FILM FORMATS

From www.cinematographers.nl

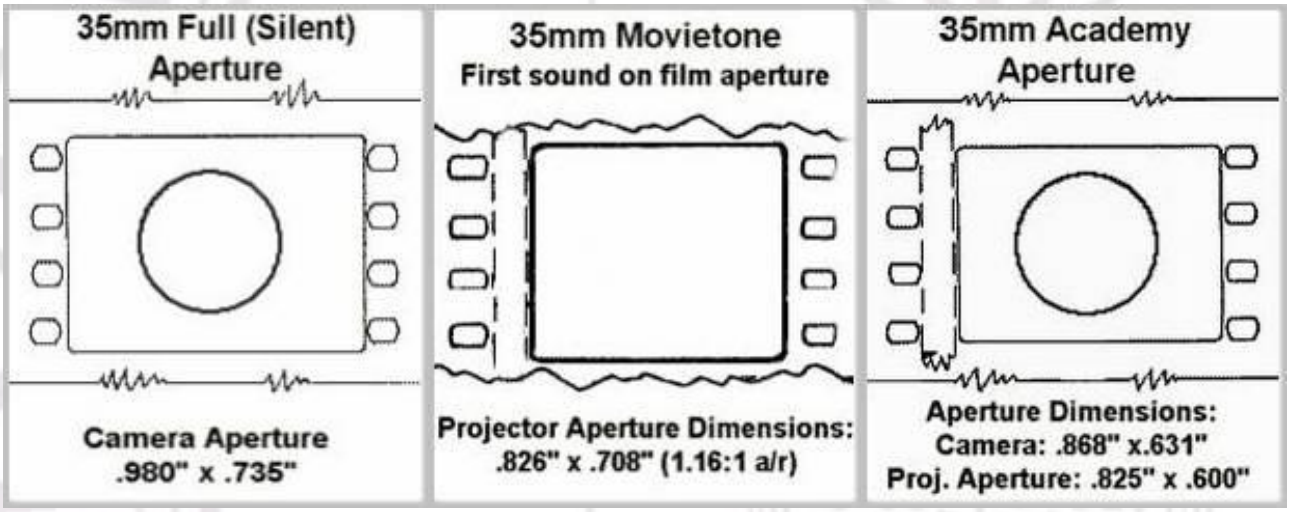
35mm: 4-perf, 3-perf & 2-perf

In 1889, celluloid-based transparent, flexible 35mm film was invented by the **Rev. Hannibal Goodwin** [1824-1901]. He conceived the idea of a flexible, unbreakable material upon which to mount the slides he liked to use in his Sunday School, and, with a license from the Newark Celluloid Varnish Co., set to work to prove that celluloid could be thinned and flattened to use as an image base. Goodwin's invention was promoted by **George Eastman** on a wide-scale for commercial use.

The first decade of motion picture production saw a mixed bag of film formats and sprocket holes and hardly any standardization. **William Kennedy Laurie Dickson** [1860-1935], working for Thomas Alva Edison, used 4-perf 35mm film [1.33:1] for his camera, the Kinetograph [1891], his peephole machine, the Kinetoscope [1893], and his projector, the Vitascope [built by Thomas Armat and C. Francis Jenkins in 1895 and sold to Edison in 1896]. The Brothers Lumière used 1-perf 35mm for their *Cinématographe* [1895]. Others used films with a width of 11mm, 24mm, 28mm, 50mm, 62mm, etc.

35mm/4-perf becomes standard

In 1907, a voluntary agreement was reached, which became known as the Motion Picture Patents Agreement of 1907. 35mm and certain other specifications were defined as a standard motion picture film: 35mm in width, 4 perforations along both sides of each frame [4:3 or 1.33:1] and a film speed of circa 16 frames per second. In 1927, the Academy of Motion Picture Arts and Sciences officially made 1.33:1 the industry standard, the Academy Aperture.



Camera Speed

'The average camera speed is two turns per second, or one foot of film per second. There are approximately 16 images per foot, and the above speed is used invariably, and projection should be at this speed except in scenes where the tempo of the action requires speeding up of the objects, as, for example, in a fight scene. "Average" speed in this case would be too slow. In comedy various speeds are used from normal to stop motion, in order to obtain desired effects. Of course if a projectionist speeds up to 100, where the scene was shot at 60, in order to get through with the show, no

human eye will be able to stand the strain of watching objects moving at that speed. It will ruin every effort made by the producer, director and staff to put their best efforts before the public.' *[Victor Milner, 1923.]*

'Regarding our opinion as to the correct camera speeds, we wish to state that this matter has been discussed from time to time among our members and it is the consensus of opinion of our Society that the correct camera speed is sixteen pictures per second or sixty feet per minute. This speed has been used for years by practically all members of the profession, slower speeds only being resorted to, to secure certain comedy and dramatic effects. Over-speeding has only been used where certain directors have attempted to combat the excessive projection speeds which exhibitors have adopted to "turn over their audiences" in the shortest possible time. We are opposed to any taking speed in excess of sixty feet per minute.' *[John W. Boyle, American Society of Cinematographers, 1925.]*

Sound

The advent of sound in 1929 at first necessitated the squaring of the frame [1.16:1] to allow room for a soundtrack. In 1931 there was a consensus among major studios as to the exact camera and projector aperture dimensions for 35mm sound films. This consensus provided a modification of the Academy Aperture to 1.37 width to 1.0 height [1.37:1], which was very close to the original 1.33:1 silent screen shape. The 1.37:1 aspect ratio remained unchallenged until 1952.

From nitrate to safety base

In 1948 Eastman Kodak introduced 35mm tri-acetate safety base film for the motion picture industry to replace the flammable cellulose nitrate base. The conversion from nitrate to safety base was completed in 1952.

Negative pulldown

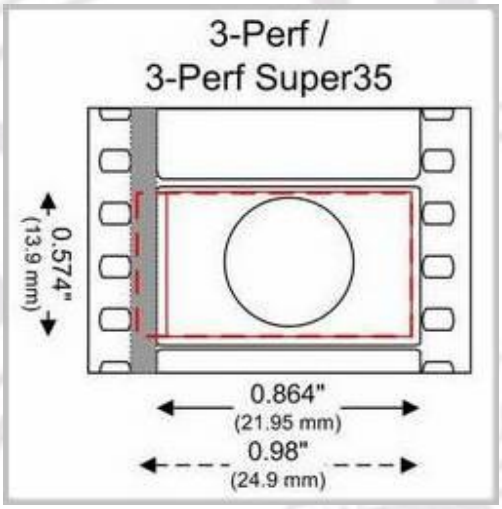
This refers to the number of film perforations that each film frame occupies, as well as whether they are pulled horizontally or vertically. The most common film pulldowns are 4-perf and 3-perf, the latter of which is usually used in conjunction with *Super 35*. 2-perf, used in *Techniscope* in the 1960's, is enjoying a resurgence due to the birth of digital intermediate techniques eliminating the need for optical lab work. Vertical pulldown is overwhelmingly the dominant axis of motion, although horizontal pulldown is used in *IMAX*, *VistaVision* [still in use for some visual effects work], and in consumer and professional still cameras. *[From the Wikipedia website.]*

3-perf

In these days of the *HD vs. Film* debate, 3-perf is the future of film origination: image quality up, cost down. Slight modifications to cameras and rush projectors induce considerable reduction of film origination costs. Any off-the-shelf 35mm raw stock can be used in a 3-perf camera [after modification of the regular 4-perf pulldown claw movement]. By eliminating the interimage waste, 3-perf pulldown reduces negative, rush and inter-positive stock consumption as well as their associated processing costs by 25%.
Like *Super 16*, 3-perf negatives must go through either a 'Digital' or 'Straight Optical' transfer to deliver standard 4-perf prints for theatre distribution. Since the 'original negative to release print' path is no longer following the 'contact-print' process, it is no longer necessary to preserve - and waste - the sound track space, on the original image. It becomes wiser to shoot *Super 35* and use the complete 'perf to perf' silver

halide real estate. The *Super 35* 1.85:1 images occupy 324 mm² instead of the 273 mm² stored on a 1.85 cropped Academy frame [a 25% bonus].

3-perf brings a 33% increase of the apparent length of the magazines: a 400 foot roll lasts for about 6 minutes instead of 4½ in 4-perf. Because of the larger image - for the same apparent graininess - faster stocks can be used, which means lighter lighting fixtures. A two hour film - considering an average twelve for one ratio - can be made with 220 rolls instead of 330, i.e. 27,000 meters instead of 40,000. *[From the Aaton website.]*

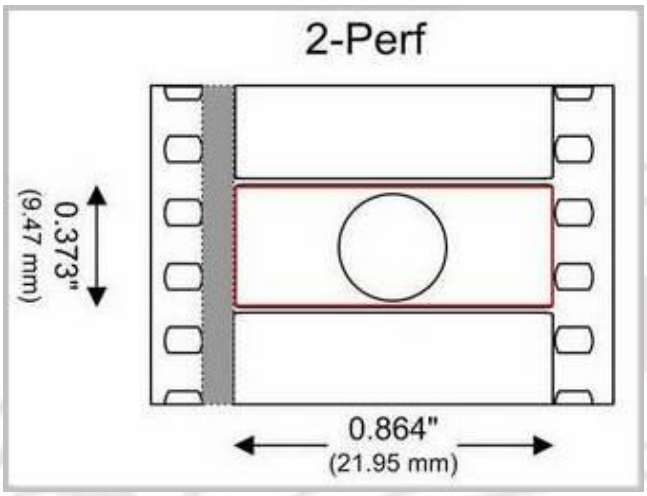


Drawing by Max Smith

2-perf

2-perf camera systems use only 2 perforations per frame on 35mm film, which gives an aspect ratio close to the 2.39:1 aspect ratio used in anamorphic prints. It was first proposed conceptually around 1930, but was not put into practice until 1960, when *Techniscope* was developed at Technicolor's Italian branch.

The *Techniscope* format uses a 2-perf negative pulldown per frame, instead of the standard 4-perf frame usually exposed in 35mm film photography. *Techniscope*'s 2.33:1 aspect ratio is easily cropped to the 2.35:1 widescreen ratio, because it uses half the amount of 35mm film stock and standard spherical lenses. [In 1970, the SMPTE revised the 2.35:1 aspect ratio to 2.39:1 (now known as 2.40:1), however, before standardization, most *Techniscope* films were photographed and released in the 2.35:1 aspect ratio.]
Thus, *Techniscope* release prints are made by anamorphosizing and enlarging each frame by a factor of two. Because 2-perf is not a release format [all films still have to be released in 4-perf to theatres], producers will often elect to do a high quality scan to video, an optical blowup or, ideally, use the digital intermediate post-production method to eliminate optical blowups and thus improve quality.



Drawing by Max Smith

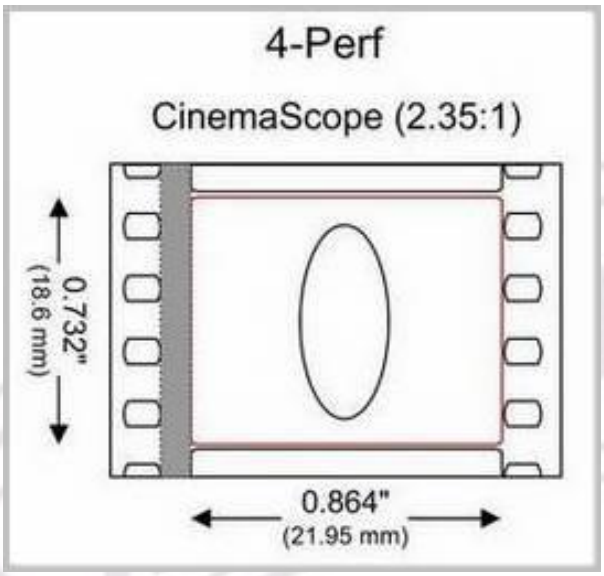
While in the recent past, some companies have offered custom conversions of camera equipment to 2-perf, it is now clear that camera manufacturers are supporting the format. *ARRI* made 2-perf movement blocks for their *Arricam* and *Arriflex 235* cameras, while Aaton's *Penelope* camera is the first camera specifically designed for 2-perf usage [as well as 3-perf].

Aaton's Penelope: 3-perf & 2-perf

CinemaScope

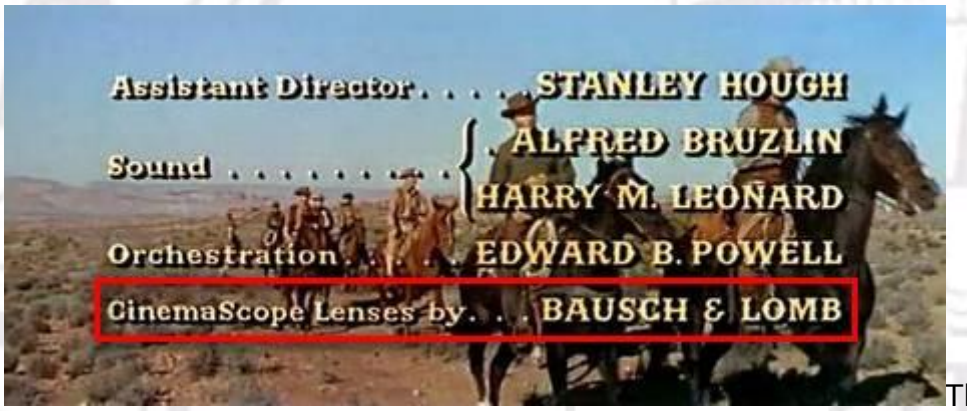
Anamorphic-lens system introduced by 20th Century-Fox in 1953 with *'The Robe'* [ph by Leon Shamroy in *CinemaScope* and a flat 35mm version]. The process was based on the *Anamorphoscope* system [using an Hypergonar lens] developed by the Frenchman **Henri Chrétien** [1879-1956].

2.55:1

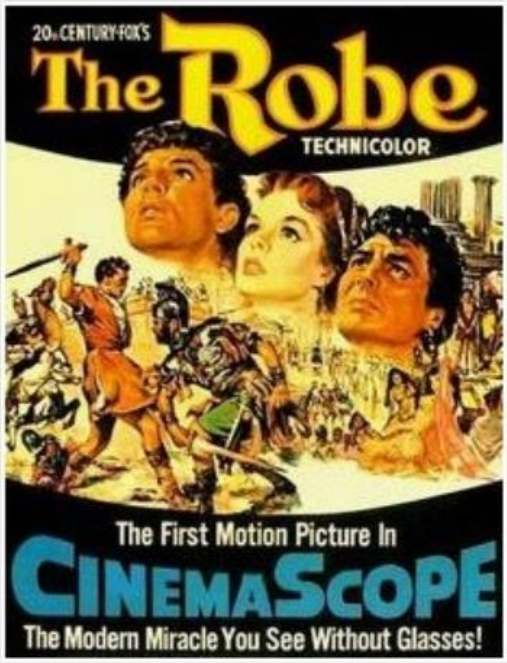


Drawing by Max Smith

Fox secured the world rights to this system and the **Bausch & Lomb Optical Company** perfected Chrétien's lens. When it set up *CinemaScope* as a new standard, 20th Century-Fox thought it had covered all legal bases. Fox intended to own the use of the process and license it to other companies. Unfortunately, Fox soon discovered its rights were limited to the patents it had obtained from Professor Chrétien and H. Sidney Newcomer, an American who had also been experimenting with anamorphic lenses in the 1920's. Other basic design patents of *CinemaScope* were considered to be in the public domain.



The production start date of *'The Robe'* had been delayed several times, with Fox reporting that it was having difficulties in deciding in what process the picture should be filmed. In January 1953, Fox announced that studio president Spyros Skouras had negotiated the purchase of the rights to a 'new French large-screen process which projects a picture two and a half times the size of today's normal screen image and uses only one strip of 35mm.' At first called *Anamorphoscope*, the process, eventually named *CinemaScope*, was invented by Henri Chrétien in 1927, and promised a three-dimensional effect due to its wide field of vision. Chrétien initially attempted to interest Hollywood movie producers in his invention in 1928, but they were distracted by the advent of sound. Chrétien also revealed that J. Arthur Rank once held an option on his lenses. Rank's option lapsed, however, and on February 6, 1953, Fox reported that it had signed a ten-year exclusive contract to manufacture and distribute all *CinemaScope* lenses in countries except France and its colonies.



Chrétien was to receive one dollar for 'each lens [made for CinemaScope] throughout the world, plus a small annual fee for ten years. In addition, he has been given a contract to produce 250,000 lenses.'

Fox decided to shoot 'The Robe' in CinemaScope, with full tests in the process beginning on February 28, 1953.

Unlike other widescreen processes, CinemaScope required only one camera and one projector. Using a special, anamorphic lens mounted over the camera's normal lens, CinemaScope was able to capture a wide-angle image that was 'squeezed' onto a regular strip of 35mm film stock. The image was then 'unsqueezed' during projection through the use of another special lens attached to the projector, so that the resulting image was at a ratio of 2.55:1 instead of the then-standard 1.37:1. The film was projected onto a slightly concave Miracle Mirror screen, which was much wider than an ordinary screen, although the exact size depended on the theater in which it was installed. [The screen installed in the Roxy Theatre in New York was 68 feet wide by 24 feet tall.] The screens, which had a metallic surface, were also capable of being used for 3-D or standard format pictures.

In order to solidify CinemaScope as the industry's new standard, Fox offered it to other studios rather than retaining it for its own exclusive use. The first major demonstration of CinemaScope was held in Los Angeles on March 18, 1953, with footage of the New York harbor, a sequence from 'The Robe', clips from 'How to Marry a Millionaire' and a musical number from 'Gentlemen Prefer Blondes' being shown. The demonstration was a success. Hollywood Reporter noted that several major studios were interested in or had committed to CinemaScope, and that numerous films using the process were in the planning stages. The lenses necessary to shoot the pictures had to be licensed from Fox, and prices varied depending on the amount of equipment required and the number of pictures for which it would be used.

Paramount, one of the few studios not using CinemaScope, promoted its own process, VistaVision, which employed a ratio of 1.85:1 and was not an anamorphic process.

In a interview, director Henry Koster described how frustrating using CinemaScope was during production of 'The Robe', as the lenses had to be focused separately, and frequently were not in focus at the same time, necessitating retakes. Eventually a

system to mechanically and automatically focus the lenses was perfected. Additional problems that had to be surmounted to accommodate CinemaScope were drastic changes in lighting, placement of actors within a scene and the type of film stock used. According to an August 1953 Variety article, 'The Robe' and a few subsequent Fox CinemaScope productions were shot on a type of Eastman negative stock that proved unsatisfactory. Later films used a new Eastman 'tungsten balanced stock', which was easier to light during production and to use to print multiple positive copies. News items noted that, even though onscreen credits of 'The Robe' state 'Color by Technicolor', the Technicolor plant only processed the Eastman Color film, and that technically, the color was by Eastman. Stereophonic sound, which had been experimented with as early as 1916, was used in conjunction with *CinemaScope*.

In order to protect its huge investment and to insure its further use, Fox offered loans to many exhibitors throughout the United States and the world to install the necessary projection and sound equipment. In April 1953 more than 1,500 theatres had already placed orders for the equipment. It would cost between $8,000 to $22,000 to re-furbish theatres for *CinemaScope* and stereophonic sound, depending on the size of the establishment. By mid-July 1953, Fox had invested $10,000,000 "in the development of *CinemaScope* and in advances to manufacturers throughout the United States and Europe to insure speedy delivery of *CinemaScope* lenses, Miracle Mirror screens and stereophonic sound."

Several large New York theatres, including the Astor, Rivoli and Roxy, bid to see which would be allowed to exhibit the picture in New York City, with the Roxy winning. The gala New York premiere was held on September 16, 1953 and received much acclaim.

Critical reaction to *CinemaScope* was mixed at first, with many critics commenting on the focus problems that were soon eliminated due to better film stock and lenses.

According to Hollywood Reporter news items, *'The Robe'* was also shot in regular 35mm, but only so that it could be reduced to 16mm for release to churches and schools. During its general theatrical release, *'The Robe'* was available only in *CinemaScope*. *[From the TCM website.]*

During photography, the cylindrical, 'anamorphic' lens [in the beginning an anamorphic lens attachment, later lens + attachment mounted in one unit] would record almost twice as much horizontal information as its spherical counterpart. By optically compressing or 'squeezing' the horizontal image by a factor of two, the anamorphic lens was able to record its wider image on the same 35mm film stock while employing the same motion picture cameras that were already being used by the major studios. To project the widescreen image, existing theatres merely needed to equip their projectors with a similar cylindrical lens that would unsqueeze the image and spread the picture across an appropriately wider screen.

CinemaScope at first projected a wide-screen aspect ratio of 2.66:1 [the maximum available area on the film + sound on separate 35mm magnetic film], later 2.55:1 [with 4 small magnetic soundtracks on the film] and eventually 2.35:1 [in 1955].

Most films during the first years of CinemaScope were simultaneously filmed in a standard 35mm flat version. A problem with CinemaScope lenses were the anamorphic 'mumps', which occurred when anamorphosis decreased as the lens was focused closer. The name 'mumps' came from the fact that actors' faces, when photographed in close-up and then projected, appeared noticeably fatter, as though they had 'mumps'. As a result, directors using CinemaScope were forced into staging scenes with wider shots, seriously limiting their editorial choices.

Originally, 20th Century-Fox only licensed CinemaScope for 'A' pictures shot in color. Yet, once the process had been established, some filmmakers wanted to use the CinemaScope lenses on dramatic pictures in b&w. Having established the CinemaScope standard, Fox quietly began to modify its strict anti-black & white attitude. The studio made a deal with independent producer Robert L. Lippert [1909-76] for a series of anamorphic low budget 'B' films. To distinguish these 'B' films from color CinemaScope productions, Fox coined the name Regalscope after Lippert's production company, Regal Films, Inc. Of course, Regal's films were photographed with Bausch & Lomb CinemaScope lenses.

Curiously, the first released Regal film, *'Stagecoach to Fury'* [1956; ph: Walter Strenge], bore a *CinemaScope* logo, though the size of the logo was much smaller and less prominent than it had been on 'A' pictures. Around the same time, Fox began to break its own color barrier. It began production on a b&w *CinemaScope* 'A' picture titled *'Teenage Rebel'* [1956; ph: Joseph MacDonald].

In 1955 Fox introduced the large format *CinemaScope 55* system using a 55mm negative with 8 perforations [e.g. *'Carousel'* ph by Charles G. Clarke]. From this negative a 35mm *CinemaScope* print was made with improved image quality. Fox abandoned the system in 1956.

In the 1960's the use of Bausch & Lomb lenses declined and *Panavision* anamorphic lenses were introduced.

In 1966, 20th Century-Fox filmed its last *CinemaScope* pictures *'In Like Flint'* [ph: William H. Daniels] and *'Caprice'*, the latter photographed by Leon Shamroy, who had started it all on *'The Robe'*.

In 1967 it was the end of *CinemaScope* for the major studios.

Cinerama

Developed by special effects ph **Fred Waller** [1886-1954] and inspired by the French triptych process *Polyvision* [1926] and Waller's own Vitarama [a wide-screen process employing 11 interlocked 16mm cameras and projectors; demonstrated at the 1939 World's Fair in New York].

Cinerama employed a special triple 35mm camera set-up whose combined images covered 146 degrees [*see photos above*]. The camera aperture was 1.116 in./28.35mm high [equivalent to 6 perforations] x 0.997 in./25.32mm wide. The three 35mm prints were projected interlocked, from three separate projection booths, onto a deeply curved screen composed of 1,200 slightly overlapping vertical strips to create an image three times the normal width and also twice the standard height [the aspect ratio, as viewed from the center projector, was 2.06:1].

The word *Cinerama* was an anagram of the letters in 'American'. The first *Cinerama* film was *'This Is Cinerama'* [1951; ph: Harry Squire], which premiered on 30

September 1952 at the Broadway Theatre, New York, and caused such a sensation that even the New York Times covered the event as a front-page news story.

According to the New York Times review, the word 'Cinerama' is a combination of the words 'cinema' and 'panorama'. The process was developed by Fred Waller, who also invented water skis. He introduced an early form of *Cinerama* at the 1939 World's Fair in New York. The exhibition sparked the interest of the Rockefeller Group, who financed further experiments. After a 1949 demonstration, however, the financiers backed out of their arrangement, allowing Hazard E. Reeves [1906-86] to purchase the company in 1950. He [president] and Waller [chairman] named the company Cinerama, Inc. and signed an exclusive partnership with Lowell Thomas and Mike Todd's company, Thomas-Todd Productions, to make five films in five years. Todd hired legendary documentary filmmaker Robert Flaherty to produce *'This Is Cinerama'*, but Flaherty died soon after shooting the Niagara Falls sequences, prompting Todd and his son, Mike Todd Jr., to take over producer chores and much of the directing. During production in Europe, however, the Todds far exceeded their budget, and as a result were fired by Thomas-Todd. Thomas then hired his friend, Gen. Merian C. Cooper, who made the decision to treat the film as a theatrical experience with an intermission.

Although there had been previous three-screen experiments, *Cinerama* strove to be the most naturalistic form of cinema to date. As noted in a April 30, 1953 New York Times article, Reeves's stereophonic sound system imitated natural, multiple-origination sound by recording sound magnetically onto a separate strip of 35mm film and then playing it back to seven banks of speakers around the theater. According to the press book, seven separate sound tracks were prepared, the seventh of which served as a control track to guide the movement of sound from one bank of speakers to the next.

The film had its premiere at the Broadway Theatre, which was rebuilt to accommodate the screen and projection booths, and rewired for the elaborate sound system. In its first release, the film ran for 133 weeks, and was followed by several re-releases, including those on November 2, 1960 and February 15, 1973. The picture's unprecedented success prompted the filmmakers to release a succession of other three-screen *Cinerama* productions, including *'Cinerama Holiday'* [1954; ph: Harry Squire & Joseph C. Brun], *'Seven Wonders of the World'* [1955; ph: Harry Squire], *'South Seas Adventure'* [1957; ph: John F. Warren] and *'How the West Was Won'* [1961; ph: various; also released in *Ultra Panavision 70*].

Fred Waller won a 1953 Academy Award of Merit 'for designing and developing the multiple photographic and projection systems which culminated in *Cinerama*', while Reeves Soundcraft Corp. won a Scientific and Engineering Academy Award 'for their development of a process of applying stripes of magnetic code to motion picture film'.

The Cinerama Dome in Hollywood opened in November 1963 to showcase the United Artists Cinerama-process film *'It's a Mad Mad Mad Mad World'*. By this point, the three-screen process had proved too unwieldy and expensive to catch on in popular use, and so had evolved into 'single-strip Cinerama', a simpler, less spectacular 70mm process.

William R. Forman, the founder of Pacific Theatres, gained control of Cinerama and its assets and stored them for nearly forty years. In 2001, the Cinerama Dome was refurbished, and a restored print of *'This Is Cinerama'* was re-released in October 2002. This screening marked the first time three-strip Cinerama was shown in the Dome. *[From the TCM website.]*

The last *Cinerama* film was *'How the West Was Won'* [1962; ph: William H. Daniels, Milton Krasner, Charles Lang, Jr. & Joseph LaShelle]. Continuing problems with the technique and competition from wide-screen systems with a single film forced *Cinerama* to become a single film system, e.g. *'It's a Mad Mad Mad Mad World'* [1962; ph by Ernest Laszlo in *Ultra Panavision 70/Super-Cinerama*].

Other 3-strip systems were *Cinemiracle* [developed by National Theatres; projected from a single booth with three closely spaced projectors, utilizing mirrors (aspect ratio: 2.33:1); e.g. *'Windjammer'* (1956-57; ph: Gayne Rescher & Joseph Brun)] and the Russian *KinoPanorama*.

Kinopanorama camera, model PSO

IMAX

A camera and projector system that employs the largest film frame in motion picture history: 65mm film moving through the camera horizontally allows individual frames that are 15 perforations wide and measure 71.09 by 52.63mm, ten times larger than the standard 35mm frame. Printed on 70mm and projected onto a screen measuring 80 feet by 100 feet. *IMAX* stands for 'Image Maximization'.

The *IMAX* system has its roots in EXPO '67, Montreal, Canada, where multi-screen films were the hit of the fair. A small group of Canadian filmmakers and entrepreneurs who had made some of those popular films, decided to design a new system using a single, powerful projector, rather than the cumbersome multiple projectors used at that time. The result: the *IMAX* motion picture projection system, which would revolutionize giant-screen cinema.

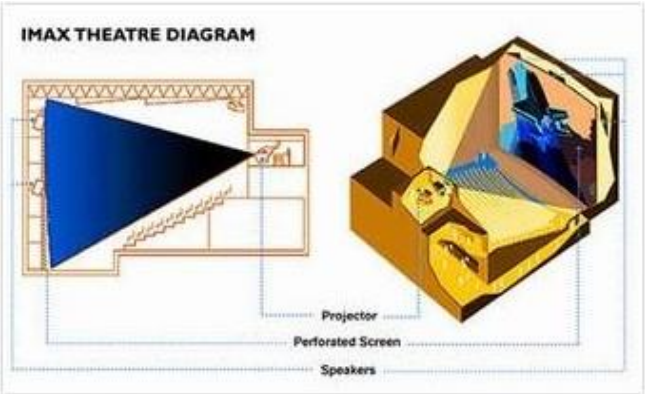
IMAX technology premiered at the Fuji Group Pavilion, EXPO '70, Osaka, Japan, with *'Tiger Child'* [1969, Donald Brittain; ph: Georges Dufaux]. The first permanent *IMAX* projection system was installed in Toronto in 1971. *IMAX Dome* [*OMNIMAX*], designed for use on a domed theatre screen, debuted at the Reuben H. Fleet Space Theatre, San Diego, in 1973.

IMAX 15/70 Standard 35mm

Currently, large format cinema has four different size formats: 15-perf/70mm, 10/70, 8/70 and 5/70. Today *IMAX* no longer has an exclusive hold on the market, as companies such as Iwerks Entertainment, Inc. and World Odyssey are producing 15/70 cameras and projectors.

In the large format industry *Showscan*, developed by special effects expert Douglas Trumbull, is a system utilizing 5-perf/70mm. The 65mm *Showscan* camera shoots at 60 fps and the resulting image is projected at 60 fps producing an extremely high resolution, grain free, flickerless image. Iwerks also presents its films in flat, dome or 3-D configurations and in either 15/70 or 8/70.

A popular and spectacular form of presentation of large format cinema is the 360° theatre, e.g. Disney's *Circarama* [eleven 16mm cameras and projectors, later nine 16mm cameras and nine 35mm projectors] and *Circle-Vision 360°*. The 70mm *Ultra* Toruscope is yet another 360° system which utilizes three 5/70 projectors running at 30 fps producing a 360° image up to 70 feet in diameter. The audience is seated on rotating servo-controlled chairs with optional breeze and scents. *Cinema 180* from Omni Films International is a 5/70 based system utilizing 65mm original negative and a 70mm print. The print is projected onto a quadraspherical domed screen 42 feet wide by 24 feet high and 18 feet in depth.



MGM Camera 65

Developed by **MGM** and **Panavision, Inc.** in 1955. Photographed onto 65mm film [anamorphic]. Printed onto 70mm film [anamorphic] with an aspect ratio of 2.76:1 or onto 35mm film [anamorphic] with an aspect ratio of 2.35:1. The image printed onto the 35mm film was taken from the center of the negative. The cameras used for *MGM Camera 65* were old 70mm cameras from the 1930's used for MGM's Realife system, which were converted to 65mm by the Mitchell Camera Corporation, and new 65mm cameras ordered by Panavision.

The first film was *'Raintree County'* [*filmed* April-May & July-October 1956; dir: Edward Dmytryk; ph: Robert Surtees], but that film was shown only in *CinemaScope* compatible 35mm because all 70mm theaters were solidly booked up with *'Around the World in 80 Days'* [*Todd-AO*]

The second *MGM Camera 65* film, *'Ben-Hur'* [1958-59; ph: Robert Surtees], was released in a 70mm version. After MGM sold its camera department to Panavision the system was called *Ultra Panavision [70]*.

Panavision

The trade name for widescreen processes and cameras developed by Panavision, Inc. Panavision was founded in 1953 by **Robert E. Gottschalk** [1918-82], a.o., in order to manufacture a prismatic anamorphic projection attachment [*Super Panatar*], which made it possible to change the aspect ratio of the projected image during projection from 1.33:1 to 2.66:1. The *Super Panatar* projection lens, debuted in March 1954 for $1,100 a pair and quickly captured the market. It was attached between the projector and the lens. A later improved and lighter design [*Ultra Panatar*] enabled this to be mounted in front of the lens instead. In December 1954, the company then captured the film studio market by creating the *Micro Panatar*, which was attached to an optical printer for the purpose of creating 'flat' [non-anamorphic] prints from anamorphic negatives. [Previously studios had shot everything with two cameras - one anamorphic and one flat - so that non-widescreen theaters could still exhibit the film. The cost savings of making flat prints in post-production instead were enormous.]

The high quality of these lenses, in comparison with Fox's Bausch & Lomb lenses, greatly impressed MGM's research director Douglas Shearer. With the *MGM Camera 65* [later *Ultra Panavision 70*] system, Panavision entered the field of camera or 'taking' lenses. The system used 65mm film in conjunction with the *APO Panatar* lens, an integrated anamorphic lens [rather than a prime lens with an anamorphoser mounted on it] set to a 1.25 expansion factor. Unfortunately, it was only used on a handful of films, starting with *'Raintree County'*.

The introduction of the *Auto Panatar* and *Ultra Speed Panatar*, anamorphic 35mm 'taking' attachments, in 1958, was the real breakthrough. A problem with early *CinemaScope* camera lenses was what was known as 'the mumps': a widening of the face in close-ups due to a loss of anamorphic power as a subject approaches the lens. Although early productions were willing to compensate for this limitation by staying

away from close-ups, as anamorphic became more popular, it became a major annoyance. Gottschalk solved the problem with additional rotating lens elements moved in concert with the focus ring so that a 2x squeeze ratio could be maintained throughout the range of focal distances.

The *Auto Panatar* was rapidly adopted industry-wide, eventually making *CinemaScope* lenses [and thus *CinemaScope*] obsolete.

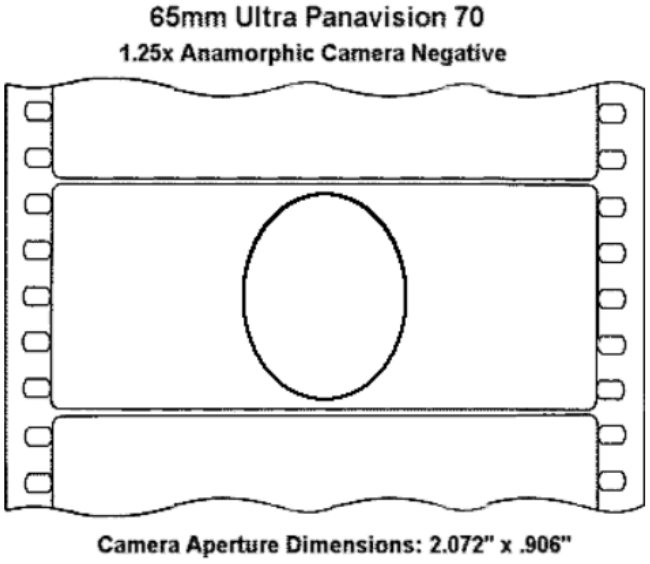
Original *Panavision* used an anamorphic lens on the camera to squeeze the picture onto 35mm film which, when projected through the same type of lens, created an image with a 2.35:1 aspect ratio. MGM was one of the first studios to use the new *Panavision* lenses on *'Torpedo Run'* [1958; ph: George Folsey] and other productions, but these films were advertised as being shot in *CinemaScope*. However, the films also bore the separate credit: *'Photographic Lenses by Panavision'*.

The first film *'Filmed in Panavision'* was *'A Hole in the Head'* [1958; ph: William Daniels].

By 1960, Paramount, which had resisted *CinemaScope* also began filming in *Panavision*. Although Panavision shot tests for the 20th Century-Fox prod *'The Diary of Anne Frank'* [1958; ph: William C. Mellor & Jack Cardiff (loc ph)], the studio resisted using the obviously better lenses. It wasn't until 1966 that several of Fox's top directors of photography began to shoot in *Panavision*.

By 1970, *Panavision* dominated 35mm anamorphic photography throughout the world.

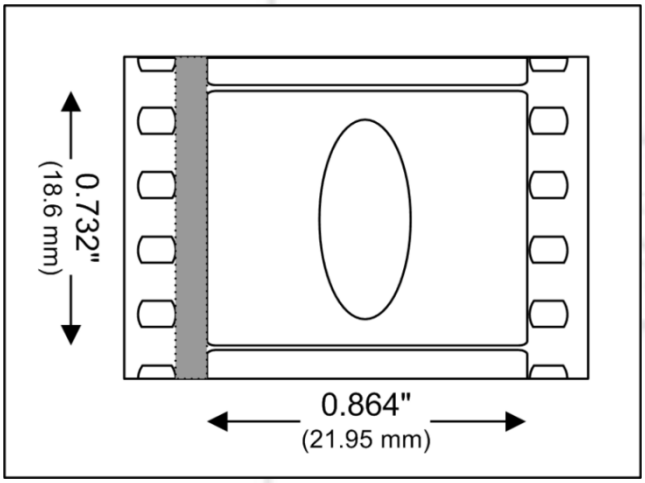
Ultra Panavision [70] used an anamorphically squeezed image on a 65mm negative and 70mm print to project a picture with a ratio of 2.76:1.



Super Panavision 70 photographed an unsqueezed image onto 65mm film which, when projected from a 70mm print, had an aspect ratio of 2.20:1. The 35mm print, with 2x anamorphic squeeze, had an aspect ratio of 2.35:1. The first film in *Super Panavision 70* was *'The Big Fisherman'* [1958/9, Frank Borzage; ph: Lee Garmes]. Other films produced and released in *Super Panavision 70* were *'Exodus'* [1960; ph: Sam Leavitt] & *'Lawrence of Arabia'* [1962; ph: F.A. 'Freddie' Young].

Scope

Soon after the introduction of *CinemaScope* in 1953, many anamorphic challengers began to appear on the horizon. Fox intended to own the use of the process and license it to other companies. Unfortunately, Fox soon discovered its rights were limited to the patents it had obtained from **Professor Chrétien**. *CinemaScope*'s other basic design patents were considered to be in the public domain. As soon as the principles behind *CinemaScope* were published, a number of competing manufacturers began to announce anamorphic lens systems.



Drawing by Max Smith

Fox's most serious challenger was Warner Bros. Warner was determined to develop its own process and solicited bids from several American and European optical companies, finally making a deal with Zeiss Optical Company from Germany for a system that would be called *WarnerSuperScope* [later shortened to *WarnerScope*]. Warner originally planned to use the Zeiss lenses on *'Rear Guard/The Command'* [1953; ph: Wilfred M. Cline] and the remake of *'A Star is Born'* [1953-54; ph: Sam Leavitt], but the lenses were not ready in time. Instead, on *'Rear Guard'* Warner used a lens system called *Vistarama*, that had been developed by the Simpson Optical Company [the film was, however, released with the label *CinemaScope*]. By September 1953, when the Zeiss lenses finally arrived at Warner Bros., the studio made a test. When the studio reviewed the footage it found that the Zeiss lenses had poor resolution and were unsuitable for feature production. As a result, Warner Bros.

started to shoot *'A Star is Born'* in spherical three-strip Technicolor, but, eventually, the studio scrapped the first ten days of filming and started over in *CinemaScope*. In the late 1950's, Warner Bros. would revive the *WarnerScope* name for 3 features that actually were shot in the *Superscope*/*Super 35* format.

Outside of the USA, various film companies began to develop *CinemaScope*-compatible anamorphic lens systems. One of the most significant systems was developed in France by Ernst Abbe and was called *Cinépanoramic*. It was the basis of the French *Dyaliscope* and *Franscope* processes.

Republic Pictures Corporation, the most important and influential studio in the history of the 'B' movie, purchased rights to *Cinépanoramic* and called it *Naturama*. The *Naturama* system appeared to have less of a problem with anamorphic 'mumps' than *CinemaScope*. Republic's *Naturama* lenses had a concave distortion, which was most noticeable in pan shots, and was apparent in every focal length of lens. By contrast, *CinemaScope* and *Panavision* lenses only caused concave distortion in their shortest focal lengths.

Showscan

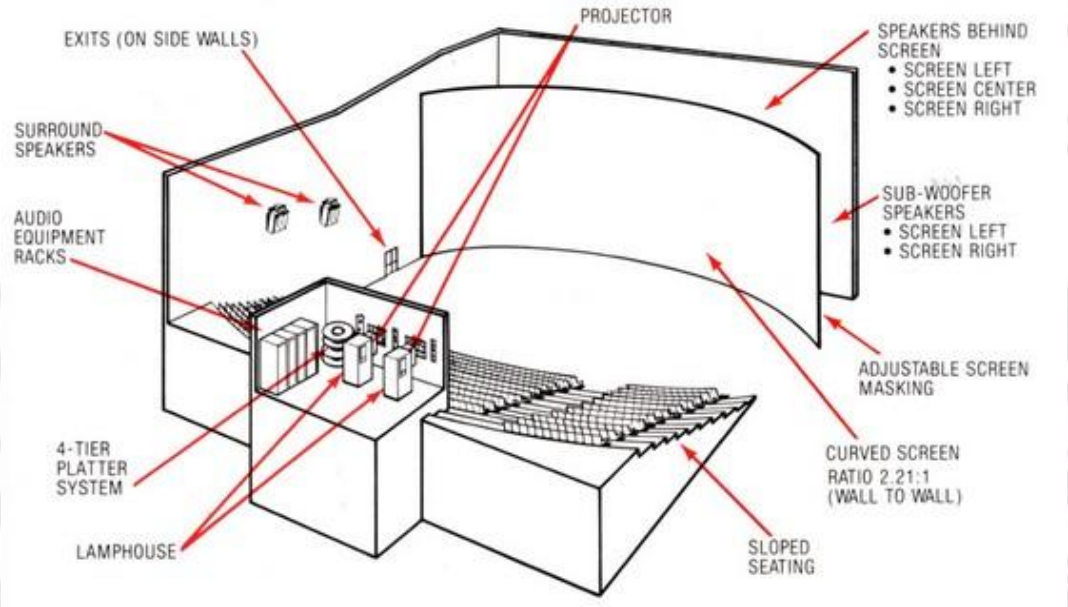
Showscan was developed by special effects expert **Douglas Trumbull** [1942-] This camera and projection process uses 5-perf 65mm [negative] & 70mm [print] film, shot and projected at 60 fps - exceeding the sound film standard of 24 fps by a 2.5 multiple - resulting in the most perfect projected image possible. The enhanced visual qualities of the *Showscan* films are a brighter, more highly defined image with a reduction in the visual persistence of grain structure, deeper color, smoother motion with greater sharpness, and the perception of depth and three-dimensionality. The *Showscan* process approaches the maximum amount of visual information that the human eye can process each second.

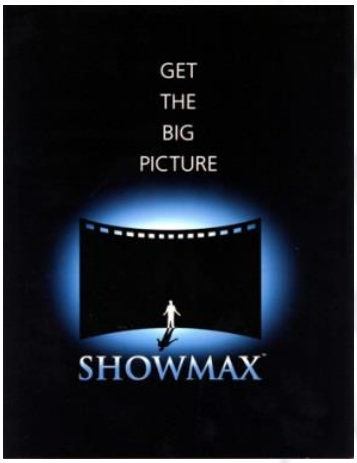
A 16 fps rate was the first speed established as the minimum required to sustain the illusion of continuous presence of a motionless image presented through a sequence of stills. The 24 fps rate was adopted later to improve the fidelity of optical sound tracks. The perception of an uninterrupted flow of motion, free from stroboscopic effects, requires a still higher frame rate. Through experiments conducted at Future General Corporation, the joint Trumbull/Paramount Pictures research division, Douglas Trumbull determined that the effective maximum frame rate should be 60.

Paramount, Future General's parent company, asked Trumbull to develop a feature film that would showcase the *Showscan* process. *'Brainstorm'*, developed initially with an eye toward amusement park theatres, seemed the perfect project. Trumbull's idea was to use *Showscan* only for the images perceived through the 'reality recorder'. The bulk of the film would be shot with a narrower aspect ratio at 24 fps, then optically converted to 60 fps by double- and triple-printing alternate frames. Thus, even though the entire film would then be projected at 60 fps, only those portions featuring the *Showscan* technique would be dramatically enhanced. But, as with all new technologies, there were problems [e.g. properly equipping each theater]. Paramount

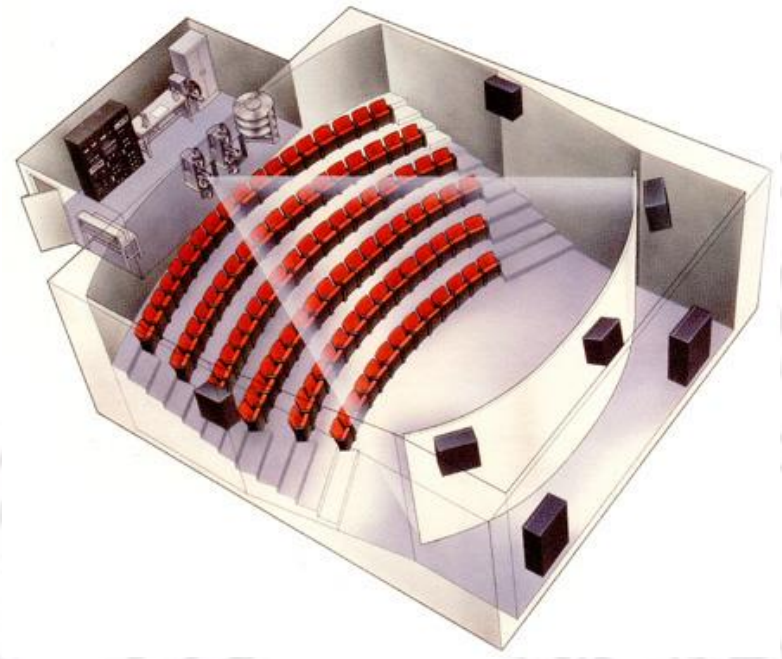
decided to pass on the project. The film began a second life at MGM [1981-83; ph: Richard Yuricich], but *Showscan* was not to be part of the project.

In developing the *Showscan* process, Trumbull was following in the footsteps of Fred Waller, Michael Todd and others, who through *Cinerama*, *Todd-AO* and multi-channel audio aspired to ever higher levels of impact and audience involvement in motion pictures.





The intensity of *Showscan* films is also due to the theatrical projection process and the theatrical environment. The 'ride' films use software and simulators, i.e. capsules in which the audience moves in sync with the movie. *[Using quotes from articles* by *Gregory Gutenko and Brad Munson in Cinefex #14, October 1983.]*



Super 35

Super 35 uses the same film as regular 35mm, however, *Super 35* utilizes more of the film's picture area. In reality, *Super 35* uses the frame area of the film that movies occupied prior to the advent of sound from sprocket hole to sprocket hole, top to bottom. When the sound track area was added to film in the late 1920s, the picture had to be narrowed and shortened to maintain the same aspect ratio. As a result, a significant portion of the original frame is not used in conventional 35mm cinematography.

In 1980, Joe Dunton planned to make and ph a 35mm film, *'Dance Craze'*, of which he wanted full-width 70mm release prints. Remembering *Superscope*, he shot the film to fill the full aperture by re-centering the spherical lenses and new viewfinder markings. In this manner, he was able to frame the important action for a 2.20:1 aspect ratio.

For the film *'Greystoke: The Legend of Tarzan, Lord of the Apes'* [1982-83], Warner Brothers wanted a full-frame 2.20:1 70mm release print, but doph John Alcott didn't like anamorphic lenses. He felt the slower anamorphic lenses would be impractical under the difficult lighting situations he would face in the jungle of Africa. As a result, Alcott made tests with re-centered lenses and chose to shoot the film with them, a technique he called *System 35*. The new process soon became generally known as *Super 35*.

Producers also became interested in the format because they could use the same negative to make a 35mm anamorphic print [without the film having been shot that way], a full-frame 70mm print and a video release that would not require the images to be panned and scanned. Because of the many cost-saving and photographic advantages of this system - spherical lenses need less light and have greater depth of field than their anamorphic counterparts - both *Super 35*, and its counterpart *Super 16*, are widely used today in feature film and television production.

'The biggest difference [between anamorphic and *Super 35*] is that anamorphic uses a larger negative area so you have more detail in the frame and less grain. The grain problem with *Super 35* blow-ups has recently been improved by a combination of new

finer-grained film stocks and digital intermediates, which can avoid the graininess of an optical printer blow-up. So the objection to *Super 35* has become less strenuous in the past two years. Still, it has less overall information in the frame than anamorphic photography and this is apparent when shooting wide shots outdoors. The trouble with anamorphic is that it may capture more fine detail with less grain, but if you're doing night photography and most of the frame is out of focus because you don't have enough depth of field, then are you really gaining much from the increased information of the anamorphic negative? But doing an exterior movie like a desert film or a western, anamorphic is still superior for just the amount of fine detail you can resolve in the image.' *[M. David Mullen]*

The *Super 35*, 4-perf system utilizes the entire width of the film and is used primarily to extract an anamorphic print for theatrical release by optical reduction printing. This system is quite versatile: from a *Super 35* negative, 70mm blow-up prints can be produced, as well as extractions for 16x9 [1.78:1]. The *Super 35*, 3-perf system is used for extracting 16x9 [1.78:1] prints and for origination for widescreen television.

A. Standard 35mm **B.** Super 35 **C.** Technirama sequential exposure negative
D. Magnetic track CinemaScope **E.** 70mm **F.** Optical track CinemaScope
(Image courtesy Blu-ray.com Site Manager Deciazulado)

Panavision Super 35 is a format for shooting full aperture, utilizing a greater camera negative area. This format provides the option of releasing a film in any of 3 formats:

70mm, 2x Anamorphic, and 1.85, without cropping any of the sides. The final decision can be made in post-production, as it does require an optical process. This format allows the cinematographer to use spherical lenses, while achieving a 2.40:1 finished product.

Superscope

This widescreen process - created in the laboratory rather than the camera - was developed in 1954 by Superscope, Inc. [**Irving & Joseph Tushinsky**] and RKO Radio Pictures, Inc. Photography in the *Superscope* process was generally no different than normal non-widescreen films. The only difference was that the entire silent 35mm aperture was utilized. Standard spherical lenses, much faster and lighter than the *CinemaScope* optics, were used. Using a *Superscope* lens, the image was printed onto 35mm with 2x anamorphic squeeze. The aperture was .715" x .715" and the aspect ratio 2:1.

The process made it possible to make anamorphic prints from spherical negatives. This made it no longer necessary for studios to film two versions, anamorphic and spherical [for theatres that were not yet converted to anamorphic projection].

Superscope, which had a brief spurt of popularity in the mid-1950's, was first employed for *'Vera Cruz'* [1954; ph: Ernest Laszlo; *see* photos below].

1.37:1

2:1

The process evolved into *Superscope 235*. Here the extraction area was further cropped down to yield a 2.35:1 aspect ratio and the prints were made using *CinemaScope* compatible specifications.

The *Superscope* system was also used under such names as *Superama* and *Megascope* until 1963, when it was supplanted by the introduction of *Techniscope* by Technicolor Italia.

A modern version of *Superscope 235* [or *Super Techniscope*], which preserves many of its characteristics, utilizes a recent generation camera set to 3-perf pulldown and *Super 35* configuration. This provides a larger than normal 1.85:1 negative with a noticeable increase in image quality, along with a 25% saving in stock and processing costs. The final 1.85:1 release prints are optically derived preserving much of the gain in image quality. 3-perf *Super 35* may well become the new standard for High Definition Television. Such a system would make exceptionally efficient use of the 35mm format, perhaps only rivaled by anamorphic systems like *CinemaScope* derivatives such as *Panavision*.

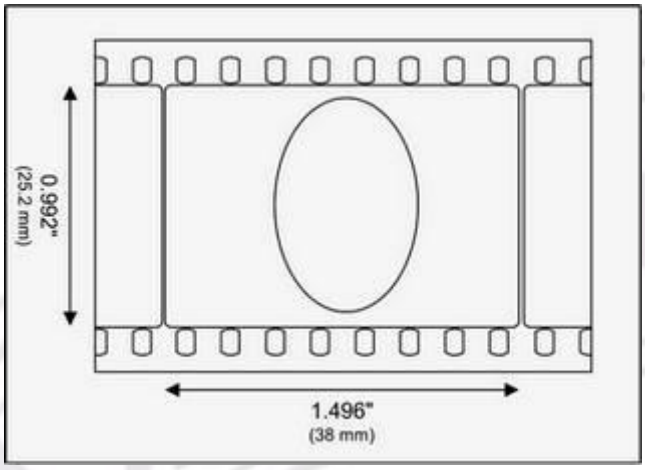
Technirama

A widescreen film process developed by Technicolor and N.V. Optische Industrie 'De Oude Delft', Holland, in 1956.

Although Technicolor was producing beautiful *VistaVision* prints for Paramount, other studios were only using the process occasionally. Technicolor decided to introduce its own widescreen process combining *VistaVision*'s picture quality and *CinemaScope*'s wider screen. Development work began at their London plant. Known during its development work as the 'Technicolor Universal Frame Process', the negative was to be the same as *VistaVision*'s 8-perf [double-frame] horizontal 35mm film format, but with the aspect ratio of the image increased to that of *CinemaScope*'s 2.35:1, by using an anamorphic lens on the camera.

Despite these similarities, however, the two formats were quite different. *VistaVision* offered impressively high-resolution images, but its 1.96:1 aspect ratio was hardly 'wide' - and only possible when footage was properly screened with a *VistaVision* projector. [Extraction 35mm prints were generally released in 1.66, 1.75 or 1.85:1.] However, with the additional use of a taking lens with 1.5:1 compression to squeeze more information onto the negative, *Technirama* could be transformed into either very high-quality *CinemaScope*/*Panavision*-compatible 2:1 compressed 35mm anamorphic reduction prints [by taking advantage of an extra 1.33 squeeze in the optical step], or

a 2.2:1 aspect ratio [when unsqueezed and printed directly to 70mm, a.k.a. *Super Technirama 70*].



Drawing by Max Smith

Technicolor had already heavily modified several of its now redundant 3-strip cameras to the *VistaVision* format. With new purpose-built *VistaVision* cameras produced by the Mitchell Camera Company, these also became available for Technicolor's own system.

The first major problem was to obtain a high quality anamorphic camera lens to match the overall quality of the system. The Dutch *Delrama* system was suggested. This system was first used in 1955-56 on *'Drie dagen met Monica'* [dir & ph: Wil van Es], a 20m promotion film for the harbor of Rotterdam.

The *Delrama* anamorphic reflecting system used curved mirrors arranged in the form of a periscope, instead of the more usual lenses or prisms, and was free of many of their defects. Tests using a modified projection unit were encouraging. *Delrama*'s creator **Dr. Albert Bouwers** [1893-1972] of N.V. Optische Industrie 'De Oude Delft' seized upon the problem and came up with a design more suitable for camera use. This employed specially computed curved surface reflecting prisms, rather than cylindrical lenses or refracting prisms. It was an auxiliary attachment big enough to cover the larger diameter of the lenses needed to cover the double-frame negative and allowed for a maximum angle of view of about 60-degrees, equal to that of *CinemaScope* and the other systems then in use for general film making. The prototype was tested by being sent to the winter sports resort at Sestriere, Italy, with instructions to shoot a wide variety of scenes in all kinds of lighting conditions, particularly with the sun glaring off the snow, to make sure that the prime lens and *Delrama* combination produced no internal reflections. The results were superb, even at wide apertures, so Technicolor obtained exclusive rights throughout the world to use the *Delrama*, so it would only be used as part of its own widescreen system. The name *Technirama* was finally chosen for the system, said to be a combination of the words Technicolor and *Delrama*. *[Using quotes from Grant Lobban's 'The Technirama Story'.]*

The first *Technirama* film was *'Montecarlo/The Monte Carlo Story'* [1956, Sam Taylor; ph: Giuseppe Rotunno], originally shown on horizontal/8-perf 35mm.

Super Technirama 70 used the same compressed frame on the negative, but unsqueezed it on a 70mm print in order to project an image of 2.20:1 through a normal lens. One of the first films was *'Spartacus'* [1959; ph: Russell Metty & Clifford Stine (add scenes)]. Metty used Cooke lenses with a *Delrama* anamorphic adapter;

the 35mm negative was converted via Panavision printer lenses to a 70mm print. One of the last *Super Technirama 70* films was *'Zulu'* [1963, Cy Endfield].

"Spartacus" - 2.20:1 [70mm]

"Spartacus" - 2.35:1 [35mm]

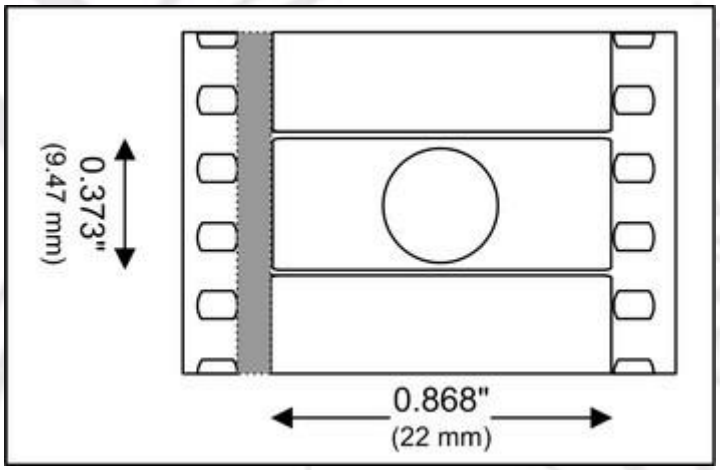
Techniscope

Techniscope was developed by **Technicolor Italia** in order to avoid the added cost of anamorphic production. The system was conceptually the same as *Superscope*. *Techniscope* employed normal spherical lenses. Anamorphic lenses were more expensive to hire, needed more light, were less sharp and had a narrower depth of field. The 35mm camera, however, needed modification. The movement was changed to expose a 2-perf image rather then the customary 4-perf to make the frame only half the normal height. In addition, the camera aperture was changed to 2.35:1 along with the viewfinder markings. A re-centering of the lens axis was not necessary with this system. The 2-perf pulldown meant another significant advantage of *Techniscope*, because the film stock now lasted twice as long as the equivalent length required for normal 35mm cameras.

When *Techniscope* came out, color duplicating stocks were not good enough to do a decent blow-up to 35mm 4-perf *CinemaScope* so Technicolor offered a deal to people using *Techniscope* that it could be blown-up [adding a 2x1 anamorphic squeeze] directly from the 2-perf Eastmancolor negative to three 4-perf 35mm *CinemaScope* b&w positive 'matrices', which then were used to make dye transfer prints, thus saving a generation and creating very nice release prints. Despite the 50% enlargement of the image, *Techniscope* was usually clearer and sharper than *CinemaScope* at the time.

Techniscope became very popular with European low-budget filmmakers because it was economical, saving half the cost of the negative. The first *Techniscope* film was *'La donna dei faraoni/The Pharaoh's Woman'* [1960; ph: Pier Ludovico Pavoni].

The process eventually died out in the late 1970's because Technicolor killed off dye transfer printing and because modern anamorphic lenses were greatly improved, and the cost of optical printing had become extremely expensive.



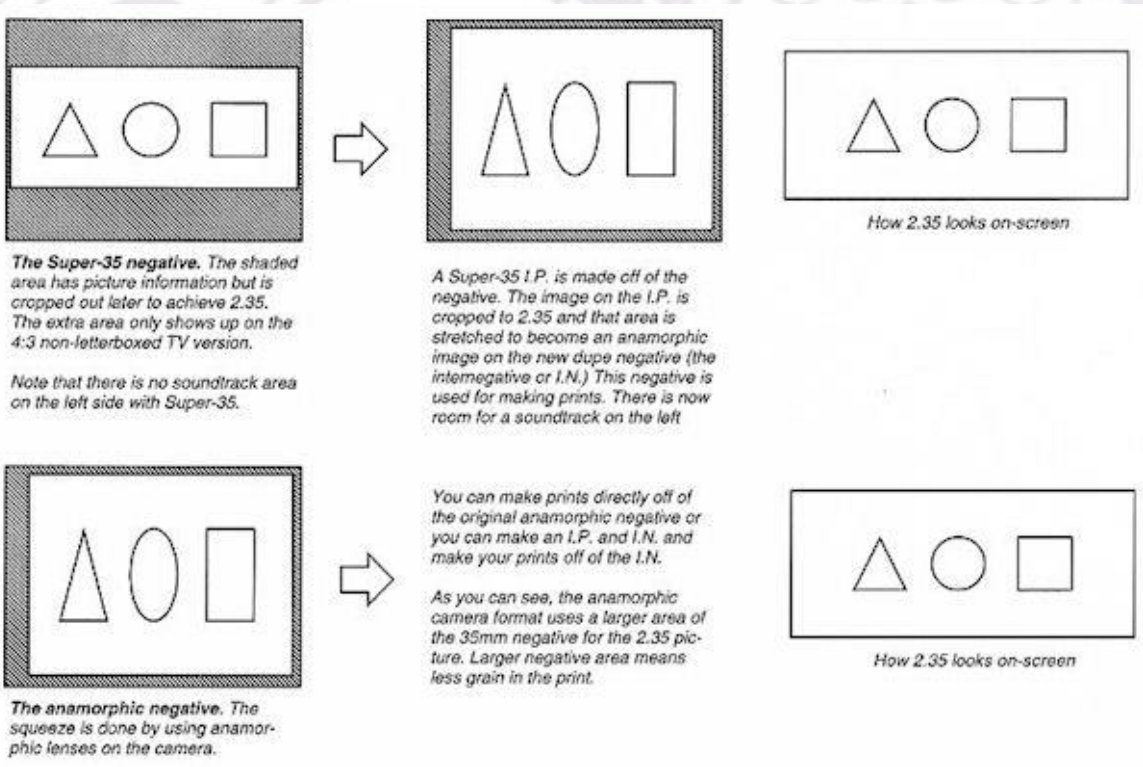
Drawing by Max Smith

In 1999, in Sydney, Australia, MovieLab owner **Kelvin Crumplin** revived the *Techniscope* format renamed as *MultiVision 235*, attempting to commercialize it as a cinematography format alternative to the *Super 16* format. His proposition was that it yielded a 35mm-quality image [from which could be derived 2.35:1 and 1.85:1 aspect ratio images] for the same cost as *Super 16*.

In April 2006, *Techniscope* was more or less revived by Aaton, who realized a pilot film shot in 2-perf *Super 35* [2.35:1]. This pilot was shot with a modified *Aaton35*. The company, however, has now developed the *Penelope*, a 3-perf & 2-perf 35mm camera.

Technovision

In the early 1970's, **Henryk Chroscicki** [1919-2000], developed the anamorphic lens system *Technovision*. He based himself on his research for and experience with his lens-system *Totalscope* [1956]. *Technovision* made its debut in 1974. The first film that used the whole range of *Technovision* lenses was *'L'innocente/The Innocent'* [1975; ph: Pasqualino De Santis]. Technovision was bought in 2004 by Panavision.




Anamorphic lens illustration without stretching


Anamorphic lens illustration with stretching

Todd-AO

A widescreen process developed for producer **Michael Todd** by **Dr. Brian O'Brien, Jr.** of the American Optical Company.

Films were shot on a 65mm negative [30 fps for the first 2 features] using 4 new lenses, among them a 12.7mm 'bug-eye' lens, that photographed an image 128° wide. The picture was printed on 70mm film [2.20:1] to allow for 6 stereophonic soundtracks or was squeezed onto 35mm [2.35:1].

Producer Michael Todd had a dream... a motion picture system with one camera that could photograph action in a very wide angle... a camera that was flexible, capable of telling a story... on one strip of film... from a single projector... on a large screen that was wide and deeply curved... with a quality so perfect that the audience would be part of the action!

Shortly after the premiere of *'This is Cinerama'* Mike Todd sold his shares in Cinerama because the board of directors did not listen to him when he was complaining about the shortcomings of the system. At the moment that the decision was made by Cinerama to build theatres all over the US and Europe, Todd left the company because he was aware of the many problems of *Cinerama*, in particular the join lines between the three projected images. He wanted the same effect as Cinerama but with just one camera and one projector. His dream began to come true.

He was very lucky to find Dr Brian O'Brien, Jr. who had just entered the American Optical Company, the largest optical company in the country as head of research. It took O'Brien and a team of the University of

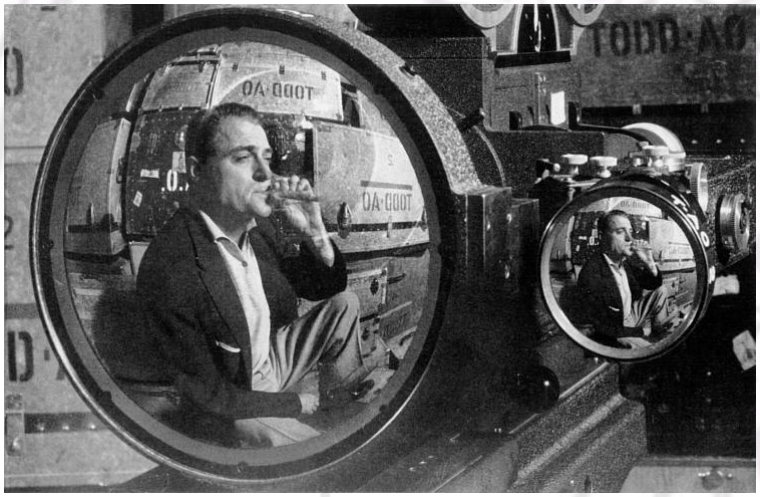
Rochester nearly three years of research and experiments to develop the new lenses. Although American Optical had to design the complete new system, they subcontracted the camera work to the Mitchell Camera Company. And the N.V. Philips' Gloeilampenfabrieken of Eindhoven, Netherlands, entered into an agreement with American Optical in October 1953 to design the projector for the Todd-AO process. Philips had a lot of experience since they were engaged in the design and production of 35mm projectors since 1934. They were instructed to design a compatible 35/70mm projector that could handle 70mm film as well as 35mm. They succeeded in developing the DP70 projector in only 6 months and by the spring of 1954 three finished projectors were delivered at American Optical in Massachusetts. Philips [North American Philips Co., Inc.] received a Class II Technical 'Oscar' [1962] for their revolutionary design of this 'all-purpose' projector, which was only slightly larger than a 35mm machine. Yet, it could project film from any of the eight motion picture systems in use at the time.

Dr. O'Brien found out that for the projection of a movie on a large curved screen a 35mm film would not be sufficient and so he decided they would need a new larger

camera negative. So he was provided with cameras from the earlier industry's attempt to introduce wide film in 1930. His 65mm format is exactly the one used to photograph the 65/70mm version of *'The Bat Whispers'* [dir: Roland West; ph: Robert H. Planck *(Magnifilm 65/70mm)* & Ray June *(35mm version)*]. This 65mm picture frame is three and a half times the area of the standard 35mm film frame. A six channel soundtrack was developed and the release prints were 70mm: 5mm extra to create space for the 6 magnetic sound tracks along the edge of the film. O'Brien and his assistants of the American Optical Company developed four new Todd-AO lenses that cover everything from a close up to wide distance shots. They range from the huge 128° [angle of coverage] wide-angle lens - called 'bug-eye' because of its enormous front element - down through the 64, 48 and 36 degree lenses. And so the Todd-AO 65/70mm format was the guarantee for a sharp image when blown up onto a large wide screen and without the technical problems of the 3-strip *Cinerama* system where Mike Todd's dream for Todd-AO was born.

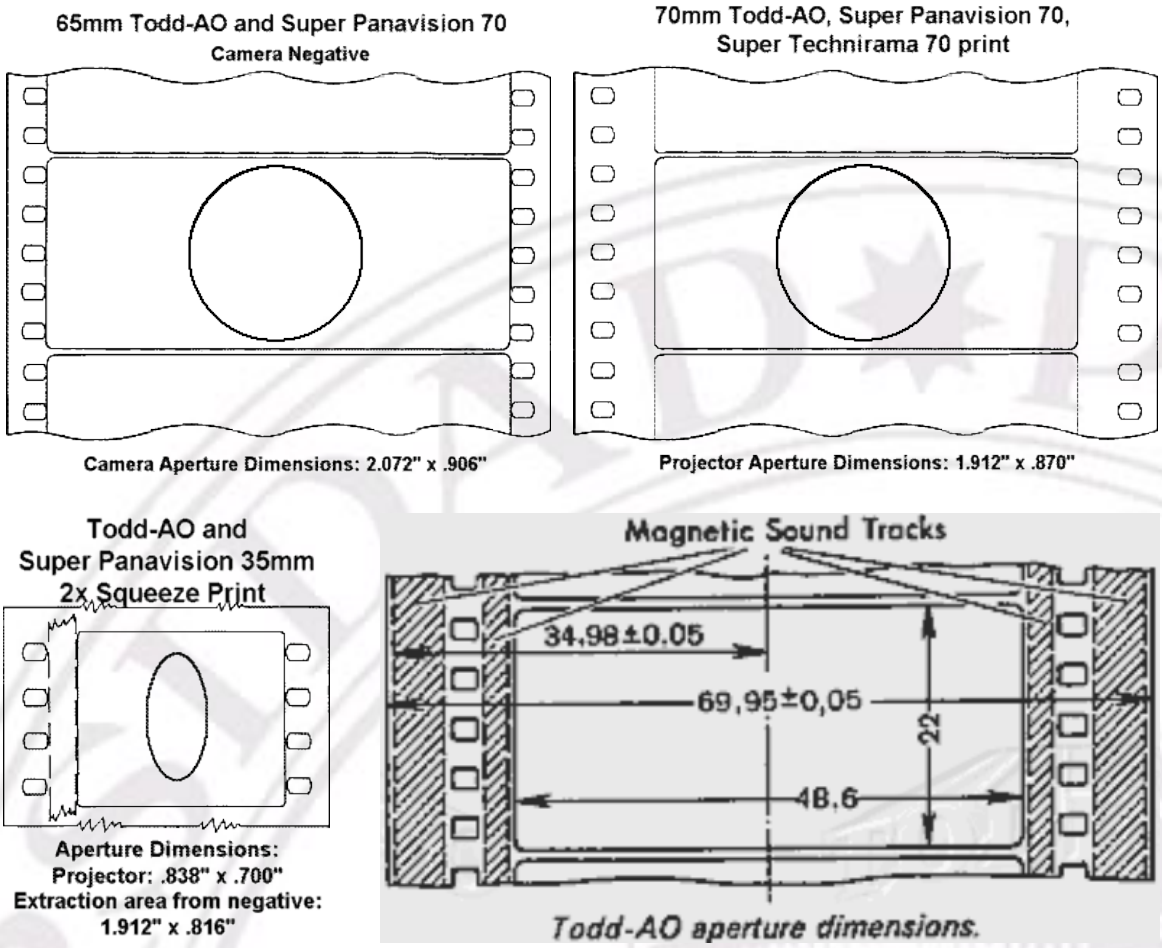
The first *Todd-AO* film, *'Oklahoma!'* [1954 (filmed 14 July - 7 September 1954 on location & 8 September - 6 December 1954 in the studio); ph: Robert Surtees & Floyd Crosby (2uc)], was shot simultaneously in *Todd-AO* [2.20:1] & *CinemaScope* [2.55:1; 24 fps], a version that was significantly different [also in length] from the *Todd-AO* version.

The next film, *'Around the World in 80 Days'* [1955; ph: Lionel Lindon] was shot simultaneously in 2 *Todd-AO* versions with one camera running 30 fps and the other 24 fps. One of the last Todd-*AO* films was *'Airport'* [1969; ph: Ernest Laszlo].



Mickel Todd in an anamorphic lens

In the 1960's, *Todd-AO* needed a new life, and that was done in the form of *Dimension 150* [*D-150*], a photographic and projection system developed by **Richard Vetter** and **Carl W. Williams**. The optical system included a 150° photographic lens, which gave the system its name, special projection optics and a patented deeply-curved screen. The photographic lenses were adaptable to *Todd-AO*/Mitchell 65mm cameras. The first film was *'The Bible... In the Beginning'* [1963; ph: Giuseppe Rotunno]. The last was *'Patton'* [1969; ph: Fred Koenekamp].



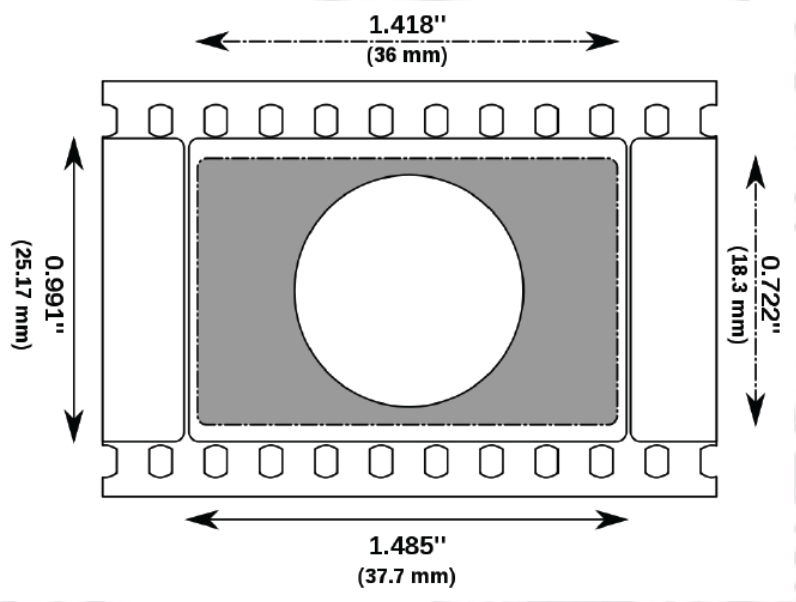
In 1971, *Todd-AO* licensed a line of Japanese designed anamorphic lenses, primarily for use with Arriflex cameras, which it marketed under the name *Todd-AO 35.*

VistaVision

A widescreen film process developed by **Paramount Pictures**, **Loren L. Ryder** and **John R. Bishop**, head of Paramount's camera and film processing departments, in response to 20th Century-Fox's *CinemaScope*, but without anamorphic lenses for camera and projector.

Paramount technicians determined that a larger negative printed down to standard 35mm could provide a vastly improved image on screens up to 50 feet wide. The Paramount camera department had in its inventory a William Fox 'Natural Color' camera built in the late 1920's. This camera exposed two frames at a time through color filters. John Bishop cut out the separation between the two vertical frames, rolled the camera over on its side and fitted it with Leica still camera lenses. The 'Lazy-8' camera, so called because of its horizontal 8-perf pulldown [or pull across],

provided a useable negative area 2.66 times greater than a standard 35mm film, but its 1.96:1 aspect ratio was hardly 'wide' - and only possible when footage was properly screened with a special *VistaVision* projector. The general practice was to reduce and print the images on normal 35mm film [in 1.66:1, 1.75:1 or 1.85:1], a practice that still resulted in a much sharper picture because of the size of the frame on the original negative.



Drawing by Max Smith

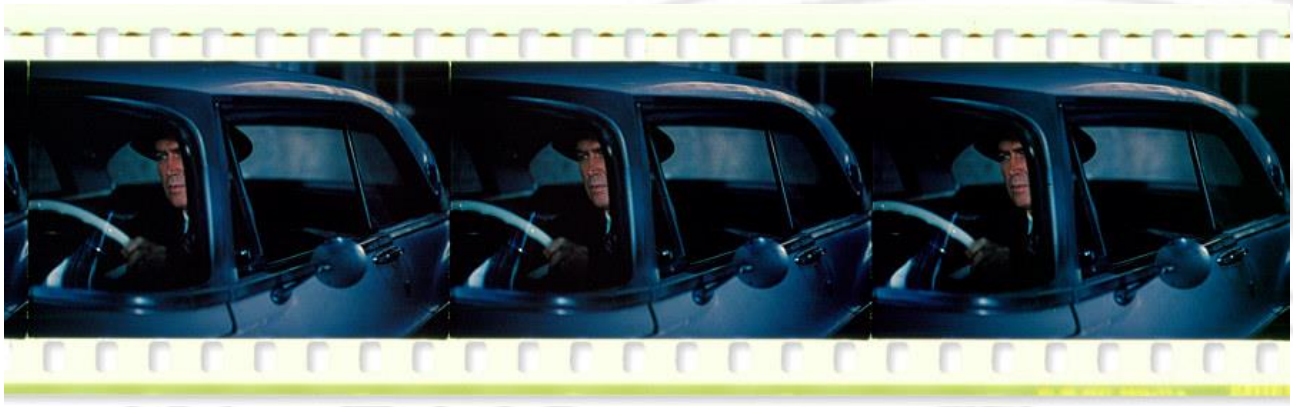
Paramount liked the results and set about to obtain a second 'Natural Color' camera. With two cameras available, Paramount began filming *'White Christmas'* [1953; ph: Loyal Griggs] in 8-perf and placed orders with the Mitchell Camera Company to develop a new silent studio camera for the process that had been christened *VistaVision*. When the first of the new cameras arrived they were immediately put into use in the production of *'The Ten Commandments'* [1956, Cecil B. DeMille; ph: Loyal Griggs; the re-release in 1989 was on 70mm (2.20:1 - *Super VistaVision*)], which would not reach the screen for two more years.

While the first conception of *VistaVision* called for standard 35mm prints, Paramount felt that the negative quality allowed for a variety of prints to be made. Several features were shown in 8-perf horizontal contact prints in limited runs, e.g. *'White Christmas'*, *'To Catch A* Thief' [1954, Alfred Hitchcock; ph: Robert Burks] and *'Strategic Air Command'* [1955, Anthony Mann; ph: William H. Daniels; aspect ratio 1.96:1 (*VistaVision*) and 2.00:1 (anamorphic prints)]. While Paramount tried to keep with their preferred aspect ratio of 1.66:1, they also made provisions for 35mm 4-perf anamorphic prints with an aspect ratio of approximately 2.00:1. The special 8-perf horizontal prints and the anamorphic prints did not see much use and the vast majority of *VistaVision* films were released on standard 35mm flat prints.

With Technicolor's dye transfer printing and the large format Eastman Color negative, *VistaVision* films, regardless of print type, provided an extremely sharp image with beautifully saturated colors. Throughout the 1950's vast improvements in Eastman Color began to reduce the initial benefits of *VistaVision*'s large format negative as a production medium. *VistaVision* was no longer used for feature production after 1962 [*'My* Six *Loves'*; dir: Gower Champion; ph: Arthur Arling].

Paramount switched to Technicolor's *Technirama* based in part on *VistaVision*'s horizontal film transport and double-frame picture area.

After its adoption by special photographic effects supervisor John Dykstra for special effects work on *'Star Wars'* [1976; ph by Gilbert Taylor in *Panavision*], *VistaVision* became standard in rear projection work and is still used for plate photography on elements to be composited digitally. *[Using quotes from an article by Martin Hart, The American WideScreen Museum, 2004.]*



8-Perf Workprint

Widescreen

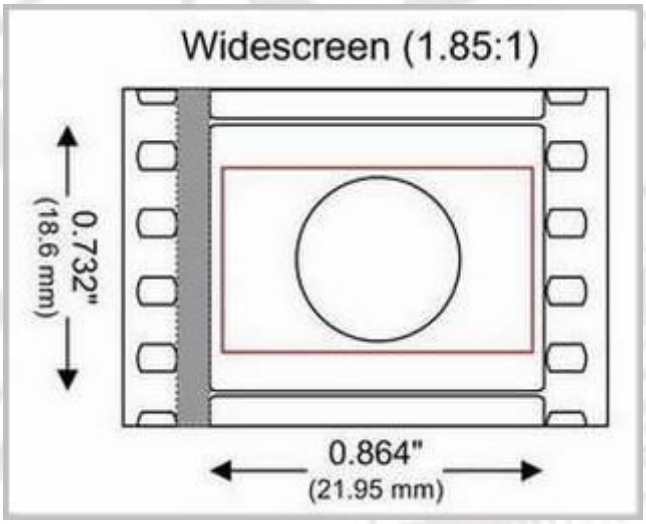
Widescreen: Any spherical film presentation employing an image on the screen with an aspect ratio wider than 1.37:1, which was the standard ratio until the early 1950's.

As early as the 1930's, studios began experimenting with widening the image, e.g. Paramount [*Magnascope*], Fox [*Fox Grandeur* - 70mm], MGM [*Realife* - 70mm (2.13:1)] and Warner Bros. [*Vitascope* - 65mm (2:1)]. After the introduction of *CinemaScope* by 20th Century-Fox other studios, especially those with a large backlog of unreleased spherical films, panicked and began to look for other ways to jump on the widescreen bandwagon. Paramount Pictures was particularly disturbed. The studio had over a year's worth of unreleased features in its vaults and began to investigate the feasibility of obtaining a 'widescreen effect' by masking off the top and bottom of the projected image and using a shorter focal length spherical lens to throw the image onto a wider than normal screen. Warner Bros. had already rejected this technique because it compromised the visual integrity of the film. But Paramount felt that by using an aspect ratio of 1.66:1 and favoring the upper two-thirds of the image - in the 1950's, important information was rarely placed at the extreme top or bottom of the frame - most films could be shown without disturbing the composition too much.

The day after Fox presented its first public demonstration of *CinemaScope*, Paramount screened *'Shane'* [ph: by Loyal Griggs] in a 1.66:1 aspect ratio on a huge, slightly curved screen specially set up on stage 15.

Other studios also chose to mask off the top and bottom of the 1.37:1 photographed image during projection, creating the illusion of a wider image. The resulting, and competing, aspect ratios used by the various studios were 1.66:1 [Paramount, 20th Century-Fox's Panoramic Pictures, RKO & Republic], 1.75:1 [MGM, Disney & Warner Bros.] and 1.85:1 [Universal, Columbia & Allied Artists].

Once they had released their inventory backlog, these studios began to establish this type of widescreen process as a standard by instructing their cinematographers to compose images so that no important action would be lost during projection. By 1956, the studios had decided unofficially upon 1.85:1 as the standard [in the USA] for this masked widescreen method.



Drawing by Max Smith