Once, There Was Film...
Looking Back at Amateur Motion Picture Technologies

In January of 2004, Eastman Kodak Co. rang in the new year by announcing it would cut an additional 12,000 to 15,000 jobs, or up to 23 per cent of its global workforce, over the next three years. Such news is becoming increasingly commonplace, as seemingly unassailable companies such as Eastman Kodak, that for nearly a century had a largely unrivaled hold on the amateur film market, are now scrambling to make the shift away from film—trying to catch up with the new digital trend which is changing the landscape of both professional and amateur practice at a dizzying pace. Ironically, the greatest use of amateur film cameras and stocks today, is arguably in a professional realm—the use of Super 8 in music videos and various Oliver Stone films and Hollywood flashback sequences—for its aesthetic appeal. As we look forward, caught up in the newness of “the digital,” however, it bears remembering that all old technologies were once new. As such, in rethinking the amateur, this article looks back, rather than forward, exemplifying landmark moments in the development of amateur motion picture practice and exposing readers to motion picture technologies which are rapidly becoming artifacts.

This article describes the major technological improvements in amateur motion picture cameras marketed in the United States from approximately 1900 to 1979, and how those improvements could have affected the appearance and quality of the amateur film or “home movie.” The principal source of data for this account is the author’s collection of the magazines Modern Photography and Popular Photography.

Almost as soon as motion pictures became a commercial reality, various entrepreneurs sought ways of bringing this new entertainment into the home. This was most commonly achieved with inexpensive and simple projectors, designed to show short segments of commercially produced films.
A few amateur cameras appeared in Europe in the 1890’s; the first American amateur cameras appeared a few years later. Almost all of these cameras used professional 35mm film slit to 17.5mm, which gave economy but left the hazard of using flammable nitrate film in place.

As the market potential of movies in the home became apparent, a number of manufacturers not heretofore manufacturers of motion picture equipment, both in Europe and in this country entered the field. Established firms in the motion picture or photographic fields such as Eastman Kodak, Bell & Howell, Paillard Bolex and Pathe Freres were representative of the “top quality” manufacturers. A second tier of less prestigious companies, still offering reasonable quality, also emerged, such as Keystone Manufacturing Co., Cincinnati Clock & Instrument Co., Stewart Warner, and Ansco Corp. Ranking below these were a number of relatively unknown manufacturers who rushed into the booming market for home movies with very rudimentary machines, such as The Movie-Maker, the Filmagraph, and the Moviematic. These cameras offered, in addition to very low price, generally not much more than a stamped sheet-metal boxy body equipped with a simple lens and viewfinder, and a hand crank. The Movie-Maker (Figure 1) for example, introduced in 1931 by the Vitascopc Corp., sold for just $10, while Eastman Kodak’s least expensive
camera of that year, the Model M, was priced at $75.

**In The Beginning**

As noted above, many early machines used 17.5 mm film slit from professional nitrate film. Several events in the history of amateur film stock were soon to shape the course of camera and projector design. First was the 1912 introduction of the 28mm safety film system, including film, camera and projector, by the French firm, Pathé Frères. Pathé was a well-established producer of commercial films, and looking to expand the market for its films to the non-theatergoer, designed a system to release reduction prints of its commercial films on 28mm safety film stock, to be shown in the home on a hand-cranked projector called the Pathé Kok. A 28mm camera was also offered. While technically successful, the cost of 28mm film was not sufficiently less than the standard 35mm film to make the 28mm system viable, so in 1922 Pathé introduced a still smaller gauge, the 9.5mm safety film system, again complete with camera and projector. This system quickly became extremely popular in Europe where it remains so today, with a much smaller constituency of users in the United States.

The next and arguably the most significant development in the history of non-professional film was the 1923 introduction of 16mm direct reversal safety film by Eastman Kodak. The new film was less than half the width of 35mm film, was on safety, or non-flammable stock, and was reversible, i.e. the same piece of film could be developed from negative to positive. This system immediately permitted much
smaller equipment just by cutting the film width in half. Even at that, Eastman Kodak’s first camera, the Ciné Kodak Model A (Figure 2) was fairly bulky at 7 1/2 lbs. To insure that the customer got good results, Mr. Eastman at first required the customer to purchase, along with the camera, a tripod, projector and screen. Other early amateur cameras and projectors were equally bulky; the 1912 Pathé Frères 28mm camera measured 12” front-to-back and 10” high, and weighed in at 13 lbs. 8 oz. The 1915 Barker Brothers 35mm combined camera and projector was about the size of the Pathé Frères, and weighed 10 lbs. 4 oz. This kind of bulk necessitated tripod mounting if satisfactory filming were to be achieved.

Bell & Howell’s first 16mm camera, the Filmo 70 (Figure 3), was simply a cut-down version of their well-known 35mm professional camera, the Eyemo, which weighed nearly 10 lbs., while the Filmo 70 weighed 4 1/2 lbs. The Filmo 75, (Figure 4) advertised in 1928 as “watch thin” weighed a mere 3 lbs. 12 oz. Kodak’s next 16mm camera, the Model B, weighed just 4lbs 4oz.

In July of 1932, with the country just beginning to pull itself out of the Great Depression, Eastman Kodak announced a startling new film and camera system, which would, as the ads trumpeted: “Cut the cost of movie making by nearly 2/3.” (Figure 5) The heart of the system was still 16mm film, but supplied to the customer on a spool holding 25 feet of what was called Double 8mm. The film was to be run through the camera once exposing one half of the film width, then turned over and run through a second time to expose the other half. In processing the film was slit in half and spliced to give the customer 50 feet of exposed film.

**Getting Un-Cranked**

In an effort to eliminate the need to mount the camera on a tripod, Eastman Kodak explored a battery drive system as early as 1924 but the wet-cell battery technology of the day was not well suited for installation in a camera, and the battery-drive option was soon withdrawn. Another early battery-driven camera was the Victor Ultra, produced by the Victor Animatograph Corp. Again, the wet-cell battery, even though in this case provided by the respected Willard Battery Company, was not satisfactory and very few of these cameras were produced. It would be
nearly 40 years before battery-driven cameras were the norm, after advances in the method of loading the camera, and the perfection of small, yet powerful “dry cell” batteries.

Bell & Howell got the jump on Eastman Kodak by incorporating a spring-motor drive in its first 16mm camera, the Filmo 70. Eastman followed suit shortly with the Cine Kodak Model B in July 1925. It almost goes without saying that mechanisms that relieved the amateur of having to hand-crank the camera greatly influenced the style and spontaneity of early home movies. This development proved a mixed blessing, however; relieved of the necessity of hand-cranking the camera, the over-enthusiastic camera operator was often prone to the unfortunate tendency to swing the camera all over the scene, a phenomenon known as “swish panning.”

**Lens Design**

Early amateur cameras, particularly the inexpensive ones, often were equipped with a single medium focal length, non-removable lens; later the lens was made removable so that close-up or telephoto prime lenses could be substituted. Interchangeable sets of prime lenses simultaneously mounted on the camera in some fashion were introduced in the 30’s. Bell & Howell appears to have been the first to offer a 3-lens turret, on their Filmo 70-C in 1927. Kodak's first turret-equipped camera was the 1933 Cine Kodak Special, a very sophisticated camera intended for the advanced amateur or professional use, with a list price of $375. Victor Animatograph Corp.'s 1935 Model 5 had a 3-lens turret, and equipped with one lens sold for $200. When it is recalled that $1.00 per hour was a fairly good factory wage at that time, it is apparent that the above cameras were chiefly for the well-to-do.

The first zoom lens offered for an amateur camera appears to have been that introduced by the Swiss firm of Paillard Bolex, in June 1952 with their Bolex Pan Cinor, a 16mm camera with a removable f2.8 20mm to 60mm variable focus lens. The lens alone was priced at $219.50 which indicates the camera

*Figure 5—Kodak’s first Double 8mm camera. 16mm film was run through the camera twice, and split in processing.*
and lens were also intended for the up-scale filmmaker. The accompanying advertisement pointed out that the lens was designed with a “standard C-mount so fits almost any 16mm camera.” While a zoom lens was thus available in 1952, it was not until 1956 that Popular Photography could announce “Zoom Cameras are Here,” headlining an editorial pointing out that camera manufacturers had been decidedly slow in offering cameras with “built-in” zoom lenses.

Prompted by the success of “3D” movies in Hollywood beginning in the early 50s, in November 1953 Paillard Bolex announced a stereo lens system for its Bolex H-16 16mm movie camera. (Figure 6) The system consisted of a special two-lens attachment that replaced the normal lens, which produced two half-frame images in each 16mm frame. A similar attachment was provided for the projector. Judging by how seldom the 3-D attachment is seen and the fact that no other manufacturer offered such equipment, one may assume that the resulting films were not very satisfactory.

**Loading the Camera**

Threading the film into the early movie cameras was a job for nimble fingers. Perhaps the first camera to address this problem was the 1917 Movette. Film for this camera was supplied by Eastman Kodak as 17.5mm nitrate stock, in a metal magazine holding 50 foot loads. The user had to extract a loop of film from the magazine, then thread it over the camera sprockets. After exposure the film was returned to Kodak where the developed film was inserted in a special projection magazine that could hold up to 200 feet of film. A clever idea, but the projector had operational problems and the company folded within a short time. The 9.5mm Pathé of 1923 and the Zeiss Kinamo S-10 also featured simplified loading; the Pathé utilizing a “cassette” holding 8.5 meters of film, while the Kinamo’s “kassette” held 10 meters of film.

All of the above cameras required the user to extract a loop of film and thread it over the camera sprockets. The first camera that was fully self-loading was the Simplex Pockette, manufactured by the International Projector Corp. and introduced in 1931. The camera used a 50-ft. magazine, designed and built by Eastman Kodak with either Panchromatic or Supersensitive film available. Bell & Howell introduced its Design 121 in 1934, using the Simplex magazine. In 1936, Kodak introduced the Magazine Cine-Kodak and Bell & Howell quickly introduced redesigned cameras to utilize the Kodak magazines. Magazine loading for 8mm cameras came in June 1940 when Kodak announced the Magazine Cine-Kodak 8, Model 40. The magazine held 25 ft of double 8, so it had to be removed and turned over after the 25 ft were exposed on one half of the film width.

A truly novel system still using spool loading of double 8mm film, but avoiding the need to open the camera was the 1963 “Dualmatic 50,” manufactured by Sekonic Optical Co. of Japan. In this camera, the entire film chamber could be rotated 180 degrees thus bringing the unexposed half of the film to the film gate. It is doubtful that the method of loading the camera had much effect on the cinematic quality of the films produced, except the obvious one that being able to film longer without having to stop to reload the camera probably encouraged longer (though not necessarily better) scenes.

**Exposure Control**

Achieving the correct exposure with the early cameras required considerable skill on the part of the operator. With hand-cranked cameras, the rate of cranking was of prime importance, and Eastman Kodak’s first Ciné Kodaks had this guiding message cast into the camera body: “Turn crank at 2 revolutions per second.” Aperture was adjustable on most early cameras, generally providing lens openings from the “fastest,” i.e. wide-open, down to f16. A small exposure guide table was often applied on the camera body.

In 1933 Eastman Kodak introduced the Ciné Kodak Universal Guide system. Packed with every roll of Kodak film was a small
Figure 6—Bolex experiments with 3-D.
square of silvered cardboard printed with a scale of light conditions, from “clear sun” to “cloudy dark.” The customer inserted this slip into a device on the side of the camera, which carried a movable arrow, one end of which was set at the light conditions as shown on the silvered card, the other end of the arrow would then point at the correct lens opening. First applied to the Cine Kodak 8mm Models 25 and 60, it was used well into the 50s, and even appeared on the elegant 16mm Ciné Special camera.

Small hand-held exposure calculators were also made available, such as the 1947 Movie Kodaguide (Figure 7) from Eastman Kodak. About the size of a 3 x 5 file card, one side had a calculator for outdoor moviemaking while the other covered movies indoors, all for a variety of film and subject conditions. Which manufacturer first took the next step, albeit a modest one, of simply attaching a light meter to the camera is a matter of debate, but several ultimately did. The early incarnations still required the operator to read the light meter then consult a table or calculator to determine the proper lens opening.

The next significant exposure advance came with the Bauer 88B 8mm camera, introduced in May 1956, manufactured by Bauer GMBH of Germany. In this camera the exposure meter needle appeared in the viewfinder, as did a pointer showing the aperture setting. The operator simply kept the two pointers coincident, thus maintaining the proper exposure. The Bauer system still required the operator to set the aperture as “instructed” by the camera’s light meter, however. It remained for Bell & Howell to take the final step: coupling the exposure meter to the aperture mechanism, making the exposure meter automatically set the aperture, with no attention to manual adjustment required by the operator. The year was 1956, the camera was the Bell & Howell 200EE, (Figure 8) a 16mm magazine loading camera, described as the “world’s first fully automatic exposure.
the extraordinary Electric Eye!

Sun Dial. A big boy at $39.95. Montrose (not shown), similar to Monterey. Does it have f/2.8 Super Comat lens. Priced for pleasure at $49.95.

3 New 200-5 Auto Load. Has 16mm Sun Dial that makes color movies easily as snapshots. Uses film magazine—loads in seconds. Has f/2.5 Symmetrical lens and five speeds including slow motion. $174.95.

4 New 209-EE Electric Eye. Synchronizes film and finds your correct lens stop when sets the camera for you! Exposure is calculated continuously as you pan from sun to shade and back again! An electric brain does it—immediately and automatically. The Ionian 210-E Electric Eye can even be an outstanding example of imagination by Bell & Howell. Yours for $209.95.


Figure 8—The Bell & Howell 200EE (electric eye) was the first to purport itself a fully automatic exposure camera.

RETHINKING THE AMATEUR
ONCE, THERE WAS FILM...

camera.” Popular Photography editorialized “The 200EE is one of the most exciting additions to come along in amateur motion picture photography in a long time.” Bell & Howell devoted an entire page of its 1956 annual report to an illustration of the camera.

Sound for the Amateur

Sound as an accompaniment to films shown in the home first came in the 30s, in the form of 16mm reduction prints of commercial films with the accompanying sound on conventional 78 rpm records. In 1931 Bell & Howell advertised a rental library of over 230 such prints and records. Some enterprising and talented amateurs found it possible to cut their own sound records, generally just for background music, special effects sound or other uses that did not demand perfect synchronization.

The first amateur camera capable of recording sound-on-film was the 1935 RCA Victor 16mm Sound Camera. (Figure 9) This curious camera utilized film with an optical sound track which recorded the voice of the camera operator, the only possible sound input. Such limited utility undoubtedly contributed to the system’s early demise. Magnetic sound recording permitted a much simpler camera and projector design, and in 1949 Eastman Kodak announced that it would begin producing pre-striped negative film. Kodak would also offer magnetic striping of customers’ silent films, allowing the customer to add post-filming sound. Bell & Howell shortly followed suit, in 1952 offering not only a magnetic stripe on silent films but the addition of a magnetic stripe to customers’ optical sound films.

Super 8

Users of standard 8mm, introduced in 1932, had long hoped for a brighter and larger projected image, and better quality sound than
was possible with the geometry of the 8mm frame. To address these demands, Eastman Kodak engineers began a radical make-over of the format. By sharply reducing the width of the sprocket holes and transferring the gained space to the opposite margin, this area could accommodate a satisfactory sound stripe, and coupled with a reduced frame line, the image area was increased by nearly 50%. (Figure 10) The resulting film was called “Super 8” and a complete system of the new film and appropriate new cameras was announced in June 1965. The new film was supplied in 50 ft lengths, in molded plastic cartridges providing “drop in” loading; gone was the old nuisance of turning over the double 8 film. In addition, the new cartridge “told” the camera what the film speed was, and whether a Type A filter was needed or not. The new cameras were battery driven, and not surprisingly were called “Instamatics.”

It is a common misconception that it was the emergence of Super 8 technologies that really democratized the amateur film practice, making it affordable to a broad base of American society. Though Super 8’s ease and simplicity did make for increased popularity, and though the Super 8 system was a great boon technically, the equipment was really not any cheaper. In fact it was generally more expensive than comparable standard 8mm equipment. The 1932 introduction of standard 8mm with its great economies, probably brought more people into amateur movies than any other advance after the introduction of 16mm.

Existing Light Photography

The next significant advance in small gauge technology was the 1971 arrival of “XL” films and cameras, the XL standing for “existing light.” Thanks to a team of Kodak scientists who developed a film with roughly three times the speed of any previous amateur film, and an entirely new camera design to make the most of that film, the filmmaker could now take movies in situations that had previously required those blinding floodlights. As the Kodak ads put it: “Now you can make color movies by the light you live with.”

The cameras featured a 230 degree shutter, a non-reflex view finder and exposure control system that did not steal any light from the film. Add to all this a fine f/1.2 Ektar lens on a camera costing less than $200, and the XL systems constituted one of Kodak’s finest achievements.

The End of Technical Advancement

The last great advance in Super 8 technology came in 1973, when Eastman Kodak introduced magnetic sound-on-film in pre-striped 50 foot cartridges. As the separation between sound and corresponding image
frame, at 18 frames per second, was just one second, editing the film was greatly simplified. Finally, in June 1975, Eastman Kodak introduced its last and most advanced amateur camera, the Supermatic 200, a camera taking either the 50 foot or a new 200 foot cartridge, allowing over 13 minutes of continuous filming.

The handwriting was on the wall however; videotape recorders for home use were introduced by Sony in 1965, who in 1966 announced that it would soon market a 3-piece video outfit, consisting of camera, recorder and battery pack. Manufacturers of motion picture equipment had long used the December issues of photography magazines for heavy advertising of their wares as being ideal Christmas presents, often taking a two-page spread, sometimes in color. The December, 1971 issue of Popular Photography still carried ads by 10 manufacturers for a total of 8 ad pages. But the December, 1978 issue had just one advertisement for an amateur motion picture camera. The day of the amateur film camera was essentially over.

As we perhaps mourn the passing of film as a medium for the amateur, it is interesting to speculate on how 50 years from now, someone will write the “Evolution of Digital Movie Making, 2000 to 2050.” It strikes this writer that it may be far less convoluted than the multi-step process that has been described above. It took about 80 years for the amateur camera to progress from a simple box to the modern sophisticated camera featuring power operation, zoom lenses, sound capability, auto focus, auto exposure control, etc. During that period of evolution, talented filmmakers worked with the technology available to them to produce remarkable, worthy films. Consider also the delightful effects that have been achieved by daring innovators who have resorted to such things as painting on film, smearing it with solvents, overlaying two films, etc. It will be interesting to see if today’s filmmaker, given a digital video camera with all its high technology will find ways to break the mold and be creative, despite having all the technology solved for him/her.

Alan Kattelle is a retired engineer who has been studying and collecting amateur motion picture equipment for over 30 years. His collection now numbers over 700 items dating from 1890 to the present day. He is the author of numerous articles on the history of amateur motion picture technology, and his 2000 book Home Movies - A History of the American Industry 1897 - 1979 is in many libraries in the U. S. and abroad.