed by men who began, ironically, by buying Edison machines and analyzing them. Edison's decision not to file for European patent rights allowed an Englishman, Robert William Paul, and, more significantly, two French brothers, appropriately named Lumière (French for "light"), to invent functional projectors and more versatile cameras.

The Lumière Brothers

Auguste Marie Louis Nicolas Lumière, the elder, and Louis Jean Lumière, the younger and more important of the brothers, started dabbling with Edison's Kinetoscope and Kinetograph in 1894. They also were familiar with the work of Marey. Their father, an avid photographer, had founded a factory in Lyon for manufacturing photographic plates and, later, celluloid film. Interested in the new motion photography, the brothers—who were excellent mechanics as well as budding industrialists, scientifically curious and brilliantly creative—had developed their own machine within a year. They called it the Cinématographe (from the Greek "motion recorder" or "kinetic writer," but more directly from Kinetograph, which it simply translated into French). It ran perforated 35mm film at 16 fps, and it used a unique claw mechanism to engage and advance the film. Louis always made sure his brother shared full credit, but Louis was the primary inventor of the Cinématographe—the final design came to him in a dream—and he shot the early films. Unlike Edison's bulky indoor camera, the Lumière camera was portable; it could be carried to any location. The operator turned a hand crank rather than pushed an electric button. Most significantly, the same machine that shot the pictures also printed and projected them. While the machine admitted light through its lens during filming, it projected light through its lens during projection. It printed by running raw and processed film through at once; they were in contact in the gate when light exposed the blank film. (This was later called bi-pack printing.) Intermittent movement and steady alignment were guaranteed for movie photography, printing, and projection.

Early in 1895, the Lumière brothers shot their first film, *Workers Leaving the Lumière Factory.* Beginning in March of the same year, the Lumières projected this film and several others to private, specially invited audiences of scientists and friends throughout Europe. The first movie theatre opened to the paying public on December 28, 1895, in the basement room of the Grand Café in Paris. This date marks the generally accepted birthday of the movies, even though the first Europeans to charge admission for projected films had been the Skladanowsky brothers, two months earlier, and the first commercial film projection in the world had been done in America half a year before that, by the Latham family. The choice of birthdate reflects the importance of the theatre—where the Lumière pictures continued to play for months and where money could be earned on a regular basis—but it also honors the first release to the public of what turned out to be the most comprehensive and influential solution to the problems of exposing and projecting movie film. The date they first presented their work—March 22, 1895—was as significant as December 28, the date their theatrical exhibition defined the business.

The Lumières projected several films, among them a later version of *Workers Leaving the Lumière Factory*, a Lumière baby's meal (*Le Repas de bébé*, the first home movie), a comical incident about a gardener's getting his face doused through a boy's prank (*Le Jardinier et le petit espiègle*, the first well-known narrative film, happily a comedy), and a train rushing into a railway station (*L'Arrivée d'un train en gare*). The last film (or one called *The Sea*) provoked the most reaction; the audience is said to have shrieked and ducked when it saw the train or the

The Lumières' first film: **Workers Leaving the Lumière Factory.**

Fig. 2-8

water moving toward them. In Jean-Luc Godard's *Les Carabiniers* (1963)—Godard packs his films with history—a farm boy watches his first movie, which is also a train arriving at a station, using the same camera angle and diagonal composition as the Lumières' film. The boy ducks, tries to protect himself from a real train. Back in 1901, R. W. Paul made essentially the same joke in a film Godard may have seen: *The Countryman and the Cinematograph.* It was clear from the start that audiences would have to learn how to watch movies.

The Lumière discovery of 1895—especially its elegant technical simplicity and public success—established the brothers as the most influential and important men in motion pictures in the world, eclipsing the power and prestige of Edison's Kinetograph and Kinetoscope. Within five years, the light of the Lumières would also begin to fade. The brothers were interested more in the scientific curiosity of their discovery than in the art or business of it, although eventually their film catalogue included over 1,200 filmstrips for purchase. They brought the camera out of doors, to life. The Lumières sent the first camera crews all over the globe, recording the most interesting scenes and cities of the earth for the delight and instruction of a public who would never be able to travel to such places on their own. Theirs were the first films to be shown in India, Japan, and other countries, inspiring film industries and filmgoing around the world. From Russia and Sweden to Guatemala and Senegal, the Lumières were the Johnny Appleseeds of cinema; in this respect their importance far exceeds that of Edison or Marey.

The Lumière brothers adopted and established conventions and practices that have remained standard throughout the history of film. The Lumières stabilized film width at precisely 35mm, still the standard gauge today. (Dickson's had been about 39mm.) They also established the exposure rate of 16 fps, a functional silent speed until the invention of sound required a faster one for better sound reproduction. The slower exposure rate used less film—thus saving money—and allowed their machine to run more quietly and dependably, whether it was shooting, projecting, or printing—for all of which it used intermittent movement. Edison, maintaining the visual superiority of the 40-or-so fps of his Kinetoscope, scoffed that the Lumière speed would destroy the sensation of continuous movement; only a year later Edison himself adopted the Lumière speed for his projector in spite of the flicker it caused. Another Lumière contribution was the fancy name of their invention—the Cinématographe. In many countries today, the movies are the cinema, and shooting is cinematography.

R. W. Paul

Almost simultaneously with the Lumières, other Europeans were making progress on their own machines. At the Berlin Wintergarten on November 1, 1895, Max and Emil Skladanowsky offered the first commercial presentation of projected films in Europe. In the years since 1892, Max had been improving his invention, a camera and double projector called the Bioskop or Bioscop ("life viewer," from the Greek for "life," *bios*, and "to see," *skopein*), working on completely independent principles.

In England in 1894, R. W. Paul, a maker of scientific instruments, was asked by two shady characters to build Kinetoscopes for them. Paul declined, but when he learned the surprising fact that Edison's machine had not been patented in England, he bought a Kinetoscope, took it apart to study it, and built a new one. With photographer Birt Acres, he invented a portable camera in March 1895. The Paul–Acres Camera was the first movie camera made in England. Paul and Acres soon dissolved their partnership, however, and invented competing projectors. Acres presented his projector, England's first, on January 14, 1896. Paul presented his, the more influential Theatrograph, less than a month later, on February 20—the very day the Lumières' films were first projected in London.

Paul's projector was the first to control intermittent movement by means of a device in the shape of a Maltese cross (a variant of which became the world standard). Converting rotary movement into intermittent movement by means of a pin that rides its curved and slotted rim, the original Maltese-cross apparatus was created for the Swiss watch, though it was adapted for the sewing machine and other devices. In cinema, it moves film through the gate: advancing it, holding it steady, then releasing it.

Paul sold cameras and projectors to others, in part so that he would have more American-perforation movies to show. His Cinematograph Camera No. 1 (built in April 1896) was the first that could be cranked in reverse, allowing the same footage to be exposed several times; thus it is of great significance that the first camera Georges Méliès used was built by R. W. Paul. (According to some sources, that camera was designed by Méliès after he studied Paul's equipment. In any case, Méliès did begin to design and market his own machines after buying some of Paul's, and he did provide Paul with movies.)

Although he left the business in 1909, R. W. Paul—an exhibitor, filmmaker, and father figure, known to his movie friends as "Daddy" Paul—was the founder of the British film industry.

The Vitascope

In America, a young real-estate salesman named Thomas Armat and his partner, C. Francis Jenkins—the more significant inventor of the two—developed a projector whose drive movement was intermittent. Called the Phantoscope, it was completed in August 1895 and commercially exhibited a month later. Jenkins and Armat had discovered—on their own, so they said—the equivalent of the Latham loop as well as the Lumière principle that *all* film movement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Thirty-fourth Street, Herald Square.

KOSTER, BIAL & CO., ... Proprietors
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Week Commencing Monday Evening, April 20, 1896.

Evenings, 8:15 Saturday Matinee, 2:15

THIS PROGRAMME is subject to alterations at the discretion of the management.

1 OVERTURE, "Masaniello," Auber

2 WM. OLSCHANSKY
The Russian Clown

3 CORA CASELLI
Eccentric Dancer.

4 THE THREE DELEVINES
In their original act "Satanic Gambols"

5 PAULINETTI and PICO
The Athletic Gymnast and Gymnastic Comedian.

MONS. and MME.
6 DUCREUX-GERALDUC
French Duettists.

7 THE BROTHERS HORN
Assisted by MISS CHARLOTTE HALLETT
"London Life."

THOMAS A. EDISON'S LATEST MARVEL
8 THE VITASCOPE,
Presenting selections from the following:
"Sea Waves," "Umbrella Dance," "The Barber Shop," "Burlesque Boxing," "Monroe Doctrine," "A Boxing Bout," "Venice, showing Gondolas," "Kaiser Wilhelm, reviewing his troops," "Skirt Dance," "Butterfly Dance," "The Bar Room," "Cuba Libre."

INTERMISSION 10 MINUTES
IN THE GRAND PROMENADE
Dr. Leo Sommer's Blue Hungarian Band.

Programme continued on next page.

Fig. 2-9
The program for the Vitascope's debut at Koster & Bial's Music Hall in 1896.

should be intermittent. Soon, however, they dissolved their partnership. Early in 1896, Armat and Edison came to a business arrangement, one that Jenkins fruitlessly opposed. Edison would sell Armat's projector—the Phantoscope, with a few modifications made by Armat—as his own invention, enhancing the prestige and sales potential of the machine. Armat would silently receive a percentage of the sales. The Edison Company promptly announced the Wizard's latest invention, the projector it called the Vitascope ("life viewer"—from the Latin "life" and the Greek "to see," a linguistic mix that Armat disliked).

The Lathams projected a boxing film to a paying audience in May 1895—a world first as well as a national one, to be sure, but the machine's nonintermittent drive reduced its influence. The first commercial exhibition of an intermittent-drive projector in the United States was the premiere of the Phantoscope in September 1895, months before Armat sold the machine. But the debut that attracted the most notice was the first Edison projection for a paying audience, on April 23, 1896, at Koster & Bial's Music Hall on 34th Street and Broadway in New York City—the present site of Macy's. Edison was now popularly believed to have invented the American movie camera and projector. The "amazing Vitascope" was only one act in a vaudeville bill; movies soon became a typical part of vaudeville shows.

For the first Vitascope program, Edison converted several of his Kinetoscope strips for the projector; he also pirated a few of the R. W. Paul films from England. As with the first Lumière showings, the most exciting films were those with action that threatened to invade the space of the audience. During the showing of Paul's *Rough Sea at Dover* (1896, shot by Birt Acres), patrons in the front rows were said to have run screaming from their seats, afraid they were about to be drenched. Those cynics who were unimpressed were sure that the film had been shot in New Jersey.

The First Films

The first film audiences were amazed to see that living, moving action could be projected on an inert screen by a machine. Frank Norris's novel *McTeague* (which became the basis of Erich von Stroheim's *Greed*) records an immigrant family's first experience of the Vitascope in a vaudeville theatre, certain that the images were produced by some kind of conventional magic trick. It was an illusion all right, but not a conventional one—an illusion that allowed them to see the world as it had never been seen before.

It is easy to forget the way the world looked to our ancestors of just over a century ago—a world without automobiles, airplanes, TV, or movies. How could an American observe life in London? How could a German ever see the Pacific Ocean? How could one person in a single lifetime ever expect to view the tropics, the frigid north, the many cities of the world, and its mountains, plains, seas, and deserts? Except for the few who could afford the time and cost of laborious travel, it was impossible to experience the sights of all these places. True, there were paintings and engravings—but they were idealized impressions, and no matter how realistic, they were made by people, not by an impartial force of nature. Of course, there were photographs—even 3-D photographed images in relief for stereopticon viewers. But none of these images moved. And, in a very real sense, life can be equated with movement—that is one meaning of "animate."

The movies were very much a part of the process that has produced what today seems a global culture—our ability to view and to travel to any place on earth. Newspapers (which rose to cultural prominence in the mid-18th century), the train (a development of the early 19th century), the photograph (in the mid-19th century), the automobile, airplane, telephone, radio, computer, TV—these are the media of transportation and communication that have shrunk the world and practically erased the distances between its inhabitants. At the center of this communication–transportation process are the movies. The Lumière catalogue is the ancestor of the newsreel, the global telecast, and the Internet.

The first films understandably exploited their visual wonder. The films that Louis Lumière shot for the Cinématographe and that Dickson's successors at Edison shot for the Vitascope were similar. A movie lasted between 15 and 90 seconds. The camera was stationed in a single spot, turned on to record the action, and turned off when the action had finished. These films were really "home movies"—unedited scenery, family activity, or posed action—that depended for their effect on the same source as today's home movies: the wonder of seeing something familiar and transitory reproduced in a permanent way. Nowhere is the home-movie quality of the first films more obvious than in the Lumières' *Le Repas de bébé* (*Feeding Baby*, or *Baby's Breakfast*, 1895), which has been duplicated uncounted times by later generations of parents with their own 8mm or video equipment.

A major difference between the first Edison films and the first Lumière films is that the Lumières have more of this home-movie quality of merely turning the camera on to record the events that happened to occur around it. The Edison films, despite their initial lack of editing and plot, were gropings toward a fictional, theatrical film, many of them shot indoors. The Lumière films, with a nose for the news, roamed around outdoors: They were freer, less stilted, better composed, more active.

The categories of the Lumières' catalogue indicate their conception of what the filmstrip would provide its audience. The catalogue breaks its films into different kinds of "views"—visual actualities, like moving postcards—General Views, Comic Views, Military Views, Views of Diverse Countries. The most interesting views are those containing the most interesting patterns of movement: a boat struggling out to sea against the waves, the charge of a line of cavalry horses, the demolition of a wall.

One of the most celebrated Lumière films is the comic jest *Le Jardinier et le petit espiègle* (*The Gardener and the Little Scamp*, 1895), remade in 1896 as *Arroseur et arrosé* (*The Sprinkler Sprinkled*, or *Watering the Gardener*). This incident—staged, but shot outdoors—contains the seeds of what was to blossom into one of the most important contributions of the silent film: physical comedy. While a man waters a garden, a boy sneaks behind him and steps on the hose. The flow of water stops, the gardener looks into the nozzle to see what's wrong, and the boy steps off the hose. Water gushes into the gardener's face; the boy laughs. The gardener catches the boy, drags him back into camera range (since the camera did not pan to follow the action), spanks him, and—in a hurry, because the film was running out—resumes his watering.

This little movie contains many elements of a comic art that would soon mature: The gag is completely physical; despite the improbability of the result, the causes are clear and credible; the butt of the joke is the victim of circumstances of which he is unaware; despite the victim's ignorance and innocence, the audience participates in the joke with the boy, laughing when the gardener gets drenched; the comic punishment (the spanking) is a blow to the ego more than to the body; the comic participants have obvious one-dimensional traits and roles so that complexity of

A "home movie": the Lumières'* Feeding Baby*; Mr. and Mrs. Auguste Lumière with their daughter.

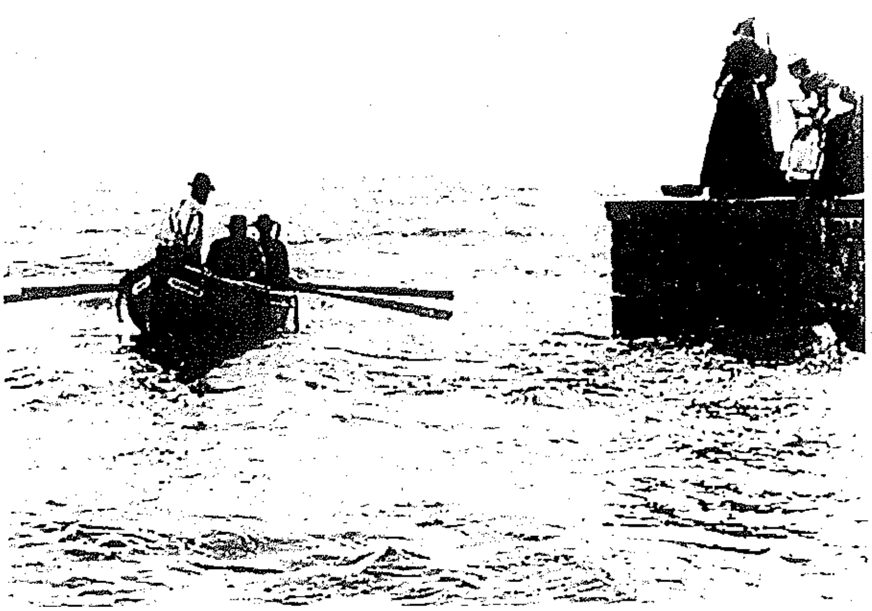
Fig. 2-10

character cannot interfere with the force of the jest; and the original situation is restored after the comic disruption. Above all, the comic incident is fictitious, even though the Lumières are correctly considered the fathers of the nonfiction film (the *actualité*, or direct, unbiased look at reality—as well as its successor, the *documentary*, which is organized to express a conviction or make a point about the factual material it presents).

For all their appearance of recording unstaged, spontaneous, real events, the Lumière films subtly incorporate the conventions of two artistic traditions that would powerfully influence the movies to follow. First, the Lumière films are very carefully composed, with symmetrical balancing of the left and right areas of the frame and interplay between the foreground and the deep space of the background (especially for those actions that move toward or away from the camera). As still photographers, the Lumières had borrowed these compositional patterns from Western representational painting—as most early photographers did. In fact, they used their movie camera almost as if it were a still camera—but the images moved.

Second, the Lumières organized their filmed events as little stories according to the most basic narrative pattern of beginning, middle, and end. This is easy to recognize in *Watering the Gardener*, but it is just as true of *Demolition of a Wall* (1896), which shows from start to finish the process of knocking over a wall. (Sometimes, for a startling effect, it was projected in reverse, and the wall sprang up.) The exceptions, like *Boat Leaving the Port* (1895), observe a portion of an ongoing action until the minute or so of film runs out. But the majority of their films, as brief as they are, do not usually begin with the event or action in progress. Instead, the camera establishes the scene before that action starts; then the event occurs, and only after the movement has terminated does the camera quit the scene. The very first Lumière film, *Workers Leaving the Lumière Factory*, establishes this pattern. As the film begins, the large double doors of the factory are closed. They swing open for the camera, almost like the curtain rising in the theatre, and the workers pour out. Some move off frame to the right and some to the left (for compositional balance and to avoid hitting the camera), some manipulate "props" (a bicycle), and some are accompanied by a companion (a dog). In one of the very earliest examples, the movies showed their affinity for machines and animals as well as people. Only after the workers have all left the factory do the double doors begin to swing shut, concluding the film with the suggestion of the event's ending and the curtain's falling. However innocent and lifelike such a film might seem, it is not at all unstaged, unplanned, or unstructured.

The early Edison films lack the outdoor freshness and freedom of those produced by the Lumières. Edison's fail to understand and exploit the wonder and beauty of watching the world at



***The freedom of the outdoors and the excitement of motion: the Lumières'* Boat Leaving the Port.**

Fig. 2-11

John Rice and May Irwin enact their kiss.

Fig. 2-12

work and at play, at rest and in motion. Typical is the staged heaviness of the first special-effects film, *The Execution of Mary, Queen of Scots* (August 1895, Edison #142), shot by Heise for the Kinetoscope and directed by Alfred Clark, one of Dickson's successors. In less than half a minute of film, guards lead Mary to the block, push her on it, and cut off her head.

Despite its primitive quality, several elements of this originally terrifying film are worth special attention. As in many early movies, the camera clearly thinks of itself as a spectator in the theatre. It watches from a fixed angle, a good seat. The characters move left and right in a single plane, rather than using the full depth that the movies were later to discover. Further, the film has a strong sense of entrance and exit, two more stage devices the mature film would discard. This stage mentality would continue to influence the movies for over 15 years. Beyond that, however, the film shows one clear, historically momentous realization of the potential of the film medium. After Mary (a male actor) sets her head on the block, the camera stops to allow a dummy to be substituted for Mary and be decapitated. The ability to stop the action and start it again without any apparent break is one of the advantages that the camera enjoys over the stage. Within a very few years, a French magician, Georges Méliès, would make much of this camera advantage.

But there is more going on here than using the camera to effect a magical substitution. *The Execution of Mary, Queen of Scots* is the first film to consist of more than one shot. It was made to look like one shot and had only one scene, so it would remain for others to invent the conventional multi-shot film, where the setups change. Nevertheless, the fact remains that long after the camera had been stopped and restarted—important in itself as the first special-effects shot—Clark *edited the film.* He trimmed a few frames from the end of the actor footage and a few more from the start of the dummy footage, and made a splice.

A second interesting Edison film, and certainly the most famous of the early ones, is *May Irwin Kiss* (April 1896), also called *Kiss* and *Kiss Scene* but best known as *The Kiss.* Shot originally for the Kinetoscope, this kiss, when projected on the big screen, excited the first wave of moralistic reaction to movie romance, which has remained a constant in film history. John C. Rice and May Irwin were the romantic leads in *The Widow Jones*, a current Broadway stage success; the Edison Company got them to perform their climactic kiss in the Black Maria. When moralists and reformers saw their large, projected mouths meet, they showered the newspapers with letters and the politicians with petitions. However, *Kiss* was also one of the biggest hits at the Vitascope shows as late as 1900, enjoyed especially for the humorous way the characters primp and prepare to kiss and then keep on kissing. Not everyone reacted to its erotic content moralistically, another constant in movie history.

Although the Lumières specialized in actualities and Edison in theatrical and staged scenes, the success of each company in its particular genre led to imitations by the other. Edison's *Washday Troubles* (1898) is a clear descendant of the Lumières' gardener film, substituting a washtub of soapy water for the Lumières' hose.

Edison developed a portable camera in 1896 and began sending cameramen outdoors, enabling the company not only to compete in the actualities market, but also to stage their made-up scenes outside the confines of the studio. It was the ability to mix dramatic studio and location footage that eventually led to the Edison Company's 1903 masterpiece, *The Great Train Robbery*, and beyond that to the conventional narrative film itself.

For their part, after seeing Edison's success with historical scenes, the Lumières staged some of their own, such as *The Death of Robespierre* and *The Death of Marat* (both 1897).

In addition to borrowing successful formulas—a practice that would continue throughout movie history—the two companies literally stole each other's films, made up duplicate prints (*dupes*) or reshot them without significant changes, and sold them as their own. In addition to competing with and stealing from each other, Edison and the Lumières faced competition and thievery from rivals who were springing up in England, America, and France. The next ten years of film history would be a period of commercial lawlessness as well as aesthetic discovery.

For Further Reading and Viewing

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Thomas Alva Edison (1847–1931)
Monkeyshines, no. 1 (1890)
Blacksmithing Scene or *Blacksmiths* (1893)
The Barber Shop (1893)
Fred Ott's Sneeze (1894)
Dickson Experimental Sound Film (ca. 1894)
The Execution of Mary, Queen of Scots (1895)
May Irwin Kiss or *Kiss* or *The Kiss* (1896)
Feeding the Doves (1896)
The Black Diamond Express (1896)
A Morning Bath (1896)
A Wringing Good Joke (1899)
Uncle Josh at the Moving-Picture Show (1902)

Louis (1864–1948) and Auguste (1862–1954) Lumière
Workers Leaving the Lumière Factory or *Leaving the Factory* (1895)
Excursion of the French Photographic Society to Neuville (1895)
Le Jardinier et le petit espiègle (*The Gardener and the Little Scamp*, 1895). Remade 1896 as *Arroseur et arrosé* (*The Sprinkler Sprinkled* or *Watering the Gardener*)
Le Repas de bébé (*Baby's Breakfast* or *Feeding Baby*, 1895)
Boat Leaving the Port (1895)
Friendly Party in the Garden of Lumière (1895)
Sack Race (1895)
The Sea (1895)
L'Arrivée d'un train en gare (*Arrival of a Train at the Station*, 1895)
Demolition of a Wall (1896)
Flood at Lyons (1896)

DVDs

Blacksmithing Scene is in *Treasures from American Film Archives* (see Chap. 1 list).

Lumière & Company. Fox Lorber. Lumière-like films made in 1995 by 40 directors.

The ***Lumière Brothers'*** *First Films.* Image Entertainment. Numerous films, 1895–97; narrated by Bertrand Tavernier.

Dickson *Experimental Sound Film*—with the original sound and a very useful commentary—is in *More Treasures from American Film Archives* (see Chap. 3 list).

The Movies Begin: A Treasury of Early Cinema, 1894–1913. Kino Video. An absolutely essential set of 133 films, many not available elsewhere, in archival prints with very informative commentaries (unfortunately, not on a separate track) and notes. Also on VHS. Includes *Homage to Eadweard Muybridge*, 8 **Edison–Dickson–Heise** films (*The Barber Shop, Sandow, Serpentine Dances, Feeding the Doves, The Kiss*); 27 **Lumière** films (*Leaving the Factory, The Sprinkler Sprinkled, Baby's Breakfast, Arrival of a Train at the Station, Demolition of a Wall, Leaving Jerusalem by Railway*); 16 **Méliès** films (*Long Distance Wireless Photography, A Trip to the Moon*); 4 **Porter** films (*The Gay Shoe Clerk, The Great Train Robbery, The Whole Dam Family and the Dam Dog, Dream of a Rarebit Fiend*); **British** films starting with *Rough Sea at Dover*, with 5 by **Hepworth** (*How It Feels To Be Run Over, Rescued by Rover*), 7 by **Paul** (*The Countryman and the Cinematograph*), 7 by **Smith** (*Let Me Dream Again, Grandma's Reading Glass, Sick Kitten, Mary Jane's Mishap*), 5 by **Williamson** (*The Big Swallow*); also films by **Alice Guy Blaché** (*Making an American Citizen*), **Durand** (*Onésime horloger*), **Linder** (*Troubles of a Grass Widower*), **McCay** (*Winsor Mc Cay The Famous Cartoonist of the N.Y. Herald and His Moving Comics*), **Sennett** (*Bangville Police*), and **Zecca** (*The Golden Beetle*); and many other short narrative films, actualities, and documentaries.

3

Film Narrative, Commercial Expansion

The two film rulers of 1896, Lumière and Edison, would encounter crafty and powerful competitors within the year. In France, the Lumière superiority was attacked by an artist on one side and by industrialists on the other. Georges Méliès, owner–prestidigitator of the Théâtre Robert-Houdin, saw the movies as a means of inflating his bag of magical tricks. He immediately recognized the cinematic possibilities for fantasy and illusion. In 1896 he asked the Lumières to sell him a camera and projector. When the Lumières, who insisted on licensing their own franchises to shoot and show their own kinds of actualities, refused to sell a Cinématographe, he bought a camera from R. W. Paul in London. Méliès shot his first film, *A Game of Cards*, in the spring of 1896. By 1902, Méliès was supplying the world with films and the Lumières had almost ceased production.

Early Companies

About the same time as Méliès, two other Frenchmen, Charles Pathé and Léon Gaumont, also began building film empires.

In 1894, Charles Pathé and his three brothers formed Pathé Frères; the company started to make films in 1899. They began by imitating the familiar Lumière views and actualities. Soon they were copying ideas and techniques from Méliès and from the British—but the Pathé films had much better production values. Pathé's ultimate goal was not simply to produce the slickest entertainments, but to conquer all branches of the French film industry. Within a few years, although it had not been able to wipe out the competition, Pathé embraced everything to do with motion pictures. It built cameras and projectors, manufactured raw film stock (after acquiring Eastman's European patent rights), produced films, and owned a chain of theatres in which to show them. This method of controlling everything from the top, from production to distribution, is called *vertical integration*, and the American film industry would grope hesitatingly toward this monolithic structure that the Pathés quickly realized.

Léon Gaumont's business perceptions were similar. In 1895, he founded a film empire whose activities ultimately ranged from manufacturing machine parts to collecting receipts at the theatre door. After seeing an early demonstration of the Cinématographe, he dedicated his photographic equipment company—eventually known simply as Gaumont—to developing a new projector, which the company began selling in 1896. It was also in 1896 that Léon Gaumont approved the suggestion of his secretary, Alice Guy, that she begin making films based on her own scripts. At 24, she became the world's first woman director as well as the first woman to head the production arm of a studio, and by 1897 Gaumont found himself at the head of the first working model of the *studio system*—in which projects are supervised by studio executives and created by writers, designers, cinematographers, directors, performers, and other artists employed by the studio, using studio equipment and facilities. Alice Guy made her first film, *The Cabbage Fairy* (*La Fée aux choux*), on 60mm stock in August and September of 1896—three months after Méliès shot his simple game of cards—and remade it on 35mm stock in 1899. By the time she left Gaumont, in 1907, Guy had produced more than 370 films, many of which she wrote and directed; among those that survive are *The Life of Christ* and *On the Barricades* (both 1906). She left for America with her husband, Herbert Blaché (an Englishman, also employed by Gaumont), where she founded her own film company, Solax (1910–13), and made films as Alice Guy Blaché (*Making an American Citizen*, 1912; *Matrimony's Speed Limit*, 1913; *A House Divided*, 1913). Back at Gaumont, Louis Feuillade—a scriptwriter who had been Guy's assistant—took over her job, selecting the scripts, directors, and performers for all Gaumont pictures; while directing 642 films of his own, he remained head of production until his death in 1925. Unlike Pathé, which did not outlast the 1930s, Gaumont is still in business today.

The English film between 1900 and 1906 was perhaps the most innovative in the world. R. W. Paul, who had been displaying the products of his Theatrograph for almost a year, began attracting other inventor–photographers to experiment with moving pictures. G. A. Smith, James Williamson—the key members of the "Brighton School"—and Cecil Hepworth made significant and rapid progress with the principles of editing and composition, realizing that the effect of a filmed story was a function of the way the individual shots were composed and stitched together. They were the first to think about the role of the camera, not just in composing shots but in defining their significant elements—and, in a film like Williamson's *The Big Swallow* (1901), in which a man swallows the camera, even in the definition of space itself. Smith, discussed later in this chapter, may have been the first to define *subjective* space, with his point-of-view (POV) shots and filmed dreams. Until the emergence of D. W. Griffith, the films of these British directors were the most visually imaginative on the screen, precisely because they had discovered the importance of systematic camerawork and editing in building their stories and driving their rhythms. Among the elements of film construction discovered by the British pioneers and taken to a more expressive level by Griffith—and later by their key British heir and biggest fan, Alfred Hitchcock—are the close-up, the cross-cut, the traveling or track shot, the POV shot, and the pan or panoramic shot. It is not clear whether the Brighton school or Méliès first discovered superimposition.

An American, Charles Urban, enriched the British film further in this period. Urban, who had tried unsuccessfully to peddle his Edison-imitation camera in America, journeyed to London to try his luck there. Fearing the stigma of Americanism, Urban named his London concern the Warwick Trading Company. He built it into the major distributor of early British films between 1898 and 1903, then left Warwick to found the Charles Urban Trading Company. The new company, which became the largest in the prewar British film industry, also pioneered in its production of scientific films using microcinematography and in its development of the first successful color process, which Urban called Kinemacolor (1908, based largely on the discoveries of G. A. Smith).

In the United States, the two companies that would share the power with Edison—Biograph and Vitagraph—had begun making and showing films by 1897. The American Mutoscope and Biograph Company (American Biograph for short) manufactured both a peepshow machine and a projecting machine that outperformed Edison's. The primary inventive intelligence behind "Biograph" ("life recorder"), as the company was to be called, was Edison's own film pioneer, W. K-L. Dickson. Having left Edison and having found the social life of the Lathams too "fast" (according to his own legal testimony), Dickson officially became the "D" of the K.M.C.D. Syndicate late in 1895. The early film companies often took their names from the initials of their owners; Dickson's initial joined Elias Koopman's, Harry Marvin's, and Herman Casler's. They had enjoyed working together before: In 1893, they had invented a miniature camera for detectives that looked like a watch.

The K.M.C.D.'s first project was the Mutoscope, their peephole machine, whose effectiveness put the Kinetoscope out of business. Like the Kinetoscope, the Mutoscope offered a series of moving photographs to the eyes of a single viewer. Unlike the Kinetoscope's celluloid frames, however, the Mutoscope pictures were large photographs mounted on individual cards. When the viewer flipped the series of cards with a hand crank, they were held still for an instant by a hook, allowing a good steady view of each frame and producing the same appearance of movement

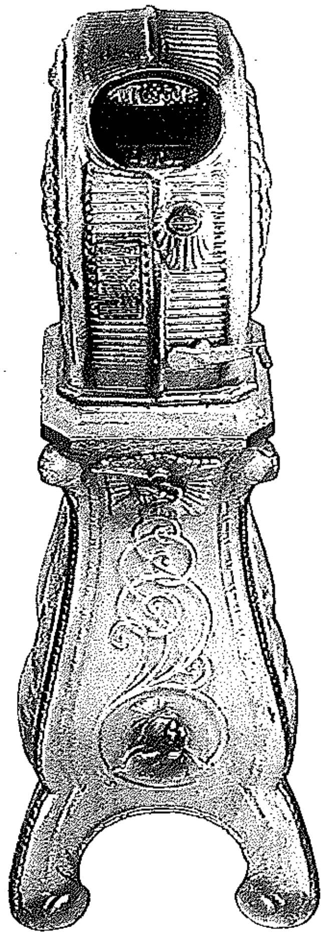


Fig. 3-1
The Mutoscope.

as a motion picture. (In principle it was similar to the flip book, which had been invented in England in 1868 by John Barnes Linnett.) The large picture cards made the Mutoscope pictures clearer, more detailed, and more lifelike than the Kinetoscope's. The hand crank added to the viewer's pleasure by allowing the motion to go slower, go faster, or stop. The ultimate testimony to the Mutoscope is that of all the archaic and outdated machines of the invention era, it survives most prominently today—in penny arcades and amusement parks—delighting children with some of the same moving drawings and photographs that their great-great-grandparents flicked through so long ago. The machine has also survived in "adult" book stores, engaging patrons with a type of photographic entertainment that could not have been envisioned by the Messrs. K.M.C.D.

The K.M.C.D. motion-picture apparatus also bested its Edison opponent. Working with Herman Casler, Dickson invented the Mutograph—a camera that used unperforated 70mm film—in 1894 and adapted it for projection in 1895. Dickson adopted this large-format film not merely to improve photographic clarity, but also to circumvent Edison's patents on all methods of transporting perforated and small-gauge film. Dickson, in effect, invented the motion picture several times: for Edison, for the Lathams, and for Biograph. The Biograph camera's huge pictures could either be mounted on Mutoscope cards or, when combined with its intermittent-motion projector, throw the sharpest, steadiest images that had yet been seen on a screen. Beginning in 1899, Biograph movies were shot on standard 35mm stock. Films shot for the Mutoscope were called "mutoscopes"; those shot for life-size projection were called "biographs." In terms of their derivations, a mutoscope views change, but a biograph writes life. Dickson's films were also more interesting and active than Edison's: the Empire State Express (a thrilling train shot), President McKinley receiving a letter at home, the actor Joseph Jefferson performing scenes from his famous *Rip Van Winkle.*

As he had done at Edison's West Orange lab, Dickson built a special studio for shooting staged scenes. The first Biograph studio was outdoors, on the roof of the Biograph Company's offices near Broadway and 14th Street in New York City. As in the Black Maria, the stage of Dickson's roof theatre rotated to keep the sun at the best lighting angle. From this nuts-and-bolts beginning the company evolved that was to give its name to moving pictures in some parts of the world (in Danish the cinema is still called the *biograf*) and that was to launch the careers of D. W. Griffith, Mack Sennett, Mary Pickford, the Gish sisters, and many others.

Edison's second major competitor was the Vitagraph Company, which had a less spectacular career than Biograph but a longer one. Vitagraph's founder and director of production was J. Stuart Blackton, another Americanized Englishman, who began as a reporter and cartoonist for the *New York World.* Blackton first became interested in moving pictures when he visited Edison at the Black Maria; he even performed his sketching act for Edison's Kinetograph. Edison soon leased Blackton a Vitascope franchise. Though his first films were partly distributed by Edison, Blackton soon set up his own company. Realizing the appeal of the Edison company, Blackton and his partners, William "Pop" Rock and Albert E. Smith, chose a name for their company that was as close to Edison's as the law would allow. One of Vitagraph's first films, *Burglar on the Roof* (1898), was filmed on the roof of their office building in Chelsea. For several years Manhattan rooftops doubled as film studios. Another early Vitagraph film was *Tearing Down the Spanish Flag* (1898), an attempt to capitalize on the Spanish-American War. Although the film claimed to have been shot in the heat of battle, Blackton actually staged it in the heat of Manhattan on his friendly rooftop.

Blackton was also a pioneer in the field of animation. He developed a camera that would expose only one frame with each turn of the crank, which made it possible to shoot one drawing after another. The first commercial film in which a drawn figure moved was Blackton's *Humorous Phases of Funny Faces* (1906). The first scientific film in which a drawing appeared to move had been made in England in 1900: R.W. Paul shot sequential drawings of magnetic lines—executed on punched cards that were mounted on pegs for the precise alignment of each frame—that had been prepared by Professor Silvanus Thompson, the designer of the experiment, and his assistant, Dennis Coales. The result, the first animated film of any kind (unless one counts the unphotographed animations of Reynaud), showed how electricity behaves when moving through an alternator. Professor Thompson first exhibited the film in 1901 as part of a lecture and explained in 1904 how he and Paul had made it; Paul first showed it to Edison in 1911.

It was also in 1911 that Blackton convinced cartoonist Winsor McCay—whose comics *Little Nemo in Slumberland* and *Dreams of the Rarebit Fiend* were the most inventive of their day, full of wild metamorphoses and ambitious graphics—to make animated films. Their first film, for which Blackton did the live-action sequences and McCay the animation, was *Winsor Mc Cay The Famous Cartoonist of the N.Y. Herald and His Moving Comics* (1911), familiarly known as *Little Nemo*. McCay went on to make some of the best silent American cartoons, notably the endearing *Gertie the Dinosaur* (1914).

Others all over the country were catching the movie craze, assembling machines, and capturing images. In Chicago, three men began tinkering independently: George Kleine, George K. Spoor, and "Colonel" Selig. Kleine would one day become the "K" of the Kalem (K.L.M.) Company that produced the first *Ben-Hur* in 1907. Spoor would one day become the "S" of Essanay (S&A) who, with his partner, G. M. ("Broncho Billy") Anderson—the "A"—would shoot the first series of westerns. William Selig, who liked to be called "Colonel," modeled the Selig Standard Camera and the Polyscope projector on the Lumière Cinématographe; in 1907 he sent a crew to Los Angeles to shoot parts of *The Count of Monte Cristo*, the first filming done in Hollywood. In Philadelphia, Sigmund Lubin began several tricky activities, including "duping" (illegally duplicating) films made by others to eliminate the problem of paying for them and re-enacting events like a heavyweight title bout or the Oberammergau Passion Play on his Philadelphia rooftop. He even precisely re-enacted film hits like *The Great Train Robbery*. Movie projectionists trooped across the country with their filmstrips much as the magic lanternists had trooped across Europe with their slides a century earlier. One of these projectionists toured the Caribbean, drawing audiences and applause with the unauthorized adopted name of Thomas Edison, Jr.; his real name was Edwin S. Porter.

Narrative

Despite the frenzy of movie activity in the United States, the films did not change much until 1902 or 1903. New films imitated the successes of earlier ones; like TV and film producers today, the earliest film producers copied successful formulas. The new films were longer, of course, freed from the 50-foot limit of the Kinetoscope box. But the same rushing trains, ocean and mountain views, one-joke pranks, and historical vignettes dominated the screen. Audiences began to yawn at these predictable subjects. The motion picture, formerly the highlight of a vaudeville bill, became the "chaser," the part of the program that was so dull that it chased the old audience out so that the new one could file in. By 1900, the movies were suffering the first of a series of business crises.

The rope that pulled the movies from the abyss was the development—to the point of industry dominance—of a new kind of screen entertainment. The rope-abyss image is an apt one, for the new kind of movie, the story film, was to use this and similar heart-stopping devices to weave its spell. The movies were born into the age of theatrical producer David Belasco; they have never quite outgrown that heritage. The Belasco theatre era traded on extreme emotional effects—violent tears, violent suspense, violent laughter. The two dominant theatre genres were melodrama and farce; they were to become the two dominant film genres as well. The most respected playwrights were Scribe and Sardou, Jones and Pinero, Dion Boucicault, Bronson Howard, Augustin Daly, and Belasco himself. In these plays, good and evil were as clearly distinct as black type on a white page. Though evil triumphed over good for the first two hours of the play, good miraculously won out in the last 15 minutes. Melodrama was a world of pathos, not of tragedy, of fears and tears, not of ideas. No action was irreversible; no matter what mistake the good-hearted character made, it would eventually be erased by his or her essential goodness. The era's farce was just as extroverted: A series of comic mistakes would arise, entangle, and explode until the denouement put all the pieces of the puzzle together. There was no reason a film could not tell the same kinds of stories.

The problem was to translate these dramatic stories into film terms. Many of the early narrative films merely pieced together the same kinds of static, unedited scenes that were shot for the first Kinetoscope—expanding the 50-foot strip to a whole reel. (A *reel* of film—up to 1,000 feet of 35mm—lasted about 15 minutes at silent speed.) A good example of one of these films is *Pullman Honeymoon* (1898). This Edison product (shot in the large multiset studio that replaced the Black Maria) records a series of events that might take place in one of George Pullman's sleeping cars between porters and passengers, lovers, comics, bandits, and the police. The film is strikingly inert. The movie set is a stage set: The berths line the frame at left and right; the center aisle of the Pullman car serves as the stage-center playing area. Although the film lasts almost ten minutes, the camera never shifts its viewing angle nor its distance from any of the action. As in the earlier Edison strips, the camera is the single spectator at a staged play. The only noticeable participation of the camera in the action is that it stops after each incident and then starts again. But the slight jumps between the scenes indicate that the filmmaker tried (and failed) to make these gaps invisible, to keep the camera from participating in the event, refusing to exploit the cinema's ability to manipulate time. Further, because the film uses only one setup, the effect is ploddingly static; the passive camera never manipulates space either, never works with size and distance, never picks out any details. No action, character, or object is made to be more important than anything else.

The French fantasist, Georges Méliès, was a much better film storyteller, precisely because he exploited the very difference between time in nature and in the cinema that *Pullman Honeymoon* tried to cover up.

Georges Méliès

The Méliès films owe their superiority to the wild imagination and subtle debunking humor of their master. Méliès was by trade a magician; just as earlier magicians had adopted the magic lantern, Méliès adopted moving pictures. He saw that the camera's ability to stop and start again (*stop-motion photography*, an effect achieved in the camera rather than through cutting) brought to perfection the magician's two greatest arts—disappearance and conversion. Anything could be converted into anything else; anything could vanish.

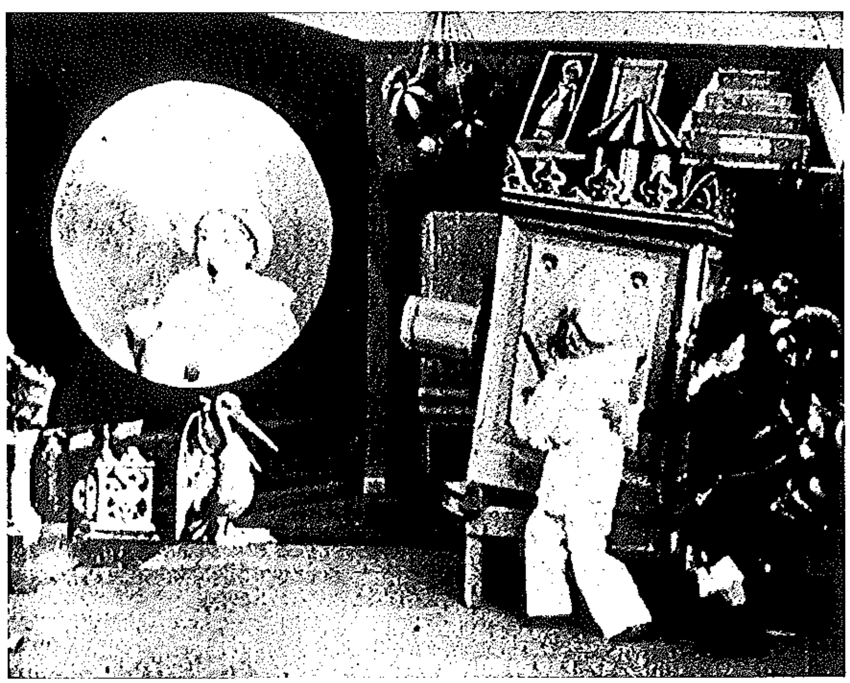
One of Méliès's most enjoyable films, *The Conjuror* (1899), is nothing but one fast minute of disappearances and transformations. The magician (played by Méliès himself) vanishes, his female assistant vanishes, she turns into snow, he turns into her, and she turns into him. Pure cinema—as pure in its own way as its opposite, the realism of Lumière. For if Louis Lumière documented the world, Méliès transformed it. If Lumière established that the camera could create a factual record of an event, Méliès proved that the camera could create an event that never happened. Lumière set the pattern for realism; Méliès opened the door to the impossible. Méliès gave the cinema the tools of fantasy, illusion, and distortion, allowing the new art to address new subject matter—notably the interior world of psychology, imagination, and dreams; the theatrical world of magic, spectacle, and set design; and the narrative world of genres and long, developing stories. It was in 1898 that Méliès made the first narrative film to consist of more than one scene. Because it had three distinct scenes—an astromomer falls asleep in an observatory (1), the moon comes down and eats him (2), and his dream ends when he meets a moon goddess (3)—*The Moon at One Meter* had more than one shot and let the audience know it. In 1899 he made more multi-scene films, notably *Cinderella* and *The Dreyfus Affair*. In England, also in 1898, R.W. Paul made a multi-shot, two-scene film whose second shot has not survived; in *Come Along Do!*, a couple was shown outside a gallery and then, on a different set, inside it. Where Paul used a simple (or *straight*) cut between his two shots, Méliès bridged the scenes in his movies with dissolves, while he continued to hide the "camera cuts" caused by stopping and starting the camera within the scenes.

It was much earlier, however, that the first true multi-shot film was made: one in which the camera positions, locations, and subjects changed. Whether it was filmmaker Birt Acres or distributor R. W. Paul who joined them, *Rough Sea at Dover* cut from a shot of water rushing forward to a shot of water rushing sideways in a different location. This crucial achievement went unnoticed.

Having more than one shot in a film amounted not just to giving the cinema the theatre's ability to proceed from one scene to another, but even more significantly, to joining two elements that had previously been considered necessarily complete, self-sufficient visual worlds. It must have seemed as rash as putting two novels together to tell one story. On the other hand, it might have seemed as familiar as moving from one "view" to another in a magic lantern show. *The Dreyfus Affair* had 10 scenes, each one—like every scene Méliès ever photographed—a single shot, usually incorporating stop-motion and multiple-exposure effects, taken by an unmoving camera. We may be tempted to take them for granted today, but Méliès's joined scenes are the beginning of *montage*, the art of editing. And the sets and costumes and props he designed, the effects he engineered—in short, the "look" he wanted each film to have—make him the first master of the cinema's other great tool, *mise-en-scène*: the art of designing and staging a scene for the camera.

Between 1896, when he founded the Star Film Company, and 1913, he made at least 500 movies, of which fewer than 140 survive. He may well have been the first filmmaker ever to use superimposition (multiple exposure), hand-painting (a dab of red on the photographed dress, orange on the fire, blue on the curtain, every single frame), the dissolve, and time-lapse photography. Even allowing for the earlier *The Execution of Mary, Queen of Scots* and *Watering the Gardener* (whose possibilities neither Clark nor Lumière pursued further), the position of Méliès as the father of the special-effects film—and every cinematic use of the fantastic—is beyond challenge, and the narrative film itself belongs on the list of his credits.

Griffith said "I owe everything to him."



Méliès's* The Magic Lantern*: The magic lantern in a toy shop projects a moving image of the clown's face while the clown himself views it—one of film's early references to its own powers.

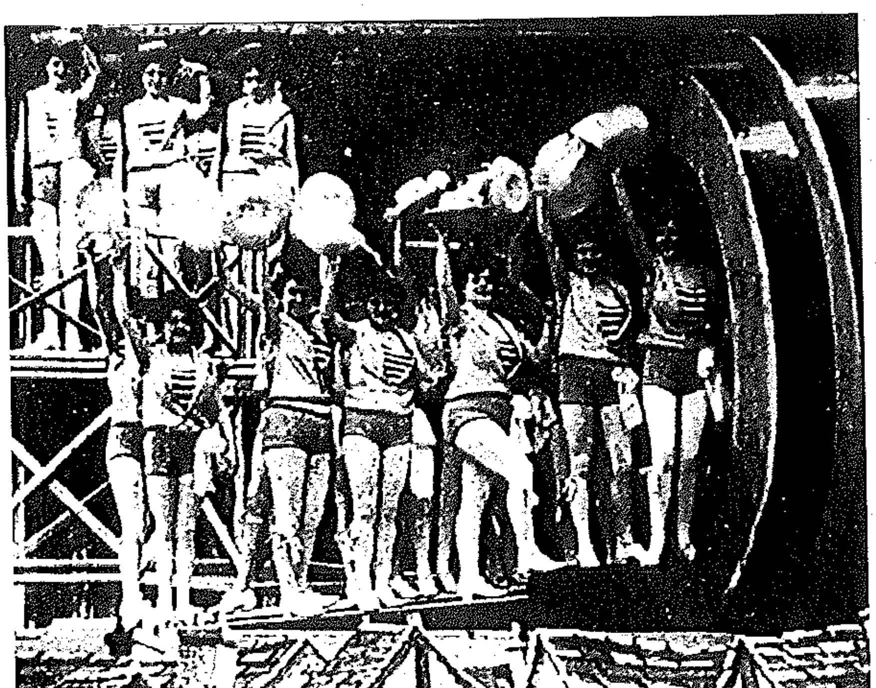
Fig. 3-2

In *The Magic Lantern* (1903), Méliès compared the art of the magician to that of the filmmaker. *The Magic Lantern* contains its own little history of Western visual representation and dramatic art. First, the lantern projects a static landscape (a re-creation of the painter's art); then it projects a pair of lovers in fancy costumes (a re-creation of the aristocratic theatre); finally, the lantern projects the magician himself and his clown-like servant (a comic image of the common people, of movies themselves). These reflexive films-within-the-film demonstrate at a very early date the filmmaker's conscious equation of cinema, comedy, and magic. The magic box, like a new kind of circus-clown car, is impossibly full of figures, for it can capture, store, and present any image in a world of images.

One of Méliès's theatrical tools that served him well as a filmmaker was black velvet, which formed the background of his multiple-exposure shots, allowing only selected areas of the frame to be exposed each time the film ran through the camera. Where there was velvet, no light hit the film; if a face poked through the curtain, its image was captured on film. This was the beginning of masking and matting, on which most special-effects photography came to depend. Without the velvet, multiple exposures made the figures transparent "phantoms" or "ghosts."

Méliès was the first filmmaker to light films from the side as well as from above, thanks to the glass walls and roof of the studio he built at Montreuil (just outside Paris) in 1897. Like Dickson's Black Maria, the Montreuil studio relied on sunlight—artificial lighting truly adequate for cinematography was not introduced until 1904—but its glass walls allowed a richer, more fully modeled lighting plan and washed out the top-lit shadows characteristic of earlier studio work. In 1899 Méliès was the first to *diffuse*, or soften, light by filtering it through cotton sheets or rippled glass; not until 1902 did any other studio (Pathé) begin to use diffused lighting, and it took Edison and Biograph another two years to catch up.

Méliès's most famous work is the 30-scene *A Trip to the Moon* (1902), which successfully combines his fantasy and his humor into a charming film full of trick effects. Méliès parodies the intellectual doings of academics in the opening scene as a professor (played by Méliès) earnestly demonstrates his points and makes his opponents disappear. Méliès's parody of the intelligentsia continues in his later *The Doctor's Secret* (1909)



Méliès's* A Trip to the Moon*: A chorus line of gunners waves after loading the space ship.

Fig. 3-3

and *The Conquest of the Pole* (1912). Delightfully whimsical in *A Trip to the Moon* are the rocket ship's landing with a splat in the eye of the man in the moon, the lines of chorus girls who wave goodbye to the moonship and lend their faces to the seven stars of the Pleiades, and the jumpy gymnastics of the moon creatures who go up in puffs of smoke when the scientists whack them with their umbrellas. In *A Trip to the Moon*, stars and planets twirl about the heads of the sleeping scientists, and the explorers gesticulate with delight when they see the earth rise.

For all his cinematic inventiveness, Méliès was still very much a stage creator, shaping effects for a passive camera, delighting in the play of plaster, pulleys, and paint. The earth's rising was contrived by pulling up the earth and pulling down the rear part of the moon's crust. The ship's approaching the moon was contrived by moving the moon closer to the camera, not by moving the camera closer to the moon. Méliès clearly saw the film as parallel to a stageplay, and he referred to his technique as making "artificially arranged scenes." The structure of *A Trip to the Moon* reveals his thinking: Though the film shifts locations, each scene is presented in a single, unedited shot. Even so, *The Conjuror* reminds us that the camera could be turned off and on—and the film cranked back and re-exposed—many times during a single Méliès "shot."

Méliès also composed the scenes as on a stage; he was conscious of limited depth, of entrances and exits. This staging is weakest in those scenes in which the performers merely line up in a row across the screen. The staginess of Méliès's technique is especially clear in his fantasy adventure, *The Palace of the Arabian Nights* (1905). Méliès took great pride in his scenic decor and effects, which he painted and conceived himself. In that respect alone he must be recognized as the father of art direction.

Theatricality aside, however, Méliès's camera tricks relied completely on his realization of the essential difference between natural time, which is perfectly continuous, and cinematic time, which seems continuous in projection even if it was not so in filming.

Méliès had an immense influence on other directors in France and all over the world. To take only one example, Porter's *Dream of a Rarebit Fiend* (1906) is as indebted to Méliès as it is to the hallucinatory comic strip (*Dreams of the Rarebit Fiend*) by Winsor McCay.

Film theorists of a later generation—particularly Siegfried Kracauer and André Bazin—observed that Méliès and Louis Lumière established the two potential directions of the cinema in the very infancy of the art: Lumière's realism (the rendering of the world as it is) and Méliès's fantasy (the re-creation of the world—or the creation of any world—through the filmmaker's imagination). Interestingly, these theorists found Lumière's realism the more legitimate path. But the Méliès films reveal a wit behind the camera's lens still capable of delighting an audience that has seen decades of later films. The Méliès films abound in surreal surprises and audacious sight gags, clearly demonstrating that a movie can result from the human acts of creation and imagination, do far more than record physical reality, and even lie.

After 1899, Méliès's peak year as a creative artist and as a businessman was 1902. His trademark, the star, was seen all over the world. That star steadily declined in the first decade of the century, if only because his painstakingly personal artisanship could not compete with the factory methods of Gaumont and Pathé. By 1914 he had lost his audience, made his last film, turned his studio into a theatre where he went back to performing magic tricks, and disappeared from the screen like a moon creature hit with an umbrella. Fourteen years later a journalist discovered him selling toys and candy at a kiosk in the Gare Montparnasse. His fame and films (some of which Méliès himself had destroyed out of bitterness; most of the rest had been requisitioned by the military during World War I and melted down for boot heels—call it disappearance and conversion) were revived. After receiving the Legion of Honor as well as a small pension from his admirers, he died in 1938.

Cohl and Others

Blackton may have been the first to move a character composed of photographed drawings, but the first genius of the animated film was Émile Cohl. Like Méliès, he was a supremely imaginative Frenchman who delighted in the irrational surprises of a world of tricks. Cohl applied the tricks that Méliès played with the natural world—and more—to animated drawings. The surreal illogic of the Cohl cartoons is much closer in spirit to the wild transformations of characters and objects in the early Disney cartoons, in Warners' Looney Tunes, or in the trippy *Yellow Submarine* (1968) than to the realism of the later Disney cartoons. Like his American contemporary, McCay, Cohl delighted in converting one kind of drawn figure into another: a stick that becomes a man that becomes a window, an angry woman whose head rolls off and turns into a parrot, a pool cue that becomes a straw. One of the best of Cohl's transformation films is *Un Drame chez les fantoches* (*Puppet Drama* or *A Love Affair in Toyland*, 1908), in which the constant metamorphosis of the white-on-black line drawings and figures takes farce to a whole new level—and that was only his third movie. (The first, *Fantasmagorie*, was released by Gaumont in 1908.) In *The Joyous Microbes* (1909), tiny microbic dots flow together to depict the diseases they supposedly cause. In another witty Cohl film, *The Neo-Impressionist Painter* (1910), an artist tries to sell his very arty abstract canvasses, each of which consists only of a single color, to a buyer. As he describes each painting (explaining, for example, that the red canvas actually shows "a cardinal eating lobster with tomatoes by the banks of the Red Sea"), the events and qualities he discusses come alive in line drawings on the canvas of the tinted screen.

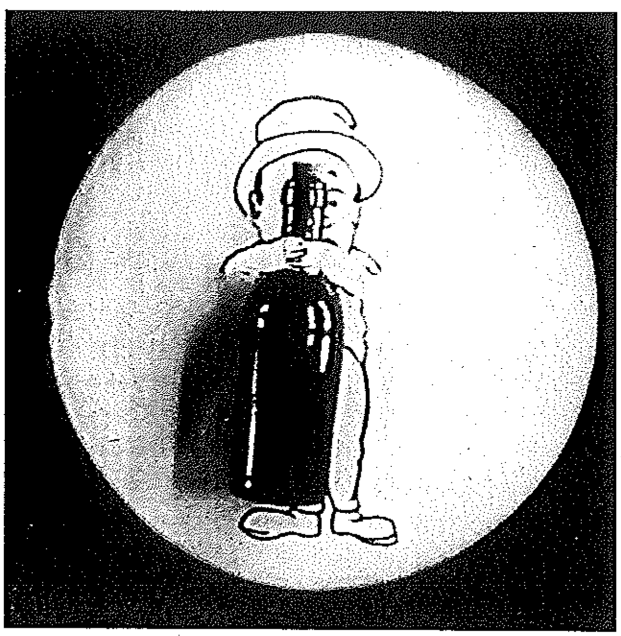


Fig. 3-4
Cohl's* The Joyous Microbes*: the disease of drunkenness.

Méliès's success also influenced the films of Ferdinand Zecca. Zecca, who was director of production at Pathé in the first decade of the century, made films in all the popular genres: social commentaries, farces, and melodramas. But Zecca also made trick films like *Whence Does He Come?* (1904), in which a man leaps out of the sea and begins putting on clothes that also leap out at him. Méliès's influence is also clear in some of Zecca's chase films. The chase was almost obligatory in the first decade of the 20th century and was perfected by the British; the excitement of people running compensated for the stasis of the camera and led the action from one shot to another. Zecca was one of the masters of the chase, but he added new excitement when he combined the chase with trick shots. In *Slippery Jim* (1905), the police chase a criminal who successfully eludes them because he has the ability to disappear, to appear in two or three places at once, to fly in the air on a bicycle, to unscrew his feet and remove the fetters, and to wriggle out of any container or bind. Méliès's success also accounts for George Lucas's *Star Wars* (1977).

One of the most influential French filmmakers in the first decade of the 20th century was more famous for his performing than for his directing of the films in which he starred. Max Linder was the first internationally famous star of motion pictures. Like the American John Bunny, who died in 1915, Linder was one of the first great film clowns. *A Skater's Debut* in 1906, in which a clumsy man meets a pair of ice skates for the first time, was also the debut of a comic character, Max, who was to become the leading figure of hundreds of comic one- and two-reel films over the next decade. By 1910, Linder's yearly salary had jumped to over 1 million francs and his face had become one of the most familiar in Europe. Linder, like Chaplin, Keaton, Lloyd, and Langdon who followed him, was a tiny man, and he used his smallness and his screwy wit to contrast with the bigger opponents and baffling obstacles he frequently faced. Linder's dancing moustache and dandyish mannerisms with hat and cane also set a pattern that Chaplin would follow and expand. Linder specialized in drunken routines (also a Chaplin specialty) as in *Max and* *the Quinquina* (1911), in which a woozy Max makes a series of comic mistakes with people and houses. He enjoyed debunking the intellectual, pretentious, and arty, as in *Max Plays at Drama* (c. 1912), which parodies classical tragedy and romantic melodrama, primarily by means of delightful anachronisms.

Because of his European popularity and American anonymity, the Essanay company brought Max to America in 1917 after Chaplin had left them. Both Max and Essanay soon failed. Although the films he made in America were slick and funny (especially the features *Seven Years Bad Luck*, 1921, and *The Three Must-Get-Theres*, 1922), they never recaptured the popularity of his earlier, cruder, but livelier films in Europe. Max's American adventure was unfortunate in another way: When he returned to France and made a wild haunted-house comedy with Abel Gance (*Au secours!* or *Help!*, 1923), Linder's American contracts kept it from being released.

While Pathé had Zecca and Linder, Gaumont had Cohl, Feuillade, and Jean Durand. Durand made a series of comedies that influenced the French avant-garde of the 1920s; it starred Ernest Bourbon as Onésime, a character whose bizarre logic and anarchic spirit were reflected in the aesthetics of the movies themselves. In *Onésime horloger* (1912), when Onésime decides to speed up time so that he can collect an inheritance sooner, Durand switches to fast-motion photography, and all the events of the world rush by. In this avalanche of action, ordinary life becomes, in the words of an intertitle, "more beautiful." *Onésime horloger* announces one of the great subjects of the French cinema: the nature of time. The New Wave filmmakers of the 1960s would learn much from Durand—as well as from the dark drive and brilliance of Louis Feuillade's serials, which were also admired by the Surrealists, for these serials—*Fantômas* (1913–14), *Les Vampires* (1915–16), and *Judex* (1917)—were as fantastic as they were realistic. Charged with sexuality and menace, violence and beauty, they were accused of glamorizing crime. Fritz Lang's silent German films about the master criminal Dr. Mabuse were clearly inspired by Feuillade, but it was not until *film noir* arrived in the 1940s that anyone would do nearly so fine a job of portraying the world as a place full of crime, beauty, rage, and nasty surprises.

Edwin S. Porter

In most of the early French, German, and American films, one shot equaled one scene; the finished film was a series of scenes—only incidentally a series of shots. Each scene progressed chronologically, following the central character about. There were no leaps in time, no ellipses in the sequence of events. The camera was usually distant enough from the playing to include the full bodies of all the players. It remained for filmmakers to learn to move the camera, to build scenes out of several shots, and to combine scenes and individual shots into sequences, the work of filmmakers from G. A. Smith in England to D. W. Griffith in America.

One of those crucial filmmakers was Edwin S. Porter. After Porter returned from the Caribbean, he paid a visit to his "father" and asked for a job. Edison hired him as a cameraman in 1900; within a year or two, Porter had become director of production for Edison's film company.

Porter was very familiar with the early British films and with *A Trip to the Moon*. From the latter he learned that a film's action could continue from one scene to the next—that a picture could tell, as he put it, "a story in continuity form"; he was sure that would "draw the customers back to the theatres." From Smith and Williamson he learned that a scene could consist of several shots. His work, which directly prepared the way for Griffith's, showed that actions could be made to appear continuous from one *shot* to the next, that it was unnecessary to show scenes from beginning to end, and that a movie could cover events taking place simultaneously in different locations.

Porter's two most important films were released in 1903. *Life of an American Fireman* (shot late in 1902) begins with the fireman-hero falling asleep, the subject of his reveries appearing in a superimposed white space near his head (a vignette, or "dream balloon"). This was the first time any American film had attempted to present a character's thoughts, converting part of the movie screen into a "mindscreen"; later, Griffith revealed the logic of simply *cutting* to the character's mental visions (a full-frame mindscreen).

As the fireman dreams of a mother and child, then wakes—worried about those who may be in danger from fire at the moment—there is a cut to a close-up of a fire alarm box and a hand setting

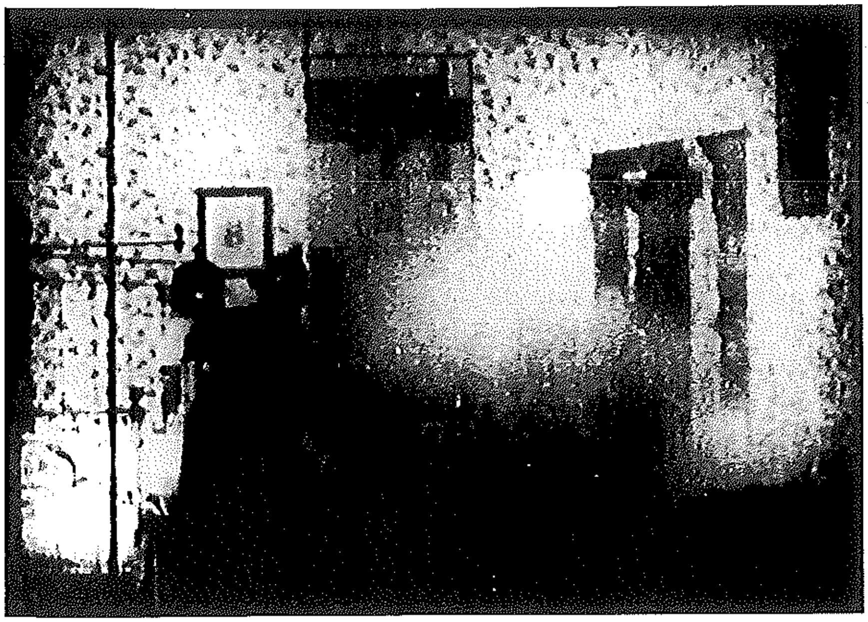


Fig. 3-5

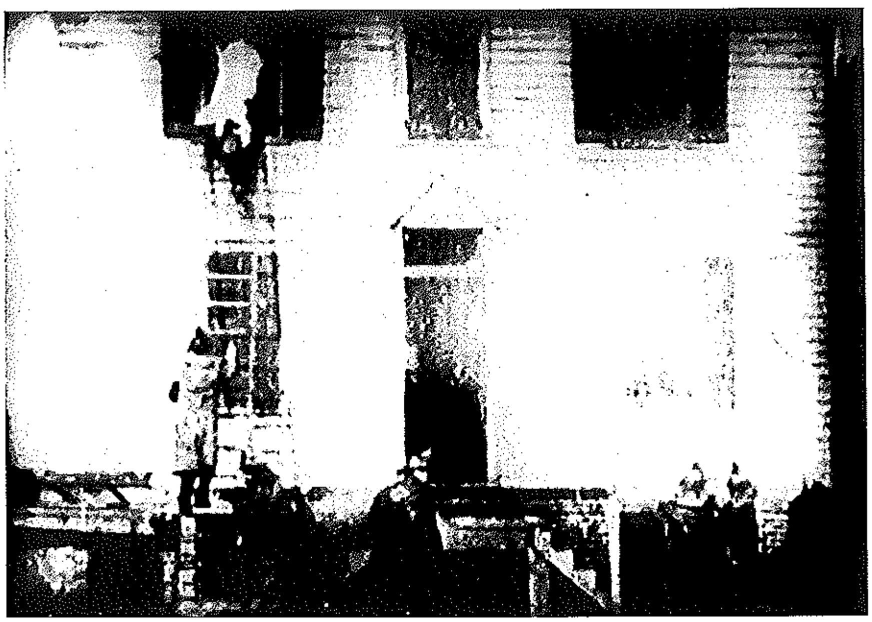


Fig. 3-6

Porter's* Life of an American Fireman*: the interior and exterior views of the rescue process.

off the alarm. The scene changes again to the fire station as the men tumble out of their beds—obviously in response to the alarm, which implies causal continuity from shot to shot. The cause-and-effect relationship between these shots is as important in the history of film continuity, in the very logic of film editing, as the cut to the close-up of the faraway alarm box. Before, there had been virtually no way to move a story from one shot or location to another without having the same character in both of them. Now the cut could be seen as the agency of a force exerted by one shot on another, a cinematic act that went beyond juxtaposition into the realm of asserted meaning and effective relationship. Like the British, Porter found that editing *had* a logic, one that would be explored by filmmakers from Griffith and Eisenstein to Hitchcock and Resnais.

That close-up itself was not the first ever made, by the way, but it was the first Porter had cut into an ongoing narrative.

Having leapt out of bed, the firemen slide down the pole in one shot and reach the ground floor in the next shot. Two sets, two shots, apparently one pole, and a cut in the right place, establishing the continuity of action and location from shot to shot—and all at once Porter's audience understood the relative location of both sets, the layout not just of the two-story firehouse but of the cinematically defined landscape.

Then the firemen rush out on their horse-drawn fire engines. The exterior shots of the fire brigade charging out of the station and down the street were bits of stock footage Porter found and cut into the narrative; that was an economical move, saving the cost of shooting a new scene, but it was also a demonstration that the actors and the real firemen would be read by the audience as the same firemen. (When Lev Kuleshov expanded on this insight, he called it *creative geography*, the fact that different shots can be asserted, through editing, to be part of the same "artificial landscape.") At the site of the fire, Porter cut from the stock footage to a new shot—and achieved yet another breakthrough, for as the fire engines rush up, the camera *pans* (that is, it pivots horizontally or turns sideways) to follow the engines and reveal a burning house. This was not a simple matter of panning to cover a wide subject, like a city skyline; what it did was discover the logic for the pan, making a camera movement part of the film's dramatic strategy—because it followed a moving object and because it kept the burning house *out* of the frame until Porter chose to reveal it.

All this is momentous. But in the final sequence—in which the fireman rescues a mother and baby, like those of whom he dreamed, from the burning house—Porter once was thought to have gone even further. There are two surviving versions of the film, referred to as "the copyright version" and "the cross-cut version"; each does the rescue scene differently.

In both versions the rescue scene is shown from two vantage points or setups—from inside the house (the woman and child awaiting rescue) and from outside it (the firemen setting up a ladder and saving them). In the copyright version, the audience sees the entire rescue and the putting out of the fire first from inside the house, then repeated in its entirety from outside the house.

The paper prints submitted for copyright were notoriously unconcerned about film continuity. Before 1912, films were not protected by copyright law, but still photographs were, since they could be printed on paper. Film companies solved this legal problem by sending individual still photographs of every frame of the movie on a roll of paper (called a *paper print*; see Fig. 2-4 for an example). When doing so, they frequently omitted continuity devices (for example, printed titles) and even ignored the continuity of the film's narrative (copyrighting the film in the order in which the scenes were shot, rather than assembled, since their order was irrelevant to protecting the individual photographs). Because all the action outside the house was shot in one continuous take, it naturally appears in the paper print as one shot, as does the scene inside the house. This version violates chronology and common sense by making the firemen go through the rescue twice.

The cross-cut version, which survived on film (but not in a 1903 print), is more comprehensible and daring. It cuts back and forth between the interior and the exterior of the house—that is, intercuts the two takes into a 13-shot sequence—turning the two place-bound setups into the coherent narration of a single temporal process. The fireman climbs up the ladder (outside), steps into the room and saves the woman (inside), climbs down the ladder with her and then up again when the woman tells him about the baby (outside), gets the baby (inside), and so on. Porter was thought to have realized and shown here that the basis of film construction was not the scene but the shot.

The question is, did he edit the film that way? Which of these copies represents the film as it was originally released? The answer, established by film historian Charles Musser, is that the copyright version corresponds to the release version. The cross-cut version was re-edited (not by Porter) in the Griffith era. The fact that to cut back and forth between the interior and exterior views would have been logical does not mean that Porter thought of it in 1902.

But it may not have been a mere economy for Porter to have used stock and new footage of entirely different fire brigades; he may have realized that he could get away with it—that the audience would integrate them into one brigade. Certainly he counted on something like that when he planned the final sequence, because the outdoor shots were clearly shot outside a real house and the indoor shots just as obviously inside a studio. Porter seems to have intuited that the cinema's narrative logic creates a unity of place where none exists in nature. As later theorists have demonstrated, we make sense of a narrative, a story, not merely on the basis of the action as presented but on the interplay between those events and our mental ability to connect them into a meaningful sequence. Regardless of how the interior and exterior shots were edited, Porter's constructing the rescue process from two distinct views demanded that we mentally connect them into a single process—one event happening at one time—and the interior and exterior shots into views of a single building.

Porter's later film of 1903, *The Great Train Robbery*, makes even greater use of this interplay between filmed event and mental connection, and probably owes to that its terrific success as the single most popular film in America before 1912. The first series of shots in the film shows the same kind of step-by-step, one-shot–one-scene editing of the Méliès films. The outlaws enter the telegraph office and tie up the operator, board the train as it stops for water, rob the mail car and shoot the railroad man, seize the locomotive, unhook it from the rest of the train, rob all the passengers and shoot one who tries to escape, run to the locomotive and chug off, get off the locomotive and run to their horses in the woods. Up to this point in the film any director might have made it, except for the flow and careful detail of the narrative sequences and the beauty and vitality of the outdoor shots. But the cut to the last scene of this sequence reveals a new editing idea. It is clearly an elliptical jump in time (from when the outlaws started their escape in the train to when they stopped the train and got off to find and mount their horses), and it contains a pan shot that follows the outlaws through the woods.

But the next shot identifies the director's cinematic imagination more clearly. He *cuts back* to the opening scene, the telegraph office, and shows the discovery of the assaulted operator. Although the cut may be a backward leap in time and certainly deserts the spatial focus of the film (the outlaws and their getaway, which we understand to be an action that continues, unshown, while we watch the operator be revived), it makes perfect sense in the story's continuity. Making the mental connection, linking the film's events with our thinking about them, it *answers the question* the audience naturally asks: How

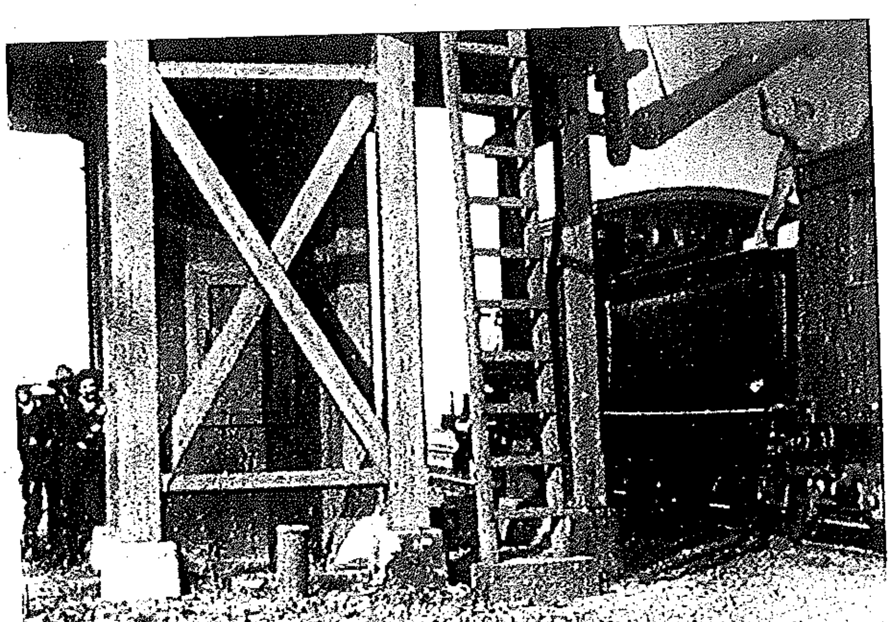


Fig. 3-7

The Great Train Robbery: *composition that hides the robbers on the far left of the frame.*

Fig. 3-8

The Great Train Robbery: ***the murder of a fleeing passenger, composed in depth along a diagonal.***

will the outlaws be caught? Part of any narrative art is making the audience ask questions and delaying the answers. Every interesting movie since *The Great Train Robbery* has learned ways to make us ask ourselves what happens next, what made that happen, who did it, how will the hero get out of this one, and so on.

Porter's next shot reveals yet another ellipsis. Rather than sticking with the new focal characters (the operator and, presumably, his daughter), it jumps to a barn dance, into which the operator and the girl eventually enter to tell their tale. And then another ellipsis. The posse is tailing the outlaws in the woods. Again, the audience makes the connecting links that the director has purposely omitted. Porter was demonstrating a familiar artistic maxim in film form: The most effective way to shape a work is to omit the inessential. Although Porter may have discovered the power of ellipsis accidentally (according to legend, he was running out of film and needed to economize), the finished film demonstrates that power nonetheless.

In the film's final shoot-out, three of the four bandits meet overacted, hands-in-the-air, pirouette-and-fall deaths. The fourth had already fallen off his horse in the chase scene. Ironically, this one gunman who did not know how to ride later became the world's first cowboy star: "Broncho Billy" Anderson (born Max Aronson), who also played the passenger who pirouetted to his death in the foreground. Apart from these stagey deaths, the film's cinematic showmanship is evident in the final shot—a close shot of a bandit firing at the audience—which was intentionally unrelated to the whole film and could, according to the Edison catalogue, be shown before or after the rest of the movie. Like 3-D of later years, the shot thrilled customers with a direct assault. For the next five years, it became almost obligatory to end a film with a close shot of its major figure (*The Boy Detective* and *Her First Adventure*, two Biograph films of 1908, are good examples)—all because of the success of the device in *The Great Train Robbery*.

For all the understandable later attention to the editing of this landmark film, several other sources of its power and popularity cannot be overlooked: its violence, its careful production design, its fluid mixing of scenes shot in the studio and on location, and its detailed demonstration of how to rob a train. Like the earliest Lumière films, *The Great Train Robbery* is a film of documentation, much as *Life of an American Fireman* is a film about a job. It is almost a little textbook called "How to Rob a Train"—first you tie up the telegraph operator so he can't send a warning, then you climb aboard the train when it stops for water, and so forth. Many of the earliest moral fears about the movies arose from their ability to teach audiences how to perform daring crimes in precise and explosive detail.

One special hand-painted copy is now widely available on film and video.

Porter's other films do not all show the same freshness in cutting or composition as *Life of an American Fireman* and *The Great Train Robbery,* even if he cut to a close-up in *The Gay Shoe Clerk* (*gay* as in playful) in 1903. His version of *Uncle Tom's Cabin,* also 1903, is completely bound by the stage. His *Dream of a Rarebit Fiend* (1906), however, based on Winsor McCay's series of cartoons in the *Evening Telegram* (*Dreams of the Rarebit Fiend,* 1905), is unusually inventive and memorable for its fluid use of long and close shots, its nearly film-long dream, its pan of the city, and a highly original use of superimposition and the moving camera to show how it feels to be drunk.

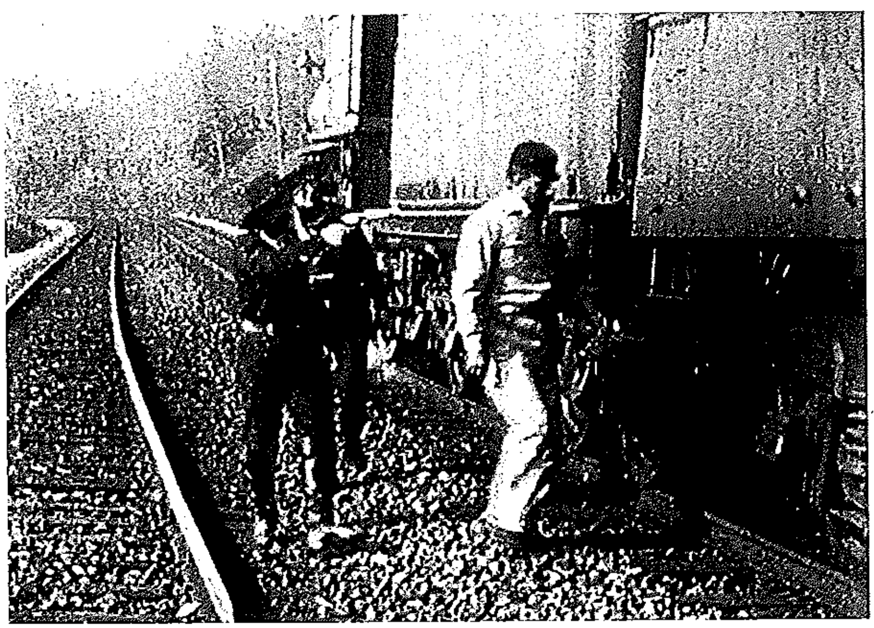
Perhaps the freedom of being outdoors influenced Porter's editing and shooting plan in *The Great Train Robbery.* One of the striking characteristics of American films before 1910 is that their outdoor shots look vital and fresh while the indoor shots look painted and flat. Outdoors, the accidental attractions of nature compensated for any lack of craft. Many studio films nearly reverted to the principles of the Black Maria. One reason, of course, is that the early films invested so little money and visual care in production. Nature didn't require an investment. Another reason is that the slowness of early film stock and lenses could render the world in depth only outdoors, where there was plenty of available light.

From Brighton to Biograph

While Porter was developing the tools of continuity and ellipsis in America, the "school of Brighton" was making similar and even more rapid progress in England. Porter, Zecca, and Griffith were among those who studied the early British films with care.

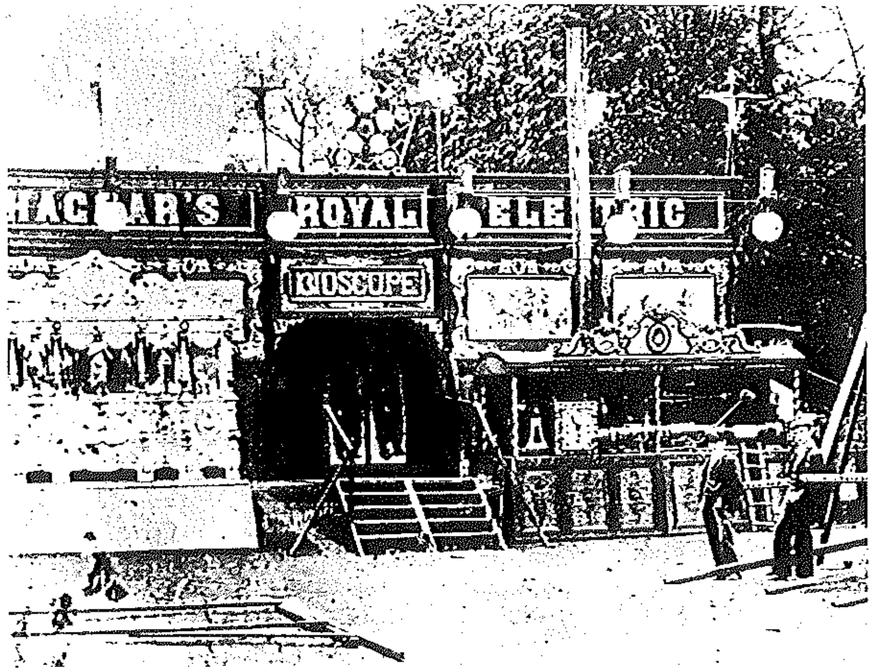
The group of filmmakers who clustered around the resort town of Brighton, especially George Albert Smith and James Williamson, built on the achievements of R. W. Paul, experimenting with ways to carry an action from one scene to the next, to break scenes into shots, and to use the camera and editing to define the landscape cinematically rather than theatrically. Paul had made the first multi-shot films in England (the very first, with Acres), and his ideas and techniques had been imitated around the world (Edison's *Uncle Josh at the Moving-Picture Show,* 1902, was little more than a remake of Paul's *The Countryman and the Cinematograph*).

In 1900, G. A. Smith made what may well be the first mindscreen film: *Let Me Dream Again.*



The Great Train Robbery: ***the freedom of the outdoors and the visual assertion of the frame's depth.***

Fig. 3-9



Haggar's Royal Electric Bioscope, an attraction at an English fair in 1902.

Fig. 3-10

In the first shot, a man romances an attractive woman; the image goes out of focus, there is a cut, and the second shot comes into focus, revealing the man in bed with his unattractive wife, whom he had begun to embrace while still asleep. The rude awakening in the second shot indicates that the first shot was a dream. Zecca remade this movie as *Dream and Reality* in 1901, joining the two shots with a dissolve—and to leap ahead of the story somewhat, Wes Craven used the technique of cutting to reality to define what came before as a dream throughout *A Nightmare on Elm Street* (1984). Smith's first multi-shot film was *The Kiss in the Tunnel* (1899).

As suggested earlier, Smith appears to have invented the point-of-view (POV) shot, in which a shot is defined—through editing, camera position, and narrative context—as what a particular character sees. If a *mindscreen* shows what is seen by the mind's eye, the *POV shot*—also called *subjective camera*—shows what is seen by the physical eye. In his vignetted POV shots, Smith put a mask over part of the frame—an iris, for instance, so that the image became a circle surrounded by black and appeared to be seen through a telescope (*As Seen Through the Telescope*, 1900). When Pathé imitated this technique in *Peeping Tom* (1901), the mask was in the shape of a keyhole. The most important of Smith's masked-POV-shot films, *Grandma's Reading Glass* (1900), intercuts medium shots of a boy and his grandmother—as he borrows the magnifying glass with which she has been reading the paper, and looks through it—with close-ups and extreme close-ups, shot through a circular mask, that show what he sees: the newspaper, the workings of a pocket watch, his grandmother's eye. Linking long with close views and breaking a scene into sharp, fascinating shots, it is a landmark in the history of editing.

Smith cut some of his other scenes into separate shots. *Sick Kitten* (1903) shows two kids taking care of their cat; shots 1 and 3 are medium views of the scene, but shot 2 cuts to a close-up of the kitten as it laps up a spoonful of medicinal oil. In *Mary Jane's Mishap, or Don't Fool with Paraffin* (1903), Smith used two techniques to vary the distance between the camera and subject: having the actress move toward and away from the camera within a shot, and cutting between full and close shots within a scene.

James Williamson also achieved major advances in continuity editing. *The Big Swallow* (1901) had two shots that were edited into three—but made to look like a continuous view of one scene: (1) a man walks toward the camera—from a medium view to extreme close-up—and opens his mouth until it surrounds the lens and the screen goes black; (2) the camera and the cameraman fall into the maw—a backdrop of black velvet; (3) the black screen yields an image as the mouth pulls away and the man walks back to a medium view, chewing in triumph. All the cuts were from one completely black frame to another (similar to a technique Hitchcock would use to hide cuts in *Rope*), to create the impression that shot 2 is a view from inside the mouth seen at the end of shot 1 and at the start of shot 3. Shots 1 and 3 had, of course, originally been a single shot.

In another 1901 Williamson movie, *Stop Thief*, a thief is chased out of the frame (that is, the field of view) in shot 1, runs into and out of shot 2, and runs into shot 3, where he tries to hide and is caught. Widely imitated, *Stop Thief* set the pattern for the chase film, from *The Great Train Robbery* to Hitchcock's *The 39 Steps* (1935). That Hitchcock enjoyed Williamson's work is evident in an homage he paid in his 1955 *The Trouble with Harry* (one of the characters is so engrossed in a book that he can trip over a corpse without noticing) to *An Interesting Story*. In the seven scenes of that 1905 movie, a man finds a story so interesting that he walks, reading, from one place to another, oblivious to the people he bumps into, the objects he falls over, and even the steamroller that finally flattens him—a fate from which he is restored by trick photography.

Apart from Brighton, important work was being done elsewhere in England. Frank Mottershaw directed *A Daring Daylight Burglary* in 1903, early enough in the year that it was a direct influence on *The Great Train Robbery*. Fast and violent, it follows the action from shot to shot (inspired not only by Paul but also by the way Williamson set up the chase in *Stop Thief* and followed a longer action in continuity in *Fire!*, 1901). Unlike Porter's film, however, it told its story without ellipses; there was little left out and no doubling back, no leaping through narrative space or time. As Porter did, Walter Haggard immed-iately saw the potential of the violent chase film built around a crime and directed *Desperate Poaching Affray* in 1903. It was a *Daring Daylight Burglary* in which the thieves were poachers. But it was far more violent, used the camera more inventively (notably in some panning shots and in the use of reverse angles), and made money for years.

Cecil Hepworth's *Rescued by Rover* (1904, remade 1905) is one of the most energetically edited pre-Griffith films, a decided advance over Porter in narrative construction and rhythm. In the first expositional shot, a nurse wheeling a baby carriage insults a gypsy woman, who vows revenge. In the second shot, a carefully blocked sequence with a camera pan—a general strategy that would later be described as *plan-séquence*, the complicated blocking of a lengthy shot—the gypsy steals the baby as the nurse chats with a beau. Then Hepworth makes a huge elliptical jump. Rather than sticking with nurse, watching her discover the loss and run home to tell baby's parents, the film's third shot begins with nurse bursting into the family living room to tell her news. As she recites her tale, Rover, the family collie, listens intently; he jumps out the window in search of the stolen baby.

Then begins the most remarkable sequence in the film: a series of individual shots documenting Rover's finding baby, returning to tell his master, and leading master back to baby. The sequence, most of which is shown in Fig. 3-11, unfolds in the following shots: (1) Rover jumps out of window; (2) runs down the street toward camera; (3) turns corner; (4) swims across stream toward camera (shaking himself off after emerging from the water); (5) searches a row of shanty doors. Then there is a cut to (6) inside the shanty, where gypsy sits guzzling booze; gypsy exits, Rover enters, nuzzles baby; (7) Rover runs out door of shanty, same setup as 5; (8) swims across stream away from camera, same setup as 4; (9) runs around corner, away from camera, same setup as 3; (10) runs down street away from camera, same setup as 2; (11) jumps into house window, same setup as 1. Then, after a cut to (12) inside the house, Rover "tells" master. (13) Rover and master run down street, same setup as 2 and 10; (14) Rover and master cross stream, same setup as 4 and 8; (15) Rover leads master to door of shanty, same setup as 5 and 7; (16) master finds baby, takes it out of shanty; gypsy returns to find baby gone but is comforted by baby's clothes and her bottle of booze. In the film's final scene baby, master, mistress, and Rover are happily united in their living room; Hepworth has elliptically omitted the process of returning home, knowing that the sequence was not necessary and would weaken the emotional tension of the film. This is

Fig. 3-11
Rescued by Rover: *The precise establishment of locations, the repetition of setups, and the consistent direction of movement within the frame produce both awareness of the process and emotional participation in the event.*

a crucial early instance of leaving out what the audience can figure out for itself, a basic lesson of filmmaking.

Hepworth's careful editing of *Rescued by Rover* produced two effects that had not been achieved before, which communicated themselves to the audience by completely cinematic means. His systematic use of the same setups (or camera positions) to mark Rover's progress both toward and away from the baby firmly implanted in the audience's mind exactly where Rover was in relation to the object of the rescue (the gypsy hovel) and the agent of the rescue (the master's house). Without any titles or explanations, the audience had a complete understanding of the rescue process. Second, this documentation produced not only awareness, but also suspense. Because the audience knew where Rover's path was leading, it could participate in the excitement of Rover's finally reaching the end of it. Hepworth increased this excitement with the dynamic fluidity of cuts from one setup to the next. Although the locations were undoubtedly far apart, the editing created the impression that Rover ran continuously from one location to the next. Hepworth cut consistently as Rover was in motion across the frame (Eisenstein and Pabst would later develop the power of cutting on movement), impelling the viewer's eye into the next shot and producing both fluid continuity and visual energy.

Despite the slower pace of visual and narrative discovery in the American films of the period, the years from 1903 to 1908 laid the foundation on which Griffith built. To be sure, Griffith studied the British films—his first film is very similar to *Rescued by Rover*, and its editing principles would be reflected throughout his work—but he also learned from Porter. After the crucial films of 1903, Porter cleverly combined live-action comedy and graphics in *The Whole Dam Family and the Dam Dog* (1905); he used metaphoric lighting, a firelight's glow, for the final old-age scene of *The Seven Ages* (1905), predating Griffith's use of the same visual metaphor in *The Drunkard's Reformation* four years later; and he also made some of the earliest American films of social commentary, such as *The Kleptomaniac* (1905), which contrasts the one kind of law that applies to a poor and needy thief and the other kind that applies to a rich, disturbed one. Griffith would make much of such "contrasts" in *Intolerance.*

Even before Griffith, the Biograph company had been producing the most interesting American films on the market. There were frantic seriocomic chases, clearly modeled on Zecca's, like *Personal* (1904), *The Lost Child* (1904), and *Tom, Tom, the Piper's Son* (1905). Within a half decade, two directors at this same studio would refine these chases into their purer but opposite types—D. W. Griffith's last-minute rescues and Mack Sennett's physical farces. Biograph also made films of ingenious thefts, like *The Great Jewel Mystery* (1905), in which the thief hides in a coffin on a train, and *The Silver Wedding* (1906), which concludes with a chase through the city sewers.

Also in this period at Biograph, G. W. ("Billy") Bitzer, the man who was to shoot all of Griffith's most inventive and important films, had begun to master the art of cinematography, notably in *Tom, Tom, the Piper's Son.* In *A Kentucky Feud* (1905), Bitzer's photography creates the appropriate visual setting for a tale of the Hatfields and McCoys. In *The Black Hand* (1906), a tale of organized crime, Bitzer juxtaposes scenes shot on sets with actual location shooting on Seventh Avenue in New York City. Biograph's *The Paymaster* (1906) may well use available light more creatively and beautifully than any other American film before 1908; especially effective are Bitzer's capturing the reflections of light on the river and his shots inside an old mill, lit entirely by oblique streams of light pouring through its window.

One question frequently debated among historians and film theorists is precisely why these early films gravitated toward narrative, toward storytelling, in the first place. Why didn't films remain depictions of real events and places in the world, or depictions of abstract visual qualities of light, shape, and form? Some suggest that films began to tell stories only as an act of commercial exploitation, because uneducated audiences were willing to pay for these primitive fictional shows. The union of film and narrative might have been an example of the capitalist ethic at work: selling the public all that it will buy and bear. Others point out film's roots in documentation—that it was a small step to move from documenting real events, like the arrival of a train, to fictional ones, like the robbing of a train.

Still others suggest there was something inevitable about film's movement into storytelling, a clear outgrowth of 19th-century fiction and drama, which themselves sought the paradoxical union of two opposites—the telling of absolutely fictional and unreal stories within a visual, social, and psychological environment that seemed absolutely real and true to human experience. Movies seemed an ideal medium for combining the fictional tale with the real or realistic setting.

Whatever the theoretical, material, or spiritual reasons, between 1895 and 1908 movies changed from one-shot "views" to increasingly fluid sequences of visually effective shots that produced a continuous—if not necessarily complex or evocative—narrative. The next evolution of narrative would require a master with a firmer and bolder sense, not so much of the individual cinematic elements but of the means to synthesize them into clearer, more credible, and more powerful narrative wholes. It would require a filmmaker not only with a strong visual sense, inherited from observing the accomplishments of Western painting, but also with a strong feeling for the plays and novels of the previous century. D. W. Griffith proved to be that artist before the end of 1909.

Business Wars

While moviemakers gradually discovered the elements of film construction, American movie exhibitors gradually converted commercial chaos into order. In the last five years of the 19th century, the American picture business enjoyed the protection of neither law nor professional ethics. Cameramen and exhibitors blatantly ignored machine patents, pirating and duplicating any instrument that could make them money. Even more vulnerable were the filmstrips themselves, which were not yet protected *as films* by copyright laws. The French and English films were the most vulnerable; although many Méliès films were shown legitimately in the United States, his Star Film Company made no money from the prints that had been smuggled out of France and duped. Piracy had become so pervasive that film companies hung or painted their identifying logo on the sets themselves. The Edison trademark can be clearly seen on a burning wall in *Life of an American Fireman*, and the American Biograph monogram—the letters AB in a circle:

—was even pasted on the street organ of *Her First Adventure* and is easy to spot throughout *The Lonely Villa*. A war entangled all producers and exhibitors of motion pictures.

In 1899, for example, Biograph set up a huge battery of hot lights on Coney Island to record the Jeffries–Sharkey fight. The film would be the first to use electricity instead of sunlight. While the Biograph camera was grinding away in the front row, the Vitagraph camera was grinding away 20 rows back. When the Biograph boys discovered the Vitagraph camera, they sent a crew of Pinkerton detectives to seize the machine and film. The fight fans surrounding the Vitagraph camera, unaware of the causes of the attack, manfully protected their neighbor, producing more action outside the ring than in it. Eventually Vitagraph's Albert E. Smith recorded the whole fight, smuggled the film out of the arena, and developed it that night in the Vitagraph lab. The next morning Smith discovered that the pirated film had itself been pirated out of the lab by some late-night delegates of the Edison company. Ironically, although Biograph went to the trouble and expense of lighting the fight, Vitagraph and Edison (both eventually released prints of it) were the only ones to make any money on it.

In December 1897, Thomas Edison served his first legal writ, announcing his intention to eliminate all competitors in motion pictures. For the next 11 years, Edison would bring suit against any company that used a loop of film in either a projection machine or a camera, claiming he owned the rights to all loops because of the Armat patent on the Latham loop, the generic name for all loops in all film machines. Edison's private detectives roamed the country searching for shooting companies, serving any they discovered with legal writs or extralegal wreckage. Edison steadily coerced the smaller companies into accepting his terms, eventually bringing suit against the big ones like Biograph.

Then Thomas Armat, dissatisfied with Edison's taking full credit for the Vitascope, took to the courts. Edison had double-crossed Armat commercially by manufacturing his own projecting machine, the Projecting Kinetoscope, just two years after marketing Armat's. Armat, like Edison, brought suit against everyone who used his loop projector; he also sued Edison. Biograph, meanwhile, was preparing its own legal dossiers. With some careful bargaining it bought both the Armat patents and the Latham patents, arming itself with plenty of ammunition to use against Edison. For ten years the motion picture companies busied themselves with suits and countersuits. Some 500 legal actions were taken, over 200 of them making their way into court.

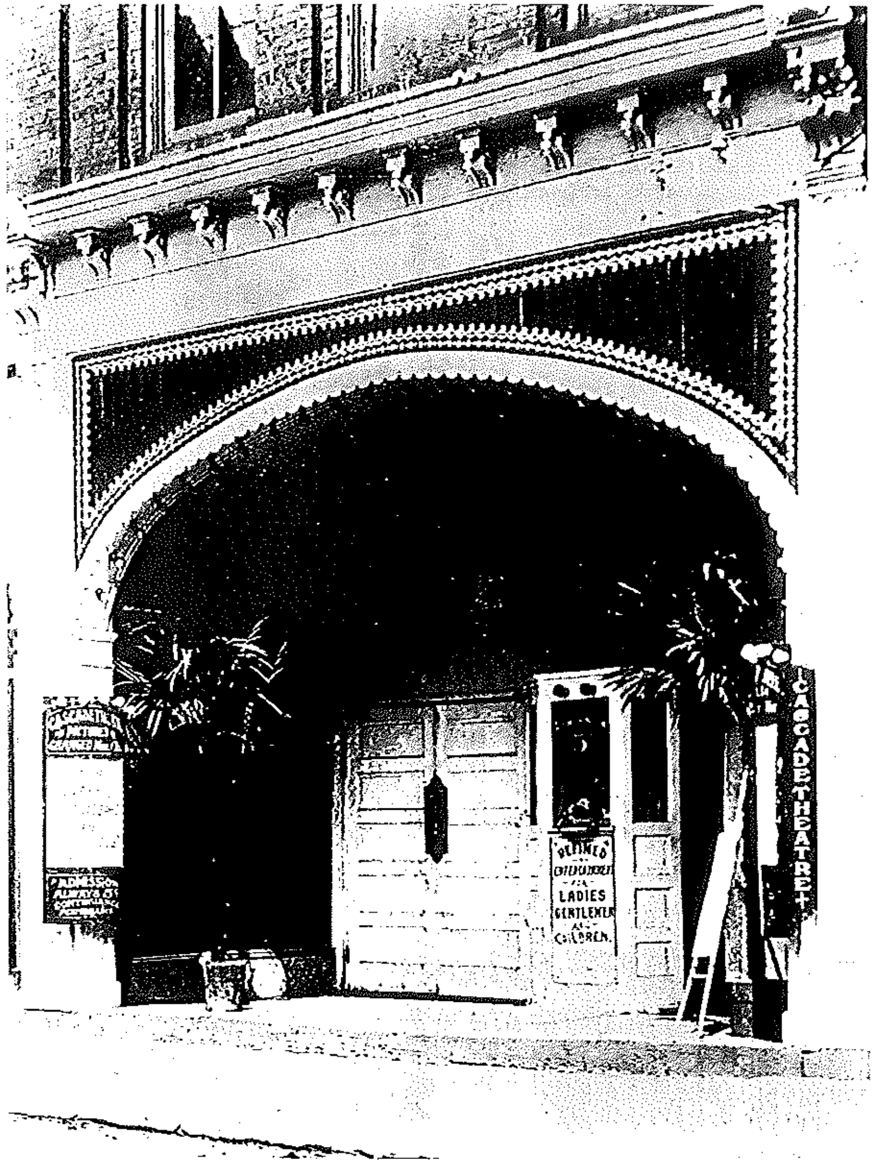
While the company lawyers were busy at each other's legal throats, the movie companies continued making and selling an ever-increasing number of films. Originally, when movies were part of vaudeville bills or amusement arcades, the film company sold the finished picture directly to the exhibitor at between 5 and 25 cents per foot, depending on the expenses of the film, its potential popularity, whether it was hand colored, and so forth. The exhibitor then owned the film and could show it until the print wore out, then buy a new one.

But a new exhibiting development, just after the turn of the century, produced a new distributing practice. In 1902, an enterprising Los Angeles showman opened a small theatre in a store specifically for the purpose of showing motion pictures. Thomas L. Tally's Electric Theatre was the first permanent movie theatre in the United States. More and more of these store theatres sprang up until, in June 1905, a Pittsburgh store theatre opened that was a bit plusher, accompanied its showings with a piano, and charged its customers a nickel. It was the first *nickelodeon*, or "nickel theatre." Within three or four years there were over 5,000 nickelodeons in the United States. So popular were they that in 1908 it was estimated that they drew 80 million admissions every week—at a time when the entire population of the United States was about 100 million.

The permanent movie theatre forced a fundamental change in the relationship of the movie exhibitor and the movie producer. The nickelodeon required a large number of films each week; about six films of one or one-half reel each made up a single hour-long program.

A *reel* is up to 1,000 feet of 35mm film, which has 16 frames per foot. A *full reel* is a full 1,000 feet; for decades, that was the largest roll of film a movie camera or projector could hold. At 16 fps, a full reel takes 16.67 minutes to project; at 24 fps it takes 11.1 minutes. In practice, a reel is usually between 900 and 990 feet, and the average reel lasts about 15 minutes at silent speed, about 10 minutes at sound speed. Today, however, a "reel" is what used to be called a *double reel:* up to 2,000 feet of 35mm film, in practice between 1,500 and 2,000 feet, lasting between 15 and 22 minutes at 24 fps. When a film history book says that *Battleship Potemkin* is 5 reels long, that means that it is under 5,000 feet of 35mm film; when a projectionist today says that a feature is 5 reels long, that means that it is under 10,000 feet. To avoid confusion this book gives lengths in feet of 35mm film (and in minutes) and uses "reel" to mean about 1,000 feet, unless otherwise specified. Division into reels does not depend purely on length but is part of the film's deep internal rhythm, coming at the end of what the editor decides is the appropriate shot to conclude a particular reel. The sound that is edited and mixed to go with a reel of film is a *reel of sound.* The ends of reels are inscribed with *changeover marks* that alert the projectionist to switch to the next reel, which in the old days was loaded on the other of a pair of projectors. (Films are still editorially constructed in reels. That is, Scene 70, to make up a figure, might be identified in a mixing session—or in a shot-by-shot description of a print—as the first 45 feet, or the first 30 seconds, of Reel 3.) *The Great Train Robbery,* which is only 720 feet long, is a one-reel picture or *one-reeler,* and so is Griffith's unusually long *After Many Years* (1908), which is 1,033 feet. For purposes of exhibition in the early Silent Era, *The Gay Shoe Clerk,* at 75 feet, was referred to as a *half-reel* picture, as was any movie under 500 feet.

To keep the customers coming, programs had to change several times a week. The theatre owner had no use for owning a film outright; after several showings, the regular patrons would not want to see it again. Between the film producer and the film exhibitor stepped a middleman who either bought the film or leased it from the producer and then rented it to the many exhibitors. The exhibitor paid less money for a larger supply of films; the producer was certain of selling films. The three-part structure of the American film industry—the producer who



The beckoning lure of an early nickelodeon: the Cascade Theatre in Newcastle, Pennsylvania, operated by the Warner Brothers.

Fig. 3-12

makes the film, the distributor who arranges for its most effective circulation, and the exhibitor who shows it in the theatre—worked out well for all parties. That structure, with some wrinkles, survives today.

Edison tried to use this three-level structure to control the chaotic American film world. It was particularly important to work out a treaty between the two top competitors, Edison and Biograph, along with the key people and companies allied with each of them. Pressure, threats, bankruptcy, and collusion led to a combining of the nine leading film companies of 1908—Edison, Biograph, Vitagraph, Essanay, Lubin, Selig, Kalem, Méliès, and Pathé (the latter two had both begun producing in America)—along with inventor Thomas Armat and distributor George Kleine (the importer of Gaumont and Urban productions). The combine, called the Motion Picture Patents Company, was incorporated on September 9, 1908, and activated on December 18, 1908; Méliès was added to the group on July 20, 1909. The members of the combine agreed to share the legal rights to their various machine and film patents (including the Latham loop, which was part of virtually every movie camera), to buttress each other's business procedures, and to keep all other parties and machine parts out of the film business permanently. The Motion Picture Patents Company could make its rules stick because it also agreed not to sell or lease to any distributor who bought a film from any other company. The exchange (distributor) that wanted to handle Patent Company films—the best pictures then on the market—could not handle any other company's films. Further, the Patent Company made an exclusive contract (on January 1, 1909) with George Eastman's factory: Eastman would sell perforated raw film stock to the Patent Company and only to the Patent Company. The Patent Company was such a big account that Eastman could not afford to sell to interlopers. After ten years of piracy and bickering, the "War of the Patents" was over. American film production was the exclusive property of nine companies: They leased their films only to those distributors who would accept their terms and pay their fees; and these "licensed" film exchanges, soon to become amalgamated as the powerful General Film Company, rented only to exhibitors who paid a weekly licensing fee ($2) and agreed to show Patent Company pictures exclusively. From first shot to final showing, law and order had come to motion pictures.

Having temporarily ended the warfare within the industry, the Motion Picture Patents Company sought to silence the increasing moral clamor outside it. The staggering success of the nickelodeons, the huge numbers of Americans who had caught the "nickel madness," troubled the moral principles of both amateur advocates and professional politicians. As early as 1907, states and cities began to establish censorship boards to ensure the cleanliness of movie content and licensing boards to ensure the cleanliness and safety of movie theatres. These boards became commercially troublesome for an increasingly national industry. What if a film were acceptable in New York but not in Chicago? What if a film were acceptable in Pennsylvania but not in Philadelphia? To silence its critics and to ensure the commercial health of its product, the infant motion picture industry took the first step of the kind it would take throughout its history when faced with a moral attack that endangered its financial welfare: It established its own censorship board to control film content. The National Board of Censorship, founded in 1908 (in 1915 it changed its name to the more tolerant-sounding National Board of Review), did not put an end to state and local censorship actions, but it greatly reduced their inconsistencies by establishing standards and principles that most of them could (and did) accept.

Less fortunate for the Motion Picture Patents Company and its General Film Company was the rebellion of some distributors and exhibitors within the industry itself against this monopolistic control. It eliminated bargaining, it eliminated profits from duping, and it raised prices. Within months after the peace had been signed in 1908, two distributors, William Swanson of Chicago and Carl Laemmle of New York, decided to "go independent." The two pacesetters urged other film exchanges to follow their example. The Patent War had ended; the Trust War had begun.

The independent distributor faced one problem: obtaining films to distribute that were not made by a Patent Company studio. One of the obvious solutions was for a distributor to turn producer. Carl Laemmle, film exchangeman, became Carl Laemmle, film producer, and gave birth to the organization that would eventually become Universal Pictures. William Fox, distributor and theatre owner, became William Fox, producer, and the organization that would eventually become 20th Century–Fox was born. Fox also retaliated against the Patent Company by suing them and their General Film Company as an illegal trust. The lawyers were back in the movie business—to stay.

For all of Teddy Roosevelt's historical reputation as a "trust buster," it was the new Wilson administration that joined Fox's suit against the Film Trust in 1913. Governmental agencies had learned at this early date that they could attract maximum publicity in the press and interest from the public by attacking a popular and glamorous industry like the movies—exactly as the House Un-American Activities Committee realized decades later. By 1913, Americans had really come to care about the movies. The first U.S. fan magazine appeared in 1912.

Until 1915, movie companies fought in the courts and in the streets. Jeremiah J. Kennedy, a major executive of the Patent Company, sent gangs of gentlemen to visit unlicensed studios, shooting holes in cameras and leaving bits of wreckage about for calling cards. To escape this, some companies set up shop in faraway

Hollywood. Some Patent companies set up studios there, too. Despite the strong-arm tactics of the Trust, the Independents prospered. Adam Kessel and Charles Bauman, two former bookies, formed the New York Motion Picture Company, which eventually founded the film careers of Thomas Ince, Mack Sennett, and Charles Chaplin. When Edison had the gall to demote him in 1907, Porter left Edison to go independent, making films for his own Rex Company; it would one day be swallowed by Paramount. Most successful of all the Independents was Laemmle's Independent Motion Picture Company, known as IMP.

The Trust's barriers sprang other leaks. Unable to buy film stock from Eastman, the Independents bought stock from English, French, and other American factories. In addition, legitimate licensed film companies and film exchanges ran unlicensed, independent companies and exchanges on the side. When the smoke of this second film war had cleared, by late 1915, the Motion Picture Patents Company had been busted in court as an illegal trust (it disbanded in 1917, when the case was finally settled), and the individual companies that formed the Trust were dying or dead. The Independent, for reasons that we will see, propelled the movies into their next era. Three of the Independent companies (Fox, Universal, and Paramount) survive today. The last of the original Trust companies, Vitagraph, was swallowed by Warner Bros. in 1925.

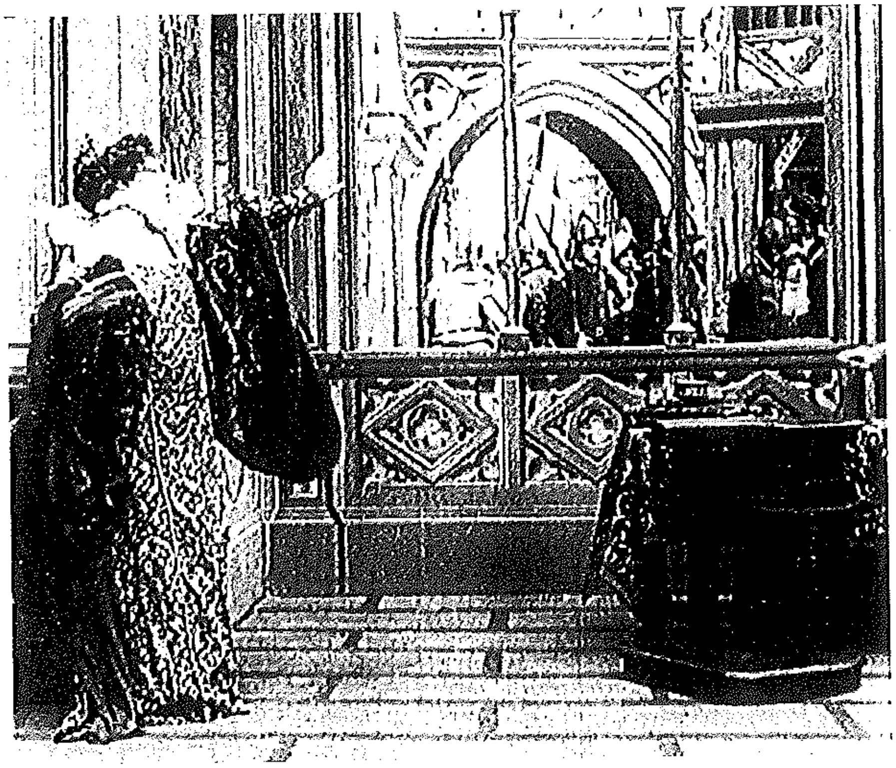
The Film d'Art

An important influence made itself felt toward the end of the decade. In 1907, a French company announced the intention of creating a serious, artistic cinema, of bringing together on film the most important playwrights, directors, actors, composers, and painters of the period. The company, which called itself the Société Film d'Art, produced its first film in 1908—*The Assassination of the Duc de Guise.* Featuring actors from the Comédie Française and incidental music by Saint-Saëns, the movie was hailed as introducing the nobility and seriousness of the stage to the film (always a bad sign). Ironically, the Film d'Art ran the movies headlong back into the theatre: theatrical staging, unedited scenes, theatrical acting. It was the first in a series of attempts to produce "canned theatre," the most successful of which was the American Film Theater of the mid-1970s with its filmed productions of plays like *The Iceman Cometh* and *A Delicate Balance.*

The first of these Films d'Art to be seen in the United States was *Queen Elizabeth* (1912), featuring Sarah Bernhardt and members of the Comédie Française, directed by Louis Mercanton. This bombastic film version of Elizabeth's love for Essex, whom she must eventually send to the block, reveals all the plodding staginess of the Film d'Art technique. Characters enter and exit from right and left; groups of soldiers, ladies in waiting, or courtiers stand immobile in the background; the actors, Bernhardt included, indulge in a grotesque series of facial grimaces, arm swingings, fist clenchings, and breast thumpings (once even raising dust from the costume). And yet these were among the most skillful stage actors in the world!

One clear lesson of the Film d'Art was that stage acting and film acting were incompatible. The stage, which puts small performers in a large hall, requires larger, more demonstrative movements. The artificiality of this demonstrativeness does not show in a theatre for three reasons: First, the live performance sustains the gestures with the vitality of the living performer's presence, which assimilates gesture as only one part of a whole performance. Second, the performer's voice adds another living note that makes facial expression and gesticulation also merely parts of a whole. And third, that voice carries words, which are as essential to the theatre as performance itself. The filmed play would truly flourish only with sound. In the Film d'Art of *Queen Elizabeth*, gesture and grimace were parts without a whole.

The way to improve film acting was not just to make the actors underplay but to let cinematic technique help the actors act. A camera can move in so close to an actor's face that the blinking of an eye or the flicker of a smile can become a significant and sufficient gesture. Or the field of view can cut from the actor to the subject of the actor's thoughts or attention, thereby revealing the emotion without requiring a thump on the chest. Film acting before Griffith—and before his greatest star, Lillian Gish—not only in the Film d'Art but in Méliès and Porter as well, had been so bad precisely because the camera had not yet learned to help the actors.



Sarah Bernhardt in Queen Elizabeth*: stage composition and stage acting, with no help from the camera. As Elizabeth watches, Essex is led to his trial.*

Fig. 3-13

In *Queen Elizabeth*, for example, there is a scene in which Elizabeth bids adieu to Essex (he's off for Ireland) and then sinks down on her throne in abject sorrow. The entire scene—adieu, exit, sorrow—is filmed in one shot. The single, frozen take is ridiculous, unresponsive to the developing action and even unrelated to the theatrical composition of the scene.

Although the Film d'Art had nothing to do with film art, the company had a lot to do with the direction that film art would take. *Queen Elizabeth* was a huge success. That success launched the career of its American distributor, Adolph Zukor, who decided to form an American Film d'Art called Famous Players in Famous Plays, which would eventually become Paramount Pictures. Its success also proved that highbrow pictures and, more important, *long* pictures could make money. It was to the advantage of the Motion Picture Patents Company to maintain that audiences would not sit through a single picture of over 15 minutes, for the whole film business they had solidified was built on programs of one-reelers. The General Film Company could not distribute any film longer than two reels; it served the nickelodeons exclusively. *Queen Elizabeth*, a 44-minute three-reeler, squashed the Trust myths. Feature films were on the way.

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FILMS

Georges Méliès (1861–1938)

A Game of Cards (1896)
The Moon at One Meter (1898)
Cinderella (1899)
The Conjuror (1899)
The Dreyfus Affair (1899)
A Trip to the Moon (1902)
The Magic Lantern (1903)
The Palace of the Arabian Nights (1905)
Hydrothérapie fantastique (*The Doctor's Secret,* 1909)
The Conquest of the Pole (1912)

Edwin S. Porter (1869–1941)

Life of an American Fireman (1903). Completed 1902
The Gay Shoe Clerk (1903)
Uncle Tom's Cabin (1903)
The Great Train Robbery (1903)
The Ex-Convict (1904)
The Kleptomaniac (1905)
The Whole Dam Family and the Dam Dog (1905)
Dream of a Rarebit Fiend (1906)

Other Films of the Era

Rough Sea at Dover (1896, R. W. Paul and Birt Acres)
The Cabbage Fairy (1896, Alice Guy)
Tearing Down the Spanish Flag (1898, J. Stuart Blackton)
Come Along Do! (1898, R. W. Paul)
The Kiss in the Tunnel (1899, G. A. Smith)
Let Me Dream Again and *As Seen Through the Telescope* and *Grandma's Reading Glass* (1900, G. A. Smith)
The Big Swallow and *Stop Thief* and *Fire!* (1901, James Williamson)
The Funeral of Queen Victoria and *The Countryman and the Cinematograph* (1901, R. W. Paul)
Dream and Reality (1901, Ferdinand Zecca)
Sick Kitten and *Mary Jane's Mishap, or Don't Fool with Paraffin* (1903, G. A. Smith)

A Daring Daylight Burglary (1903, Frank Mottershaw)
Desperate Poaching Affray (1903, Walter Haggard)
Rescued by Rover (1904, Cecil Hepworth). 1905 version co-directed by Lewis Fitzhamon
An Interesting Story (1905, James Williamson)
Tom, Tom, the Piper's Son and *A Kentucky Feud* (1905; Biograph)
Scenes of Convict Life and *Slippery Jim* (1905, Ferdinand Zecca)
On the Barricades (1906, Alice Guy)
Humorous Phases of Funny Faces (1906, J. Stuart Blackton)
The Black Hand and *The Paymaster* (1906; Biograph)
The Story of the Kelly Gang (1906, Charles Tait)
A Skater's Debut (1906, Max Linder)
The Pumpkin Race (1907, Louis Feuillade and Romeo Bosetti)
Rescued from an Eagle's Nest or *The Eagle's Nest* (1908, J. Searle Dawley). Completed 1907
The Music Master (1908; Biograph)
The Assassination of the Duc de Guise (1908, Charles Le Bargy and André Calmettes; Film d'Art)
Fantasmagorie and *Un Drame chez les fantoches* or *A Love Affair in Toyland* (1908, Émile Cohl)
Une Dame vraiment bien! (*A Truly Fine Lady!*, 1908, Louis Feuillade)
Meeting of the Motion Picture Patents Company (1909; Biograph)
Princess Nicotine (1909, J. Stuart Blackton)
The Airship Destroyer (1909, Charles Urban)
The Vampire (1910; Selig)
Little Nemo (1911, Winsor McCay and J. Stuart Blackton)
Onésime horloger (1912, Jean Durand)
Queen Elizabeth (1912, Louis Mercanton; Film d'Art)
I nomadi (*Nomadic People*, 1912, Elvira Notari)
Matrimony's Speed Limit and *A House Divided* (1913, Alice Guy Blaché)
Fantômas (1913–14, Louis Feuillade)
Gertie the Dinosaur (1914, Winsor McCay)
Les Vampires (1915–16, Louis Feuillade)

DVDs

Judex (1917, **Louis Feuillade**). Flicker Alley. Complete serial, tinted.

More Treasures from American Film Archives, 1894–1931: 50 Films Image Entertainment/ National Film Preservation Foundation. Important silent and early sound films, most not available elsewhere, with expert commentaries. Includes ***Dickson** Experimental Sound Film* with the original sound, Dickson's *Rip Van Winkle* (shot by **Bitzer** for American Mutoscope), **Porter**'s *Life of an American Fireman*, **Griffith**'s *Country Doctor*, a **Pearl White** serial episode, several early color films, a 1910 adaptation of *The Wizard of Oz*, a 1912 film about child labor, the original **Rin-Tin-Tin**, a film with Sioux actors, the feature *Lady Windermere's Fan* (**Lubitsch**, 1925), *Greeting by **George Bernard Shaw***, two Phonofilms by **de Forest** (Eddie Cantor in 1923, President Coolidge in 1924), fieldwork footage shot in 1928 by **Zora Neale Hurston**, many actualities and documentaries, a detailed book, and of course *Gus Visser and His Singing Duck* (1925).

16 **Méliès** films, including *Long Distance Wireless Photography* and *A Trip to the Moon;* most of the early **British** films discussed in the text, including *Rough Sea at Dover, Let Me Dream Again, Grandma's Reading Glass, The Big Swallow, Sick Kitten, Desperate Poaching Affray, An Interesting Story,* and *Rescued by Rover;* 4 **Porter** films, including *The Great Train Robbery* and *Dream of a Rarebit Fiend;* **McCay**'s *Little Nemo;* and **Durand**'s *Onésime horloger* are in *The Movies Begin* (see Chap. 2 list).

Rescued from an Eagle's Nest (1908, **J. Searle Dawley**) is in *Griffith Masterworks* (see Chap. 4 list).

Les Vampires (1915–16, **Louis Feuillade**). Image Entertainment. Complete serial, tinted.