

A CHRONICLE OF THE MOTION PICTURE INDUSTRY

INTRODUCTION

If you've ever taken a still photograph, you're already acquainted with the essentials of shooting a motion picture image. The biggest difference between the two is that the movie camera typically captures twenty-four images each second.

Well into the late Nineteenth Century, most images were captured on sensitized glass plates, metal, or heavy paper. Shortly after the invention of photography, attempts were already underway to capture and reproduce a moving image. Typically, an array of individual cameras, triggered in rapid succession, captured a series of single exposures on glass plates. These experiments relied on a persistence of vision concept—the eye-brain combination is capable of melding a series of sequential images into a movie. A more practical photographic system had yet to be created.

It was George Eastman's invention of the KODAK Camera, and the flexible film it exposed, that made the movie camera possible.

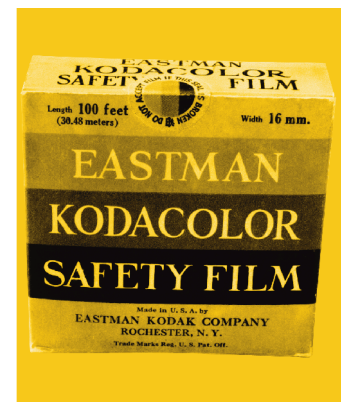


1951 KODAK BROWNIE
Movie Camera

A HISTORY OF CINEMATOGRAPHY

Human fascination with the concept of communicating with light and shadows has its roots in antiquity. Aristotle supplied the earliest reference to the camera obscura—sunlight, passing through a small hole, projected an inverted image on the wall of a darkened room.

Renaissance artists traced that projected image to create accurate drawings. Gemma Frisius published a drawing of a camera obscura in 1545. Thirteen years later Giovanni Battista della Porta wrote "Magia Naturalis," a book describing the use of a camera obscura with lenses and concave mirrors to project a tableau in a darkened room. They might as well have been drawing pictures in sand, because the images were impermanent.



1923 KODACOLOR Film

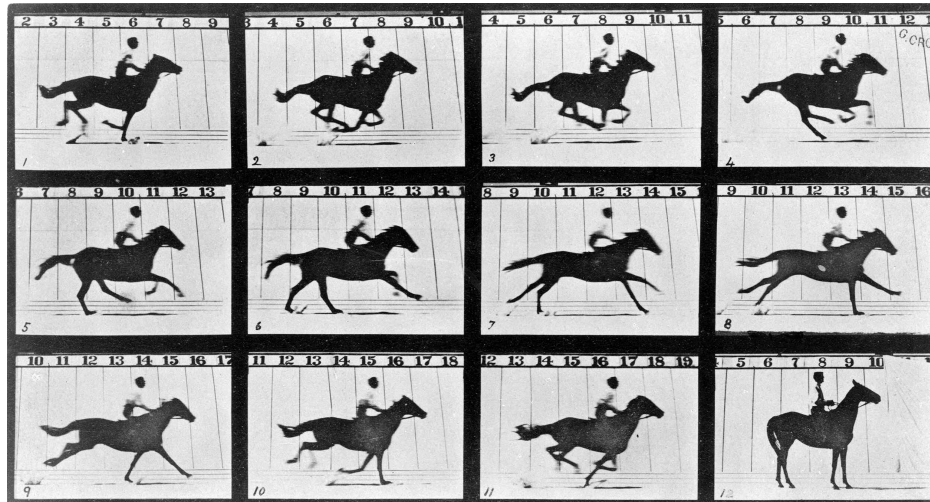
This phenomenon eventually led to the development of the early photographic camera—a simple box in which light struck a sensitive solution on a glass, metal, or paper base. The roots of modern photography trace back to 1816, when Nicephore Niepce, a French lithographer, recorded images on metal plates coated with a sensitized material. In 1827, he recorded a picture on a pewter plate coated with a light sensitive chemical emulsion.

Niepce subsequently collaborated with Louis Jacques Mande Daguerre in the development of the world's first practical photographic system. They recorded clear, sharp images on silverized copper plates in Daguerre's studio in 1837. Niepce gave his invention to the French government, which put it into the public domain.

William Henry Fox Talbot invented the first process for making positive prints from negative images during the 1830s. Richard Leach Maddox discovered that the silver halide crystal is an incredibly efficient repository for capturing light. His 1871 discovery was a crucial building block for modern photography.

Eadweard Muybridge, a vagabond photographer who migrated to California, made the oldest recorded attempt at motion picture photography. In 1872, California Governor Leland Stanford hired Muybridge to help him win a bet

by proving that there are times in a horse race when all four of the animal's feet are off the ground. Five years later, Muybridge set 24 cameras up in a row along a racetrack. He attached a string to each camera shutter and stretched the strings across the track. Muybridge chalked lines and numbers on a board behind the track to measure progress. As Stanford's horse ran the track, it tripped the wires and recorded 24 photographs that proved that all four of the horse's feet were off the ground at the same time.



Stanford won his bet, and Muybridge continued experimenting. During the early 1880s, he traveled to Paris to demonstrate his multiple camera system for other photographers and scientists. One of his hosts was Etienne Jules Marey, who was experimenting with the use of a single camera for recording images in motion.

The camera had a long barrel that served as a lens, and a circular chamber containing a single glass photographic plate. It took Marey one second to record 12 images around the edge of the glass plate. He called his invention chronophotography. Marey recorded moving images of men running and jumping, horses trotting, and gulls flying. They were permanent records of one to two seconds of motion.

Concurrently, Thomas Edison invented a system that recorded and played back music using wax cylinders. After his invention became popular, Edison got an idea for building and selling a device to consumers that displayed moving images to accompany the music. In 1885 at his research laboratory in Menlo Park, New Jersey, he assigned W.K.L. Dickson the task of finding a way to record moving images on the edges of records.

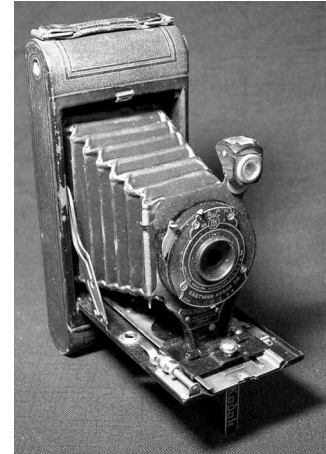
Eventual Kodak founder George Eastman became interested in still photography in 1877, when he was a 25-year-old bank clerk in Rochester, New York. Photography was a cumbersome process; the photographer had to spread a chemical emulsion on a glass plate in a pitch-black area, and then capture the image before the emulsion dried.

In 1880, Eastman manufactured dry plates that maintained their sensitivity to light. EASTMAN Dry Plates played a major role in popularizing photography, but the former bank clerk was determined to make it even easier.

In England in 1887, Reverend Hannibal Goodwin invented and patented a way to coat light-sensitive photographic emulsion on a cellulose nitrate base. The base was strong, transparent, and thin enough to perfect a process for manufacturing film on a flexible base.

Eastman purchased the right to use that patent in 1888, and introduced the KODAK BROWNIE Camera the following year. The camera was pre-loaded with enough film for 100 pictures. The ad campaign promoted photography as a hobby for every man, woman and child; its byline: "You push the button, and we do the rest." The camera was mailed to Kodak after all the pictures were taken. Kodak processed and printed the film, then returned prints to the photographer along with a reloaded camera.

Dickson saw the BROWNIE Camera at an amateur photographers' club in New Jersey. He traveled to Rochester to meet with Eastman, who agreed to provide the film needed for an experimental motion picture camera. Dickson developed the Kinetograph camera and Kinetoscope projector, which Edison patented in the United States in 1891. Dickson wrote to Edison stating, "Eureka, this is it!" Edison replied, "Now, work like hell!"



1898 KODAK Folding
Pocket Camera

At that time KODAK Camera Film was manufactured in 70 mm wide rolls. The rolls were long enough to make 100 round exposures, each about two inches in diameter. Dickson determined that Kodak film, if sliced in half lengthwise to a 35 mm width, would be far more manageable in the new camera. Eastman supplied the film, which was perforated on both film edges, sixty-four times per foot, to engage with the Kinetograph camera's sprockets. These basic physical specifications remain the world standard for cinematography and theatrical exhibition.

A hand crank drove the Kinetograph camera. It was determined that a frame rate of about sixteen images per second would yield satisfactory moving pictures when viewed. Accordingly, the camera made eight exposures for every revolution of the crank, and two turns per second became the standard operating procedure until the advent of sound film. The actual size of the film frame was 24 mm wide by 18 mm tall. The camera was brilliantly simple. Then (as now) 35 mm film has sixteen photographic frames per foot of film. Accordingly, the length of film footage during the Silent Era was equal to the movie's running time in seconds.

After exposure, the light-sensitive film was unloaded and developed in a conventional darkroom. The resulting negative was placed in contact with fresh, unexposed film and then, still in the darkroom, exposed through the negative under controlled light. After development, the resulting positive print was ready for viewing.

On May 20, 1891, Edison demonstrated his projector for the first time when delegates from the National Federation of Women's Clubs visited the company's research laboratory. A reporter for The New York Sun wrote, "The women saw a small pine box with a peephole about an inch in diameter. One by one, they looked through the peephole and saw moving images of a man, smiling, waving, taking off his hat, and bowing with naturalness and grace."

In 1892, Edison opened a crude movie studio in Orange, New Jersey, and told Dickson to begin producing motion pictures there for a big debut at the 1894 Chicago Exposition. Edison named it the Black Maria Studio, because of its resemblance to the shape of so-named horse-drawn police carts. The roof could be removed to let in daylight, and the studio was built on a turntable that was revolved to follow the sun. Dickson installed a trolley track at the studio that enabled him to move the camera further away from and closer to his subjects for more interesting shots—an early, intuitive step towards making cinematography an interpretive art.

The Kinetoscope was a sensation at the Exposition. That same year, Edison made a business deal with Norman Charles Raff, who organized The Kinetoscope Company and sold territorial rights to entrepreneurs who wanted to operate peep show parlors. Soon, more than 1,000 parlors operated in the U.S. and Canada.

Record of a Sneeze, shot by Dickson, is the oldest motion picture on record at the Library of Congress. The title of the 1893 film is literal; it shows Fred Ott, a mechanic who worked for Edison, sneezing.



Although Kinetoscope movies were only 20 seconds long, more than 1,000 Kinetoscopes were sold between 1894 and 1895 in North America and Europe. It is said that Edison did not see any applications for movies apart from these peep shows.

THE BOX OFFICE IS BORN

In 1894, French brothers Louis and Auguste Lumière saw a Kinetoscope demonstration. It inspired them to invent a combination motion picture projector and camera called the Cinématographe, a Greek word meaning writing with light and motion.

Thomas Edison was one of the first inventors to realize the potential that a flexible ribbon of film offered for capturing sequential images. His camera moved a small area of film into position behind a shuttered lens, held it steady for a split second as the shutter opened and closed to expose the film, accurately advanced the film, and then repeated the whole process many times per second. To this day, Edison's creation is the basis for all motion picture film cameras, in all formats.

The Lumière brothers presented eight short films at the Grande Café in Paris on December 28, 1895. It was the first time an audience paid to see movies projected on a screen. One showed workers leaving a factory at the end of the day; another showed an approaching train.

In February 1896, Thomas Armat and C. Francis Jenkins patented the Vitascope motion picture projector, then requested a supply of film from Edison. Edison asked to see a demonstration of the projector. Afterwards, an agreement was reached to sell the Vitascope projector under Edison's name.

The first public screening was on April 23, 1896, at Koster & Bial's Music Hall at 34th Street and Broadway in Manhattan. There were 12 short films augmenting vaudeville acts, and these included a boxing match, a serpentine dance, the German emperor reviewing his troops, and one called *Rough Sea at Dover*. A reporter for a local newspaper wrote enthusiastically about the experience shared by the audience of strangers, sitting in a dark theater, watching moving images projected on a screen: "The second film represented the breaking of waves on the seashore. Wave after wave came tumbling on the sand, and as they struck, broke into tiny floods just like the

real thing. Some people in the front row seemed to be afraid they were going to get wet, and looked to see where they could run, in case the waves came too close."

Edison granted brothers Andrew and George Holland sole marketing rights to the Vitascope projector in Canada. The first screening was staged in West End Park in Ottawa on July 21, 1896. Nearly 1,200 spectators saw a magic show, followed by a series of short films. The hit of the evening was *The Kiss*, a brief film featuring Canadian actress May Irwin and actor John Rice, co-stars of a popular Broadway play, *The Widow Jones*. The kiss in question was really just a quick peck on the cheek, but the scene had been scandalizing Broadway audiences. With the magic of film, people everywhere could share in the shock. The almost immediate commercial success of motion picture entertainment was startling.

Innovative still photographers such as George Melies were just discovering the real power of this fledgling medium. This sometimes-political cartoonist, actor, and magician was intrigued by the storytelling potential of film. In the early 1900s, Melies developed the concept of "artificially arranged scenes." Taking his guide from the world of theatre, he created the events needed to tell his story with actors and appropriate settings rather than relying upon randomly recorded events. This new approach to reality opened doors to creative storytelling and resulted in a prolific and successful career for Melies. His 400th film, *A Trip to the Moon* (1902), was enormously popular.

THE POWER OF EDITING

Edwin Porter was an ex-sailor who installed and operated the Vitascope projector for the Holland brothers. He spent the next three years on a barnstorming tour showing short films in Canada and Central and South America. Edison hired him to direct and shoot short films at the company's new glass-enclosed studio in Manhattan in 1900. By then, Edison owned copyrights to some 500 short films, including many shot by roving freelance cinematographers.

Porter's brainchild was creative editing, a facet of motion picture production that we take for granted today. Until he came on the scene in the early 1900s, no one had edited films; they simply shot footage and projected the results. Porter experimented with creating a grammar for visual storytelling by moving the camera to alter the audience's point of view. He intercut parallel scenes, created double exposures, and combined live action in the foreground with painted and projected backgrounds.

Inspired by the innovative use of theatrical staging techniques and varied camera angles he observed in Melies' films, Porter set out to tell a story using footage he had already shot. He recognized that the filmmaker had the same freedom in developing a fictional world that had long been available to the novelist and dramatist—the ability to change scenes quickly, to flash backward and forward in time, to show simultaneous actions, etc. With this newfound flexibility in film editing came another revelation that simplified the production process—that scenes in a particular film do not have to be shot in a projection sequence; they can always be reassembled later for maximum impact.

Porter went on to direct Mary Pickford and many other great stars. He made spectaculars on location (*The Eternal City*), and left his indelible stamp on this fast-growing business before retiring in 1915. His 12-minute 1903 drama, *The Great Train Robbery*, was one of the most successful narrative films made during that period. In 1907, Porter hired a stage actor named D.W. Griffith to appear in a film called *Rescued from an Eagle's Nest*. Griffith soon became a director, who completed his first film the following year. With that film a 16-year collaboration with "Billy" Bitzer began.

Billy Bitzer was an electrician who began his career shooting scenic footage of the Canadian outback during the late 1890s, films sponsored by the Canadian National Railroad. The films were shown in England to attract settlers to the outback. Bitzer's co-ventures with Griffith included such landmark dramas as *The Birth of a Nation*, *Intolerance*, and *Broken Blossoms*. He pioneered the use of cinematic storytelling techniques in those and other films, including close ups, soft focus, fade outs, and backlighting. In 1913, Bitzer installed an iris diaphragm in his personal camera, which enabled him to go to black between scenes. He and Griffith first used that technique while they were filming *The Battle at Elderbush Gulch*. Bitzer also used the iris diaphragm to subtly sharpen the focus on characters and actions in the background. Bitzer and others in the first generation of cinematographers were inventing a new language.

MOVIE MAGIC

In 1919, 21-year-old George Folsey shot his first film, *His Bridal Night*. Alice Brady played twins in her dual role. An ingenious idea in its day, Folsey's low-tech solution consisted of black velvet taped over half of the lens while Brady played one twin. Then, he rewound the film, moved the velvet to cover the other half of the lens, and re-shot the scene with Brady playing the other twin. It worked beautifully.

All motion pictures at that time were produced on black-and-white orthochromatic film that was only sensitive to blue or violet light. Colors in other light recorded as black. Makeup was used to offset the limitation, but sometime actors often appeared unnaturally. Kodak heeded cinematographers' suggestions in 1922, and developed a panchromatic black-and-white film that recorded all colors and reproduced each of them in accurate gray tones.

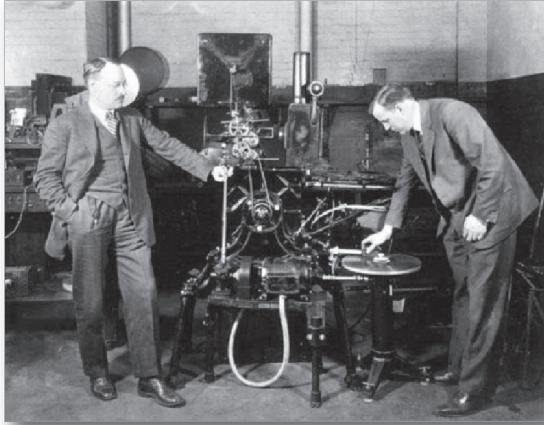
By the mid 1920s, Europe began clamoring for Hollywood films while the homegrown industry recovered from war. Hollywood studios adopted the practice of having two cinematographers operate cameras side by side. The negative from one camera was edited and used for producing prints for domestic release. The negative from the second camera was edited and shipped to labs in Europe that produced release prints for that continent. For this purpose, Kodak developed a high quality duplicate negative film in 1926. That development sparked a breakthrough in the evolution of the art of cinematography: the second cameramen became operators, freeing cinematographers to concentrate on lighting and creativity.

AND THEN THERE WAS SOUND

By the mid-1920s, the public's fascination with radio had noticeably affected box office receipts at the movies. Although soap operas were not yet thought of, radio plays were occasionally broadcast in addition to live music and a hodgepodge of other offerings. A few far-sighted individuals took notice of the growing menace.

Thomas Edison invented sound recording in 1877 with the intention that sound accompany film from the beginning. The technology was slow to develop. Several engineers in the 1920s experimented with radio amplifiers as a means of reproducing sound for movies, but none were adequate for use in large movie theaters.

Finally, in 1926, Warner Bros. Studio developed a sound system that produced volume at a level that was adequate even for movie palaces. Their first offering using the new medium was *Don Juan*. It had a musical soundtrack via a phonograph record, which was mechanically linked to the movie projector in the theater. They named their system Vitaphone.



One of the earliest synchronized sound systems was the Vitaphone disc system. Introduced in 1927, this employed large 16-inch diameter phonograph discs which were played from the center outwards on a turntable attached to the film projector with the drive mechanically synchronized to the film gate. The trick was to ensure re-synchronization at the start of each film reel and disc. This required the projectionist to develop the skill to flick the stylus to the exact groove.

In order to produce sufficient sound fidelity and consistency, the hand-cranked cameras were fitted with electric motors that ran at a constant speed of 24 frames per second, rather than the familiar 16 fps. Another important advantage, at 24 frames per second, the flicker characteristic of silent films disappeared. The smooth image gave the audience about 50 percent more image information to absorb.

The success of *Don Juan* convinced Warner Bros. to take their system a little further, adding synchronized speech and singing to the picture, still using phonographic recordings. Their first effort, 1927's *The Jazz Singer*, had a weak story, but because of its brief use of sound, it broke box office records. It was so successful that all major film studios rushed to create sound departments of their own.

Soon, the public shunned silent films in lieu of anything with sound. In many instances, the studios pulled back expensive silent features and hastily added sound—any sound—in order to release it as a talking picture. With few exceptions, scripts were now written exclusively for “talking pictures.”

The use of phonograph records for sound recording and reproduction was short-lived. The discs wore out quickly and broke easily. Maintaining synchronization required skill during projection and often failed. Film technicians created a way of recording the sound along the edge of the film; they designed a tiny photographic representation of the actual sound wave with light. The projectors designed for this process used a tiny light bulb and photoelectric cell to recover the sound energy and feed it to the theater amplifier.

This system eliminated the need for recorded discs, and it didn't wear out or lose synchronization. Eighty years later, this basic technique is still in use, albeit in a much improved form.

Sound created enormous technical problems for the cinematographer. Contemporary cameras were too noisy. The short-term solution was to enclose them in something like a large telephone booth, large enough to hold the operator, director and, sometimes, other assistants. That solved the noise problem, but it made the camera immobile. Some cinematographers tried putting wheels on the booths, but the problem was finally solved with the “barney,” a flexible covering for the camera that muffled camera noise.

Nor could actors move. Because the early microphone picked up every sound, wanted or not, the actors were forced to stand still and speak their lines toward where the microphone was hidden.

Musicals seemed the obvious venue for exploiting sound, and the public was inundated with them during those first few years. The immobility of the camera and the actors required that any dancing remain fairly stationary. Actors spoke and actors sang, but sound recording was so primitive that even great voices sounded bad.

In the end, though, the desire for quality musicals advanced sound technology. Busby Berkley's *42nd Street* was one of the earliest examples of effective post-sync recording; all musical recording was done in a sound studio, and then the actors lip-synced (or tap danced) along with a playback during filming. Thus the camera and the actors were free to perform naturally.

In addition to sound, major studios were experimenting with color and wide-film formats. Every studio had a proprietary wide-film system. A 1930 article in the *Cinematographic Annual*: "One of the outstanding developments of the past year in the motion picture industry has been the introduction of wide film. Even the advent of sound created no greater flurry of excitement." The economic depression of the 1930s, however, stifled further progress. Saddled with the cost of upgrading to talkies, exhibitors resisted investing in specialized projection systems for wide-screen presentations.



The collaboration between George Eastman and Thomas Alva Edison was crucial in establishing the basic technology of the motion picture system.

PUSH, PULL, AND KOOKALARIS

Charles Lang, ASC, was shooting *Shopworn Angel*, an early sound film, in 1929. Within a few days, the director told Lang that everyone was disappointed with his work, and that he was going to be replaced if things didn't change soon. "I did a lot of thinking that night, and decided the problem was that I was trying to emulate Arthur Miller and other cinematographers whose work I admired," Lang said. "I decided that I had to think for myself and trust my own instincts."

Lang earned the first of 18 OSCAR nominations from his peers in 1931. The following year, while shooting Helen Hayes in *A Farewell to Arms*, Lang was told to make her beauty sparkle. He approached that task like an artist painting a portrait. Lang took the back off the camera and used an amber filter to view the images that he was going to compose. The filter enabled him to previsualize in black and white. With his newfound perspective, he created backlight, hair light, and subdued soft light on Hayes' face. Lang also personally ground the glass filters that he used along with bits of gauze to soften the images. *A Farewell to Arms* won Lang his only OSCAR.

Later in his career, George Folsey, ASC, reflected on that seminal period. "We didn't have published film speeds or light meters," he said. "You trusted your eye. You could go to the lab on the studio lot, and ask them to pull a rack containing your film out of the tank, and look at it in safelight. You would say, push it back in for another moment or two. Then we'd say pull it out again." Thus, the now-familiar terms push and pull.

Folsey told another story about the invention of the "kookalaris." While shooting a scene with an actor who was wearing a white shirt, he wanted to separate the skin tones on the actor's face from the hue of the shirt. Folsey told a grip to hold a stepladder in front of a key light to create a shadow on the actor's shirt. The closer that the ladder was held to the light, the softer and less defined the shadow became. The grip eventually tired of holding

the ladder, so he cut a grill with the same pattern in a sheet of light wood. One day, Folsey visited Hal Rosson, ASC, who was shooting on another set. In the scene, an actress was lying on a bed swathed in white sheets. Rosson used Folsey's wooden grill to create some shadows, which made the scene more dramatic. Later, while shooting a similar situation, Rosson asked Folsey, "Where's that kookaloris thing?" The evolution of cinematography is filled with similar stories.

TECHNICOLOR, CINEMASCOPE, 3D, DISH NIGHT, AND TRIPLE FEATURES

Many early filmmakers tinted portions of their films for dramatic impact. But emulsion tinting was an expensive and time-consuming technique.

In 1922, the Technicolor process was introduced. Initially a two color process, two rolls of black-and-white film were simultaneously exposed. One was sensitized to red light, and the other to green light. Both films were processed and printed onto blank film and dyes were used to match the original colors. The first feature produced in that format was *The Toll of the Sea*, starring Anna May Wong. Throughout the 1920s, two-strip Technicolor was used selectively to visually punctuate individual scenes in some films.

In 1932 Technicolor announced a new three-color process that was simpler and less expensive than the earlier two-color process. One of the first to exploit the new process in his animated films, Walt Disney produced his *Three Little Pigs* in 1933. *Becky Sharp* (1935) was the first three-strip Technicolor feature film.



Released in 1935, *Becky Sharp* was the first three-strip Technicolor feature film. Three-strip Technicolor became the color standard for movie-making around the world, even though the required camera's large size made it a cumbersome process to work with.

The bulky filming equipment and complicated processing requirements of the Technicolor three-color imbibition process produced excellent results, but remained technically troublesome. In 1950, Kodak announced its first EASTMAN Color Negative Film, along with a complementary positive print film, that could record all three primary colors on the same strip of film. It was the beginning of a rapid transformation from black-and-white to color movies. Since then, color motion picture production has literally been available to anyone with a camera.



In 1950 Kodak introduced the Eastman Color single-strip system. The negative had special color couplers incorporated into the emulsion that reacted with developers to form dyes. This system would soon revolutionize color filmmaking around the world.

The studios also focused on differentiating motion pictures from television by making movie-going a unique entertainment experience. The first successful 3-D movie, appeared in 1952. As the major studios struggled to compete with black-and-white television at home, nearly forty 3-D movies were produced in 1953, and another 20 were started the following year. Only a few of those, however, were actually released in 3-D format. There are different theories given for 3-D's eventual demise. Some critics said that the format wasn't conducive to dramatic storytelling, and that it relied too much on gimmicks. Film audiences complained about the heavy glasses they had to wear, and claimed that 3-D gave them headaches and caused eye strain, problems typically caused by misaligned projectors.

The brief flirtation with 3-D movies led to the use of 65 mm and other wide format films that were screened in 70 mm format and augmented with stereo sound. More than sixty successful wide-format films were released between 1953 and 1970.

Throughout these years of innovation, however, theaters hedged their bets by handing out free dishes and offering triple features. Anything to push back the growing menace, television.

TELEVISION COMETH

The BBC experimented with television in the late 1920s. On July 13, 1930, The New York Times published an essay written by David Sarnoff, an executive at RCA and the NBC radio network and the future chairman of both organizations. Sarnoff predicted "radio-vision would be a theater in every home with cultural education and benefits for children."

Some progress was made during the 1930s, but World War II stalled television's future. After the war the television industry shifted into high gear. Most major studios kept their distance, but the more innovative among them organized separate TV production companies.



When a 2-inch videotape system was introduced in 1954, a *Daily Variety* headline proclaimed, "Film is Dead!" Lucille Ball and Desi Arnez didn't agree. They wanted a "movie look" for the now classic *I Love Lucy* television series. Desilu Productions hired Karl Freund, ASC to design and execute a cinematographic style and film look for the television series. He invented and perfected the technique of orchestrating three cameras while shooting in front of a live audience. One camera covered close-ups, while the other two filmed master shots from different angles. *I Love Lucy* was a runaway hit, and episodes have played in syndication around the world for more than half a century.

SUSPENDING REALITY

The ultimate objective of any movie-going experience is the ability that it provides the individual viewer to temporarily suspend reality and embrace an illusion on a two-dimensional screen. That requires some understanding of how people see the world. The human eye is an incredible imaging device capable of recording vast amounts of visual information in a wide range of colors. What we actually see is the density of light in the visible spectrum as it is reflected off people and objects in a field of view that stretches over a thirty-degree angle. Our brain translates the reflections of light, temporarily imprinted on our retinas during fleeting fractions of seconds, into a continuous stream of images. Conventional 35 mm movies projected at 24 frames a second are a reasonably close match to the human visual (eye/brain) system. The feeling of reality is more intense when there is additional visual information, as with a 70 mm print.

The human viewing system is also discretionary. People aren't locked in static positions watching images passing by. They are mobile in a world that is both spatial and temporal. Our view of the world is constantly moving in space and time. This explains the dual role that cinematographers play in providing the audience with a visual perspective. They must master the craft and play an interpretive, artistic role that requires making choices. They aren't just recording images. A cinematographer must probe beneath the surface and evoke an emotional response from the audience.

KODAK WAS THERE AT THE BEGINNING

From the beginning, filmmaking has been a global language. Kodak people have a unique place in that history, and they have a sincere appreciation for the artists who write with light on film. Kodak scientists have been listening and responding since W.K.L. Dickson described his needs for Edison's experimental camera. Every can of film you buy contains the cumulative knowledge of 120 years, so you become free to concentrate on the creative aspects of your filmmaking—not the technology required to make it work.

In 1966, Rune Ericson, a Swedish cinematographer, was preparing to shoot a feature film during a six-month journey around the world. He envisioned the need for a lightweight, mobile camera that could be handheld and used in tight spaces. Ericson planned to use a 16 mm camera, but he wasn't satisfied with the quality of the images when they were optically blown up to 35 mm film format. He asked Kodak to provide him with a supply of 16 mm film without perforations on one edge of the frame. That provided a 45-percent larger useable image area, and it also enabled Ericson to compose in the European wide screen 1.66:1 aspect ratio.

His experiment was temporarily put on hold when the picture was shelved. In 1970, Ericson modified an Éclair NPR camera, and Kodak provided a new fine grain negative film in 16 mm format with no perforations on one edge of the frame. Ericson shot *Lyckliga Skitar* in the new format, which was initially called the Runescape. With the recent rapid evolution of film, cameras, lenses and digital intermediate (DI) technologies, the Super 16 format has become an attractive alternative.

In 1982 cinematographer Daniel Pearl was contacted by an Australian director named Russell Mulcahy who wanted to chat about a new cable channel called MTV and something he called music videos. He spent the next eight years shooting scary movies for drive-in screens. Pearl was intrigued when Mulcahy told him that the “videos” would be artful interpretations of musical performances. Mulcahy said that they would be shooting 30 to 35 setups a day, but they would be able to fine-tune the images in the telecine suite.

That was a novel concept for Pearl because the Rank-Cintel telecine was a relatively new tool, which featured advanced imaging technology developed by Kodak scientists. Pearl embraced the concept, and pushed it to its limits while expanding the grammar of visual storytelling. He shot hundreds of music videos that won countless awards. However, Pearl also cautioned that the telecine suite was not a substitute for creating great images on the original negative.

“Woody” Omens, ASC, a three-time Emmy winner and six-time nominee, commented, “The negative is like the score of a symphony that can be interpreted in different ways in telecine.”

Throughout most of cinema history, cinematographers tended to work in the shadows rather than in the limelight. They were rarely mentioned in reviews and news articles. In 1986, the American Society of Cinematographers inaugurated the organization’s first Outstanding Achievement Awards celebration. ASC President Harry Wolf explained that the primary purpose was to let colleagues around the world know that their peers recognized and admired their artistry. He pointed out that members felt that it takes other cinematographers to recognize and appreciate all of the nuances integrated into artful cinematography.

AND THEN THERE WAS DIGITAL

Another giant step forward was taken in 1989 when Kodak invited some 20 cutting-edge cinematographers to meet with some of the company’s top imaging technology scientists to define the needs for developing digital postproduction technology that could be used for film restoration as well as for seamlessly compositing live action film with visual effects. A scientist at that meeting presciently predicted someday that it would be routine for cinematographers to extend their roles into “digital intermediate” postproduction suites to finalize film looks.

Kodak brought the Cineon digital film system to the marketplace in 1993. It included a digital film scanner and recorder, digital workstations, and software. Cineon was designed as an open system in order to encourage a broad, industry-wide evolution of new, compatible tools. It was resolution independent, because it took immense amounts of computer space and power to manage all of the data that 35 mm film was capable of recording. Kodak scientists estimated that it would take 40 megabytes of digital data to accurately represent the nuances in colors, contrast, and resolution that a single frame of 35 mm film was capable of capturing and storing. They envisioned a time when it would become more practical and affordable to scan and convert more or all the information stored on the negative in manageable digital files. They also anticipated increasing expectations for repurposing films for new markets.

Walt Disney Studios made the first use of the Cineon system in restoring the 1937 film classic *Snow White and the Seven Dwarfs* to its original splendor. There were many subsequent restoration projects and applications for the seamless integration of visual effects with live action film.

There were complimenting dramatic breakthroughs in the evolution of motion picture emulsion technology, beginning in 1996 with the introduction of the KODAK VISION Color Negative Films. Those films were designed with considerable advice from cinematographers around the world who defined their needs for finer-grained emulsions with specific imaging characteristics that gave them more latitude for creating artful images.

Kodak scientists were still listening when they developed several new platforms of color negative film, incorporating the latest advances in emulsion technology that were designed to give cinematographers more creative flexibility.

Several years ago, James Glennon, ASC, was reminiscing about a conversation that he had with Jack Warner. Glennon was a mail boy at the studio when he decided to pursue a dream of becoming a cinematographer. Glennon reported that when he asked the mogul for advice about the future, Warner replied, "If you want to know what the future will bring don't ask a scientist, because they will tell what they see at the end of a microscope. Ask an artist, because they use their instincts. We are an art gallery. Don't ever forget that."

The future: The dream goes on.

“We had to convince the National Film Board (NFB) of Canada that the (documentary) story (Letters from Karelia) required images captured on film. The archival superiority of film was also a factor. ... I calculated how much more it would cost to shoot on film, and then showed them where we could save the same amount in postproduction.”

—*Kelly Saxberg, Director - Editor*
