

A Cooke Look Back

Timeline of Cooke Cine Lens History



by Barbara Lowry

The recent surge of interest in Cooke Series II and III and other classic lenses suggested the time was right for this article.

There is a short list of prolific Cooke optical designers who were responsible for major innovations that helped define the look of motion pictures for the past 118 years.

William and Thomas Smithies Taylor were mechanical and optical geniuses. They opened their first workshop while still in school. In 1885, they moved to Slate Street in Leicester, England to set up a business as “Manufacturers of Optical Instruments.” In 1887, William Hobson joined them as sales manager. The firm was named Taylor, Taylor & Hobson. They built the first Cooke lens in 1894, after T. Cooke & Sons of York (makers of telescopes, but not interested in photography) offered Taylor, Taylor & Hobson the manufacturing rights to a Triplet photographic lens that solved the problem of edge softness. The 3-section lens was designed by Dennis Taylor (not a relative).

William Taylor invented, among other things, the standardized screw thread for photographic lenses (1892), the dimpled golf ball (1905), engraving machines, and many devices for making lenses at tolerances that can still compete with contemporary equipment.

William Taylor hired optical designer Arthur Warmisham 1912. Warmisham filed 70 optical patents, from 1922 through the late 1930s—more than any other person or company. His designs included the Cooke Varo, a 1931 zoom lens for cinematography.

Warmisham hired Horace W. Lee as an optical designer shortly after—in 1913. Rudolf Kingslake, head of the Optical Design Department of Eastman Kodak in 1937, among other distinctions, said, “Horace Lee was one of England’s foremost and most original lens designers.” Lee was responsible for the first f/2.0 lens, the subsequent Cooke Speed Panchro design, and the telecentric (reverse telephoto) lens design for use on 3-strip Technicolor cameras.

In 1948, Warmisham hired Gordon Cook, who was responsible for many Cooke zoom lenses. His 1971 Cooke Varotal 20-100mm was innovative and breathtaking: it did not breathe at all. This was a first. The Varotal was also the first zoom lens for 35mm cinematography with a sealed and fixed front element. It had excellent performance and was easy to service—innovations incorporated

in all Cooke zooms ever since. In 1988, the Academy honored him with the Gordon E. Sawyer Award for his lifetime contributions to the motion picture industry, the first time this award went to someone outside the United States.

In 1998, Les Zellan, then U.S. distributor of Cooke lenses, bought the Cooke lens division of Taylor-Hobson. The factory where Cooke lenses had been made since 1894 was so run down that sea-gull feathers would float down through holes in the roof. Les built a new 20,000 sq. ft. factory about 4 miles away, and moved all the equipment, machines, and existing personnel, including Mark Craig Gerchman, who became chief optical designer. The Cooke brand continued under a new company name: Cooke Optics Limited.

Here’s a timeline of events and inventions as Cooke lenses became a standard in the motion picture industry for most of the 20th century and into the 21st century. Note that up through the 1940s, these were uncoated lenses.

1914: Cooke Series IIa, f/3.5 Cinematograph Lenses



From a 1914 Cooke Catalog of the Taylor-Hobson Company, 1133 Broadway, New York: “Designed specially for the exacting requirements of Cinematography. . . we furnish a 2 inch f/3.5 lens at \$30.00 and a 3 inch f/3.6 lens at \$36.00.

1920 – 1924 Cooke, Series I, f/3.1 KINIC Lenses

Cooke literature from the period says, “These lenses are of new and improved design: our object being to produce a lens with even larger aperture than previously made by us. These lenses can be readily used on Motion Picture cameras at a moderate extra charge for fitting. For motion picture film: 40mm, 51mm, 58mm, 76mm, 90mm. From \$43.50 to \$69.00.”

1914-1917 Shackleton Expedition

Ernest Shackleton sent the following letter to Taylor, Taylor & Hobson: “Dear Sirs, Now that the affairs of my late expedition to the Antarctic have all been settled.....it was largely through the excellent quality of lenses you supplied, and the care and interest taken by your firm that Capt. Hurley was able to achieve the first-class photographic records we obtained.”

1922 and 1924 Mt. Everest Expeditions

Captain John Noel, the expedition’s photographer, used a Newman Sinclair camera, designed to hold 400 feet of 35mm film and a specially made 20 inch (508 mm) Cooke Series VIII f5.6 Telephoto lens to document the Mt. Everest expeditions in 1922 and 1924 and to take pictures of the climbers from a distance of two miles away.

Captain Noel donated his Newman Sinclair camera to the Science Museum in London, where it was on display without lens. When asked what happened to the missing Cooke lens, Captain Noel’s daughter replied, “He donated the camera, but he wanted to keep the lens.”

1924: Cooke Series O f/2.0 OPIC lens

Horace W. Lee designed the Cooke OPIC lenses (British patent 157,040) to be the first to combine an f/2.0 aperture with a fully corrected color and geometry.

In 1924, Sweet, Wallach & Company, Inc., an Eastman Kodak Company in Chicago, was sole distributor in the U.S. for the Cooke Series O, f/2.0 OPIC lens – which were sold by another Eastman Kodak company, the Robey French Company of Boston.

1925: Bell & Howell 35mm Eyemo Cameras introduced

Every Eyemo camera was supplied with Cooke lenses made in Leicester, England. Bell & Howell wanted high-end, quality lenses at a reasonable cost and Taylor, Taylor & Hobson became Bell & Howell’s main supplier.

The British Journal of Photography wrote on May 28, 1926, “Taylor-Hobson Cooke lenses, fitted to Bell-Howell Eyemo cinematographic cameras, have been used with great success upon many recent expeditions to remote parts of the globe. On May 9, Lt.-Commr. Richard E. Byrd reached the North Pole by aeroplane and Capt. Amundsen’s airship ‘Norge’ passed over the North Pole on Wednesday, May 12. Both these aerial expeditions carried Eyemo cameras fitted with Taylor-Hobson Cooke f/2.5 lenses.”

1926. Kinematograph Weekly, The Observation Window column September 9, 1926, writes, “Over a hundred Taylor-Hobson Cooke lenses of various focal lengths are used by the photographic department of the Famous Players-Lasky studios. Frank E. Carbutt, Famous’ Director of Photography, adds that these lenses have, without, exception, given perfect satisfaction and that they have yet to find a poor Cooke lens.”

The Famous Players-Lasky dominated the industry through its (monopoly) ownership of production, distribution, and exhibition. As owners of Paramount Pictures, they had the largest exhibition chain in the world and were releasing two features a week.

1927: *The Jazz Singer*, the first feature-length motion picture with synchronized dialogue sequences, was produced by Warner Bros. Cooke quickly adapted the design of their Series O f2.0 OPIC lenses for sound motion pictures. Sound films created a demand for faster lenses: noisy arc lamps could not be used, the lights that replaced them weren’t as bright, frame rate increased from silent 16 or 18 fps to talkie 24 fps—a decrease of about 1/2 stop exposure. Studios snapped up the new Cooke f/2.0 (T2.3) lenses. The original f/2.0 OPIC design became the now-legendary uncoated Cooke Speed Panchros.

1930: Cooke Speed Panchro f/2.0 lenses

Cooke Speed Panchro f/2.0 were offered in 11 focal lengths: 24, 28, 32, 35, 40, 47, 50, 58, 75, 100 and 108 mm. The lenses were distributed in the USA by the Bell & Howell Company.

1931: Cooke Telecentric lenses for Technicolor



Horace W. Lee was the optical designer (British patent 355,452).

Technicolor’s 3-strip camera used a beam-splitter between the lens and 3 separate rolls of film. This required a longer flange focal depth than before. The challenge was to provide lenses, and especially wide angle lenses (short focal lengths), with a wide relative aperture and having the long back focal distance necessary to clear the prism while maintaining high resolution.

Because Horace W. Lee’s 1931 design for the inverted telephoto lens had a high degree of correction for chromatic aberration, it was very suitable for color photography and contributed to the success of the Technicolor process. “The most notable feature of these lenses is the inclusion of what might be called the inverse telephoto principle, whereby the back focal length is considerably longer than the equivalent focal length.” (The Technicolor Process of Three-color Cinematography, by J.A. Ball, vice president and technical director, Technicolor Motion Picture Corp., Journal of

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Motion Picture Engineers, Vol. XXV, August 1935, No. 2, pp. 127-138.)

Most Technicolor pictures were made with specially modified Cooke Speed Panchros until the early 1950s.

1932: Cooke Varo 40-120mm "Zoom" Lens



Arthur Warmisham was the optical designer (British patent 398,307).

One of the first commercially manufactured variable focal (zoom) lenses for cinematography was the Cooke Varo 40-120mm for 35mm format. The lens was made and sold by Bell & Howell. It came equipped with a special cradle that held the Varo lens and the camera together to ensure correct alignment. Focal length was changed by rotating a crank.

1935: Cooke Speed Panchros



Cooke Speed Panchros for cinematography were introduced in 8 focal lengths, all f/2.0: 24, 28, 32, 35, 40, 50, 75 and 108 mm. They covered the standard format of 0.631 x 0.868 inch. These are now known as Series I. They are uncoated. (16.03 x 22.05 mm, Standard Academy film format, 27.2 mm image circle— British Patent 377,537; U.S. Patent 1,955,591-1931.)

The Head of Metro-Goldwyn Mayer's camera department wrote, "All of our productions are made with the Taylor-Hobson Cooke Lenses and at least 50% of our productions are made with Speed Panchros. This Studio is practically 100% Cooke equipped."

A 1938 Bell & Howell brochure says, "Paramount, Metro-Goldwyn-Mayer, and Warner Bros. use Cooke Speed Panchros almost exclusively. Fox, R.K.O., United Artists, Columbia, Universal, and other studios are using them increasingly. In England, all film

producers, including British Gaumont, British & Dominion, London Films, and British International Pictures, use these lenses. In other countries, Cooke Speed Panchros are used by the leading studios.

1939-1945: The Bell & Howell Eyemo, fitted with Cooke lenses, was standard issue for World War II combat cameramen.

1945: Cooke Speed Panchro Series II Lenses.

Gordon Cook was the optical designer. The Cooke Series II lenses were designed to cover the 0.723 x 0.980 inch format (18.36 x 24.89 mm). They came in 6 focal lengths: 18, 25, 32, 40, 50 and 75mm.

1946: 100mm, f/2.5 Cooke Deep Field Panchro

This was a six-element, four-component lens of extended Speed Panchro construction that corrected all aberrations and was used with both color and b&w film stock.

1954: Cooke Speed Panchros, Series III 18mm and 25mm.

Gordon Cook was the optical designer. The 18mm f/1.7 and 25mm Cooke Speed Panchros were redesigned to address the use of larger negative areas—especially CinemaScope and VistaVision. VistaVision was 1.6 times as wide as the conventional picture:

Gordon Cook wrote, "The lenses used in motion-picture cameras are almost invariably of wide relative aperture and the sharpness of the recorded film images must permit very considerable magnification on to large viewing screens. These and other factors present a series of optical problems which are more severe than those encountered in other branches of photography. In recent times this situation has been aggravated by the demand for wider angles of view at the camera and even larger magnifications for bigger screens and wider screens. . . . [The solution had to] achieve a larger angular depth of field while balancing spherical aberration, astigmatism, coma and more." (from paper, *Modern Cine Camera Lenses*, by G.H. Cook, Senior Lens Designer, TT&H, Leicester, "British Kinematography," Vol. 27, 37-52.)



The Series III 18mm design achieved an angular field of 80 degrees, a wide relative aperture on the 18mm of f/1.7. The Series III lenses corrected for all aberrations and maintained good definition and resolution for widescreen presentation.

1953-54: Cooke Anamorphic optical systems

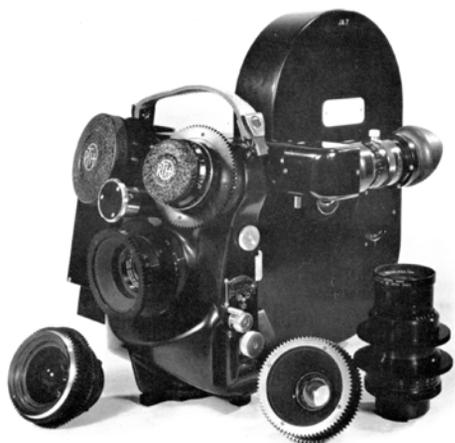
Gordon Cook worked on "anamorphic optical systems" to squeeze the image horizontally during photography and to expand it in projection. His work on anamorphic systems gained

him the Fellowship of the British Kinematograph Society and a silver metal in Rome.

1958: Bell & Howell 8mm and 16mm cameras were sold on the amateur photography market with Cooke lenses of various names and focal lengths.

1959: Cooke Telepanchro Lenses for 35mm Motion Pictures

Gordon Cook designed lenses to supplement the Cooke Speed Panchro range for shooting close-ups from a considerable camera distance. The Cooke Telepanchros came in focal lengths of 152mm, f/2.8; 203mm, f/4.0; 318mm, f/4.0; 406mm, f/4.0; 558mm, f/5.6. The lenses were offered unmounted or in "basic" focusing mounts for adaptation to a variety of cameras: Newall NC, Mitchell NC, Arriflex and Éclair Cameflex (CM3 picture below).



1959 – 1960: Cooke Kinetel Lenses for 16mm Production

The Kinetals (optical design by Gordon Cook) were built in response to increased demand for 16mm format documentary, industrial and scientific production. By the early 1960s, the Kinetals for 16mm professional motion picture cinematography were offered in 9 focal lengths: 9mm f/1.9; 12.5mm, f/1.8; 17.5mm, f/1.8; 25mm, f/1.8; 37.5mm, f/1.8, 50mm, f/1.8; 75mm, f/2.6; 100mm, f/2.6; 150mm, f/3.8. They were supplied in Arri Standard Mounts.

1960s. Cooke Speed Panchro lenses were supplied in a range of unmounted (neutral) optical units. Mounted versions were supplied for almost every camera used in the motion picture industry: Newall, Mitchell, Éclair Cameflex and Arriflex.

In 1960, Director of Photography Russell Metty, ASC used Cooke lenses with a Delrama anamorphic adapter to film "Spartacus" in Technirama. The 35mm negative was converted via Panavision printer lenses to a 70mm print.

1971: Cooke Varotal 20-100mm, T3.1 zoom lens.

(Gordon Cook, optical designer.) This was the first high-quality zoom designed for professional motion picture production with a new design concept that remained the basis for all Cooke zooms subsequently produced. The lens had a sealed front focus unit and fixed front element that eliminated the risk of dirt and moisture being drawn into the lens, did not rotate or trombone in and out, and allowed for easy fitting of matte boxes. The lens used an anti-reflective wide-band Varomag high-performance coating. This increased shadow area definition, light transmission and durability, and reduced ghosting and flares.

1975: Cooke Varokinetal (CVK) 9-50mm

For standard 16mm format.

1978: Cooke Super Cine Varotal 25-250mm

With an aperture of f/2.8, it was attractive for special effects and was used to shoot the original *Superman* film in 1978.

1980: Cooke Super 16mm Varokinetal (CVK) 10.4-52mm

The Super16 version of the 9-50. This lens was first used by Director of Photography Curtis Clarke to film "The Draughtsman's Contract," the first technically and commercially successful Super 16mm feature to be made. The CVP helped filming under difficult lighting conditions in 16mm and Super 16mm formats.

1981: Cooke Varopanchro (CVP) 20-60mm, T3.1

Optical performance comparable to prime lenses. Jon Fauer, ASC bought one of the first models and used it to shoot the second unit of *All the Right Moves* with Tom Cruise in 1983.

1983: Cooke Varopanchro (CVP) 10-30mm, T1.6. The CVP offered advancements in filming under difficult lighting conditions in 16mm and Super 16mm formats. It began production in 1983. The Cooke 20-60mm was the 35mm equivalent of this lens.

1983: Cooke Cine Varotal 25-250mm, Mark II, T3.9



There were 2 versions of the Mk II 25-250: focus in front, and zoom in front.

1986. Cooke Wide Angle Varotal, 14-70mm, T3.1

During the development stage in the mid-1980s, customers' input prompted the company to incorporate a curved front cover glass and a noise isolator. This lens was unique in the zoom series because it included a wide angle aspheric element.

1987: Cooke Varotal 18-100mm



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Design was initiated at the beginning of 1987 and the lens was exhibited for the first time at Photokina in 1988. It included refinements prompted by extensive suggestions by cinematographers and camera operators, and became very popular.

1992: Cooke Cinetal 25-250mm, Mark III, T3.7



1995: Cooke S4, T2.0 Prime lens series. Discussions began between Denny Clairmont, Otto Nemenz, Paul Duclos and Cooke lens designers Mark Gerchman and James Moultrie about characteristics to include in the next series of Cooke lenses, based on the requests and needs of cinematographers. After many conversations, especially with Denny Clairmont and Paul Duclos, the new Cooke S4, T2.0 Prime lens design included a cam movement and a novel, open window with opposing focus scale design that has since become an industry standard.

Gerchman designed the Cooke S4 T2.0 lenses and was part of the team that developed the illuminated focus ring on the new Cooke 5/i T1.4 Prime lenses.

March 1998: Les Zellan entered the Bank of Scotland's main branch at Trafalgar Square, opened a carrying bag, plunked down two Cooke lenses on the desk of a bank officer, and announced he intended to buy the company. The planned 30-minute meeting lasted for more than two hours. "We were surprised that an American, or anyone overseas, had so much knowledge of Cooke," Mr Wighton, the banker involved, said. "He had a clear knowledge of the market and a clear vision of the company."

July 10, 1998. 7 pm GMT. Les Zellan bought Cooke. Designs were completed and production began on the Cooke S4 Prime, T2.0 lenses.



After purchasing Cooke in July 1998, Les Zellan built a new 21,000-square-foot facility a few miles from the old factory in Leicester, with a canteen for the staff and plenty of free park-

ing. Lord Richard Attenborough, the Oscar-winning director of *Ghandi* who grew up in Leicester, presented a plaque at the opening ceremonies. Orders flowed in for the new S4 lenses, and within two years, the company had nearly doubled its staff.

Cinematographers loved the look. Camera Assistants loved the mechanics. Cooke S4 lenses were a breakthrough because their design made focusing much easier. Most lenses focused by rotating at a constant speed on interlocking or helical threads, much the way a toothpaste cap is raised or lowered on the tube. The S4 lenses use cams that follow an elliptical track, which is smoother and doesn't become stiff at low temperatures. These were breakthroughs that became industry standards.

Cooke S4 lenses won a Cinec Award in 1998.

1999: the Academy awarded Sci-Tech plaques for "the Cooke S4 range of fixed focal length lenses for 35mm motion picture photography" to James Moultrie for the mechanical design and to Mike Salter and Mark Craig Gerchman for the optical design. In 2000, Cooke S4 lenses were awarded a Technical Emmy from the Academy of Television Arts and Sciences. By 2012, the Cooke S4 set consists of 18 or 20 lenses, depending on whether you count the two SF (Soft Focus) attachments: 12, 14, 16, 18, 21, 25, 27, 32, 35, 40, 50, 65, 65SF, 75, 75SF, 100, 135, 150, 180 mm T2 and 300mm T2.8.

2005: Cooke /i Technology



In February 2005, Cooke developed /i Technology and began incorporating this digital protocol into every Cooke S4 Prime lens made from then on. Cooke's /i "Intelligent" Technology enables both film and digital cameras to automatically record important lens and camera data (focus, iris, serial number, etc) for every film or video frame. The data can be viewed live on set, saved as metadata with the picture, and used in post-production to streamline editing, effects work, saving time and money.

2007: Cooke SK4 Prime lenses for 16mm/Super16



The 6mm, 9.5mm and 12mm wide angle T2.0 lenses were designed as an adjunct to the Cooke S4 range of 35mm lenses for shooting in 16mm/Super16.

2009: Panchro/i by Cooke T2.8 Prime Lenses



Cooke S4/i

The new “Mini S4” T2.8 range of 35mm lenses were announced at NAB 2009 in Las Vegas. These prime lenses were designed to provide a smaller, lighter weight and lower cost option for professional filmmakers, while maintaining familiar optical quality and “Cooke Look.” Panchros currently come in seven focal lengths, 18, 25, 32, 50, 75, 100 and 135 mm. More coming—including the new 65 mm T2.8, previewed here, to be announced at IBC 2012. All lenses are /i Technology equipped.

2009: Cooke 5/i T1.4 Prime Lenses



Cooke Panchro/i

The new Cooke 5/i T1.4 35mm format Prime lenses were introduced at IBC2009 in Amsterdam. The 5/i lenses come in 9 focal lengths: 18, 25, 32, 40, 50, 65, 75, 100 and 135mm. More are in the works. For the 5/i, Cooke’s designers developed and incorporated an illuminated and dimmable iris ring into its fastest lens designed to date (U.S. patent 8079723). All lenses are /i Technology equipped.

All Cooke lenses, for both photography and cine use, have been designed and made substantially by hand in Leicester, England since 1894.

Taylor-Hobson currently manufactures fine metrology instrumentation, while Cooke lenses are made exclusively under the company name Cooke Optics Limited in Leicester, England.



Cooke 5/i