

From Hand Colouring to Three Strip Technicolor Process: A Historical Review of Colour in Early Cinema

V.P. Shijitha¹, Deepak John Mathew²

¹PhD Scholar Department of Design, Indian Institute of Technology (IIT), Hyderabad, India;

²Professor Department of Design, Indian Institute of Technology (IIT), Hyderabad, India.

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Abstract

The evolution of colour in cinema undergoes several technological innovations and artistic experimentations in the early years of moving images. This article examines the complicated history of colour in motion pictures, from the early applied colouring techniques to photographic methods, 'artificial' to 'natural' colour, particularly in European and Hollywood cinema. That means early manual colouring methods like hand-colouring, tinting and toning to the landmark introduction of the Technicolor three-strip process. This essay focuses on the period from 1895 to 1950, considered the early years of colour development in cinema. This article draws on existing available secondary sources and literature. Initially, colour in moving images was considered a novelty or attraction, but gradually, it revealed its potential to shape motion pictures' technological, aesthetic and dramatic aspects and visual narrative dimensions. The existing general notion of early motion pictures was silent and black-and-white. Nevertheless, this article gives a new insight that most of the early films were in colour and used a variety of colour processes and techniques. Moreover, these early moving images aesthetically uplifted a unique sense of visual attraction to the audience.

Keywords: colour, cinema, technology, aesthetic, Technicolor, tinting, toning, stenciling

Introduction

The article discusses the evolution of colour in early motion pictures from the applied colouring techniques to photographic colouring methods. This article examines how early technological innovations, aesthetics, and narrative use of colour in motion pictures worked from infancy to development. According to John Belton (2000b), the world of colour has undergone various changes over the decades, particularly in motion pictures. The early twentieth-century filmmakers' efforts were mainly in assimilating a colour other than black and white into the cinema frame. In the next stage, they experimented with one colour filling the entire frame or scene. After the 1930s, a new scientific technique of three-colour Technicolor came into existence in the production of cinema, followed by Eastman colour in the 1950s (Belton 2000b). However, the history of colour in motion pictures became a history of failures, setbacks, detours and delays, like the development of widescreen cinema techniques (Belton 2000a).

As a modern and technological art, motion pictures closely engaged with colour from the beginning. However, Tom Gunning (2015) argues that, historically and aesthetically, colour has often been treated in moving images as a secondary quality compared to conventional or traditional art forms. He also added that a significant historical misconception that colour came to the motion picture relatively late in its evolution. However, this concept has recently been corrected with the evidence of recent studies on colour in early moving images. He writes that this misconception may happen because cinema is an art form that considers technological and scientific research to play a significant role, so the history of motion pictures has often been described in terms of progress. According to this view, in the beginning, films were very primitive, which means short, silent, black, and white, and gradually, movies became larger and added sound and colour in later periods (Gunning 2015). Due to different reasons, such as purely archival, aesthetic, and technical reasons, the early use of colour in silent cinema in the history of moving images, although known to specialists, was unknown by most people until recently (Gunning

2015).

Applied Colour in Early Motion Pictures

According to John Belton, "The history of colour in the motion picture is as long as that of the motion picture itself. However, unlike sound, which also began with Edison's first Kinetoscopes, colour took considerably longer to establish itself as a standard for motion picture presentation (Belton 2000b; 339)." Richard Hincha (1992) pointed out there were three ways in which colour motion picture films can be created - first, by physically adding colour through tinting and toning; second, by the additive theory of formation; and third, through the subtractive theory of formation. In earlier periods, colour in cinema was included with the black and white image through various processes. These processes were historically noted as the 'artificial' and 'natural.' Kim Tomadjoglou (2009) wrote that from the beginning to the end of the 1920s, filmmakers applied colour in cinema through hand-colouring, stencilling, tinting and toning. These colour processes were often used in combination. Later, they experimented with natural colour processes, such as two colour systems: Technicolor, Kinemacolor, Multicolor and Prizmacolor, but this failed due to technical and market-related problems. John Belton explained the differences between 'artificial' and 'natural colour methods'. "Artificial" colour refers to early colouring methods or techniques like hand-colouring, stencilling, tinting and toning. Colour was added to black and white films during this process. In contrast, "natural" colour initially describes a process whereby the actual colours of a scene are recorded, through filters, on black and white film and reproduced during projection or in print processing (Belton 2000a).

Hand-Colouring/Painting

The main form of colour in early moving images was applied colour, which means colours applied to the positive print, not achieved through the photographic process (Gunning 2015, 1994). As we discussed earlier, hand colouring, stencilling, tinting, and toning were the conventional methods for colouring the early silent cinema. The earliest colouring method employed in the cinema was hand-colouring, in which elements of each frame were manually coloured on the emulsion side of the print, which was porous enough to absorb dye. Young women and girls with magnifying glasses and brushes often carried out this work, at times as small as a single horsehair (Yumibe 2012). Most of the first motion pictures appeared in colour, painted by hand. Hand colouring means applying colour to figural elements or objects depicted in a film image. Everything is coloured individually through hand painting, such as costumes, props, and decor (Gunning 2015). This means that hand-painting involves applying one or more colours to specific areas of each frame of a positive film. Workers used brushes and transparent aniline-based dyes for this process.(Fossati 1998). For example, Edison's *Annabelle's Dance* (1895) is the first hand-coloured moving image (Higgins 2007), and the *Serpentine Dance* in 1896 (Fossati 1998). In the second half of the 19th century, hand painting of photographic images was already practised in other contexts; for example, magic lantern colourists were the first to be employed in colour films (Fossati 1998). Hand colouring was, in fact, the first production work available to women in the emerging film industry, for as with other decorative arts of the nineteenth century, females were often deployed for handicraft work. This was partly because, at least initially, women could be exploited for a lower wage than men and because females, with their assumed sensitivity to colour and their handicraft skills, were thought to be more suited to work (Yumibe 2015). As film production companies started making lengthy and complex films in the early 1900s, the hand-painting method became impractical for large-scale industrial use. This situation led to the rise of other colouring techniques, particularly stencilling, tinting and toning, which became more prevalent (Yumibe 2012).

Stencilling

The stencilling technique is also considered as the hand colouring method only. By 1905, as film production became more industrialised, the process of colouring films evolved with the stencil process, pioneered especially by Pathe Freres, the world's largest international company. This technique made the colouring process somewhat more manageable but required tedious skilled labour. Workers had to carefully cut stencils, which were prepared for each frames (Gunning 2015). The stencil system widely used by Pathe production company throughout the silent era claimed to produce the best movies coloured with this system. Pathe engineers were the pioneers to patent the machines for mechanised stencilling, called Pathecolor. Between 1907 and 1910, the colouring system was totally mechanised in Pathe laboratories; however, some touch-ups had also to be applied by hand to the final product (Fossati 1998). During that time, Pathe began mechanising the stencil colouring process to avoid wasting new film prints each time. Instead of manually cutting out frame sections, the operator used one positive print as

a guide. They traced the first area to be coloured using a pointer connected to a cutting tool, which created the exact shape on a blank film. The positive was then re-wound, the next colour area was traced, and a new stencil was made. This process was repeated for each colour, making the colouring process more efficient (Cleveland and Pritchard 2015). Other famous filmmakers from France also used such techniques. For instance, the stencil method used was manual stencilling, known in French as ‘Pochoir,’ developed by Melies and Gaumont. For each colour to be applied to the film, a positive copy of the film was hand cut hand as a stencil, and then emulsion was washed away in the selected areas (Read 2009).

Tinting and Toning

During the silent era, tinting and toning became standard methods for adding colour to black-and-white films. Moreover, tinting and toning are often discussed together; they are two distinct technical processes that could be used separately or together (Brown 2012). Tinting is a process where the entire film base is uniformly coloured with a single colour while the black-and-white image underneath remains visible. This results in a monochrome image overlaid with one consistent colour (Read 2009). The tinting was comparatively affordable and became the most common colouring technique until the late 1920s (Yumibe 2012). Initially, tinting was done by brushing coloured varnish onto the film print, which often caused streaks. To resolve the streaking problem, later, film technicians changed the tinting process by dipping the black-and-white positive film into a dye, which the gelatine in the emulsion absorbed, resulting in a uniform colour. (Brown 2012). After 1910, a positive film print stock with a pre-dyed film base (pre-tinted film stock) became available. By the mid-1920s, many film manufacturers offered dyed film at the same price as clear film stock (Read 2009).

Toning was a more complicated process compared to tinting. While tinting mainly to the lighter areas of the frame, where it was more visible, toning was a chemical process that added colour to the darker areas instead (Brown 2012). Toning, on the other hand, changes the colour of the black portion of the silver image. Instead of having black, grey, and white tones, the image now appears as shades of a chosen colour fading into white. Toning can be done using two different processes: Metallic toning and Mordant dye toning (Read 2009). Paul Read (2009; 14) explains that “Metallic toning is a chemical process that replaces the silver image with a coloured metallic salt produced in the film during the process. The dye is generated from the silver image together with the ingredients of the toning solution.” He also explains that “Mordant dye toning is a process where the silver of the image is converted to a salt of silver (or occasionally, another metal) in the bleaching process, and this salt acts as a mordant (Read 2009; 15).”

According to Cherchi Usai Paolo (2000) tinting and toning were occasionally used in the early 20th century. However, from around 1908 to 1925, uniform colouring of the film base became a widespread practice. During this time, most films were coloured using either tinting, toning or a combination of both (Cherchi Usai 2000). Givona Fossati (1998) noted that combining tinting and stencil colouring was standard while combining toning and stencilling was less frequent. In both cases, stencil colouring was added last after the film had already been processed with tinting or toning. The most common combination was using both toning and tinting together. In this process, the film was first toned and then tinted unless pre-tinted film was used. In this situation, toning was done on an already-coloured film to prevent changes in the hue during the tinting process. A popular combination was blue toning with pink tinting, often used for dawn or sunset scenes. Other combinations included blue toning with yellow tinting or yellow tinting with sepia toning (Fossati 1998). This period can be divided into two phases: an initial phase with frequent use of both techniques, followed by a gradual decline in toning between 1921 and 1925. He also noted that "surviving nitrate copies of silent films suggest that some form of tinting or toning was employed in approximately 85 per cent of the total production (Cherchi Usai 2000; 24)."

Natural Colour Processes

When motion pictures became lengthy, the extra burden of expense or the economic limitations of filmmaking always prevented entire frames from being hand-painted or stencilled (Misek 2010). Richard Misek (2010) pointed out that in mid and late 1920s, the tinted colour process disappeared in cinema and entered a new phase. The late 1920s also saw the first widespread use of Technicolor, an early natural cinematographic colour process. All these experiments were done only through technological development, so when the film industry productively solved the sound trouble during the late 1920s, the industry rapidly became colour-conscious. The studios and colour process unit were behind the development of better natural colour cinematography (Belton 2000a).

However, In the early 1930s, adding colour with natural cinematography in cinema was difficult because colour filmmaking practices had become more scientific and complicated.

By the end of the 1920s, the practice of tinting and toning had weakened; although the colour was conspicuous, it was not considered an essential ingredient in feature films (Sarah and Joshua 2019). Paolo Cherchi Usai (2000) points out three factors that have led to the decline in integrated colouring techniques for film bases, such as tinting and toning. The three components are the increasing availability of sophisticated technologies such as Technicolor, the gradual introduction of panchromatic film to replace orthochromatic film, and the introduction of soundtrack on film in the late 1920s. Wendy Everett (2007) noted that studios mainly had lost interest in colour, believing that the novelty of sound alone was enough to attract audiences. According to Gorham A. Kindem (1979), availability (supply), predictability (accuracy about the pictorial depiction of original records), and simplicity (operational flexibility and its compliance to existing technological updates and equipment) were stated to be the technological elements responsible for determining either black-and-white or colour in matters related to film recording, projection mechanisms and printing. It was not until the 1950s that most technological factors favoured colour over black and white (Kindem 1979). Technological factors delayed the widespread use of colour in Hollywood during the 1930s and 1940s to some extent.

During that time, the two well-known colour systems were recognized as additive and subtractive—changes from two-colour additive to two-colour subtractive processes, the major influential technology during the 1920s. Simon Brown (2012) explains that early attempts to reproduce natural colours on movie screens were generally based on additive processes. The basic principle behind additive colour is that various colours can be achieved by combining red, blue, and green light. When these three colours combine, they form white light. During the projection process, adding two or more different colours to one another on screen was necessary for this technology. So, additive processes, such as Kinemacolor, Prizmacolor and Technicolor Process Number One, produced this technology (Belton 2000a), mainly from the 1910 to the early 1920s.

Subtractive colour starts from white light, a combination of all spectrum colours (Brown 2012). The subtractive colour process works by subtracting or absorbing unwanted colours from this white light, leaving only a mixture of primary colours in the scene. When an object is seen, it absorbs or reduces some parts of the visible spectrum of white light, reflecting the remaining components. The human eye then perceives this reflected light as colour (Ryan 1977). Technicolor greatly influenced the history of colour feature film production, particularly in the early subtractive colour process. These were considered the two major technological innovations in colour filmmaking. In 1928, Technicolor developed a new two-colour printing process, and later, in 1932, they offered a three-colour (three-strip) recording and a printing process (Kindem 1979). The subtractive system gained prominence in the 1930s due to the commercial and aesthetic success of three-strip Technicolor and superseded additive colour (Brown 2012). After the unstable degree of success of the two-colour-based system, the three-colour Technicolor was the company's fourth colour process. *La Cucaracha* (1934) and *Becky Sharp*, full length three-colour feature (1935) were the two pioneer films produced in three-colour Technicolor (Higgins 1999, 2000)

Technicolor significantly enhanced the predictability and accuracy of colour recording and printing with its three-strip colour process. Technicolor, having been at the forefront of the colour film industry for many years due to its abundant resources and laboratories, has naturally been the leading force in the field. In the past, Technicolor was predominantly used to incorporate colour sequences into films. However, several other colour processes have emerged rapidly, such as Multicolor, Cinecolor, Harris Colour, and Vitacolor. The Technicolor company held a virtual monopoly on three-colour feature film services until the introduction of Eastmancolor (Monopack system) in the 1950s (Kindem 1979). "Eastmancolor greatly simplified colour recording and printing. It increased the supply of colour production. The advantage of Eastman colour over Technicolor in this respect was that Eastmancolor prints could be made conventional black-and-white printing machines (Kindem 1979; 31)." Colour acquired the popular mode of aesthetic enhancement for many filmmakers of 1940s and 1950s, especially with the launching of Monopack color film stock, regardless of its application in any camera (Street 2018).

Aesthetic Use of Colour in Early Cinema

During the late nineteenth and early twentieth century, colour became a central point for the remarkable aesthetic and scientific inquiry field. These inquiries happened in all sessions, like science, particularly in medicine, fashion and textiles, art and architecture and even in cinema as a part of the historical context of modernity (Tomadjoglou

2009). It means that colour was a concern of inventors, entrepreneurs and producers of popular objects and scientists, aestheticians, and artists (Yumibe 2012). In other words, During the 19th century, new understandings of vision were closely linked to the changing ideas about colour. From this time onwards, the technical and cultural aspects of colour, like coloured objects, coloured visions, and coloured representations, became essential for developing other arts and the science of perception (Yumibe 2012). So, according to Joshua Yumibe (2012), "Without the developments in nineteenth-century colour theory, the cinema would not exist exactly as we know it." He added that to trace the origins of colour in cinema, it is essential to recognise how different aspects of modernity-from physiological studies of colour to the emerging mass culture to modernist art- were interconnected. Modern artists responded to the colour culture of their time, while artistic design principles influenced the industrial production of coloured goods. The ideas and theories of colour that shaped this relationship between art and industry also guided the use of colour in early motion pictures, particularly throughout the silent film era (Yumibe 2012). Early films used bright, applied colours that often-resembled bold combinations seen in children's book illustrations, carnival and circus posters, and the costumes and sets of magic shows and spectacles. Colour played an essential role in the emerging mass commercial culture at the turn of the century. It drew audiences to new visual spectacles, competing with the excitement of modern life and matching the eye-catching designs of new consumer products (Gunning 2015).

From 1895 through the early 1950s, colour was relegated to a novelty status (Belton 2000b). However, in silent films, colour played a variety of overlapping and sometimes conflicting roles. Both aesthetic and commercial reasons drove its use. Aesthetically, colour was used as an attraction on its own, to enhance realism by imitating the natural world, to evoke emotions and appeal to the senses, and as a tool for style and storytelling. Commercially, colour helped differentiate products, could result from distribution or exhibition practices, served as a marketing strategy for high-quality films, and was used for advertising consumer products like fashion (Tomadjoglou 2009).

The genres of early cinema were influenced by nineteenth-century stage traditions and focused on spectacular visual effects, such as people disappearing and reappearing, objects coming to life through stop animation, and various dramatic crashes, explosions and transformations. Along with these visual tricks, one of the most popular special effects in these films was the use of colour, applied through hand colouring and stencilling (Yumibe 2015). Tom Gunning (2015) argues that in early films, colour mainly served as a visual attraction designed to capture the viewer's/audience's imagination and enhance the visual experience. He suggests that these films' unique use of colour helped strengthen the connection between early cinema and human imagination and fantasy (Gunning 2015).

Tom Gunning (2015). added that, at the time, film as a new medium amazed its first audiences by showing unusual aspects of the natural world, such as scientific discoveries or distant places, and by recreating dreams and fantasies. Seemingly realistic subjects like close-up/macro views of plants and insects or scenes from exotic places fascinated early viewers. The use of applied colour enhanced these "realistic "visual attractions. As a result, the range of colours in early cinema was broad and varied. Whether creating a fantasy world or revealing hidden parts of the real one, colour plays a crucial role in enhancing the magic of movies. (Gunning 2015). Tom Gunning (2015)noted that, "even later colour films, especially the use of Technicolor in the 1930s and 1940s in such films as the *Wizard of Oz* or *Gone with the Wind*, or in genres that stressed fantasy, such as musical extravaganzas or Arabian night fantasies, employed saturated hues, bright lighting, and sharp contrasts to construct Hollywood dream worlds (Gunning 2015; 20)."

As discussed earlier, different methods and formulas for tinting and toning were developed during the silent era, creating a wide range of colour effects. These colouring techniques gave motion pictures a distinctive look. Additionally, tinting and toning often carried specific meanings in silent films. On the one hand, using colour in certain scenes could convey clear, symbolic messages (Yumibe 2015). The colours used for tinting became standardised and were selected to match the setting, action or usual mood of a scene. For example, night scenes were often tinted blue, daytime or indoor scenes were yellow, and fire scenes were red (Brown 2012). On the other hand, colours were also used to create emotional and often culturally specific meanings within the images. For example, instead of using blue tint sloely for night scenes, it could represent the icy cold of the Arctic glaciers, as seen in *Gekleurde kijkjes uit de geheele wereld* (Pathe, 1913). Similarly, the red tint was used to depict a devilish magician's underground lair in *Physique Diabolique* (directed by Segundo de Chomon, Pathe, 1912). Filmmakers sensory (blue for cold) and cultural (red for hellish cave) meanings were not applied systematically but uniquely

and varied during the silent era. This blend of meanings contributed to the fantastic quality of these aniline colours in early cinema (Yumibe 2015).

Sarah Street and Yumibe (2019) point out that synthetic colour developments have influenced a wide variety of cultural sectors. It also heightens the sense of colour consciousness in film, advertising, theatre, music, architecture, fashion and design. However, the effects of the recession of the 1930s weakened the dominance of colour. Thus, the recession in the economic sphere has hampered the chromatic modernization of the cultural sphere. It is rather complex to unfold the immediate chromatic legacy of the decade, especially during the 1930s and beyond. This is widely perceived to be the starting point of the global amalgamation of black and white with aesthetic realism, even though embedded in the pictorial traditions of the Depression era, thereby ruling the classical sound scene. At the same time, colour has become completely sidelined to occupy the generic formulations comprising fantasy, melodrama, musical, and historical fiction. By the end of the 1920s, the practice of tinting and toning had weakened; although the colour was conspicuous, it was not considered an essential ingredient in feature films (Sarah and Joshua 2019). Maria Helena Braga e Vaz da Costa (2011) points out that there was a time lag during the 1930s for the optimum utilization of colour technology with its great potential. This lag happened because people expected colour in films to be precisely like colour in nature, preventing the innovation of colour technology and advancement and its massive use in cinema. Consequently, realist cinemas were made in black and white during that period. It was because colour films' association with fantasy and black-and-white films' association with so-called reality affected the film industry during the early period of colour filmmaking (Kindem 1979).

Film theoreticians like Rudolf Arnheim (1957) argue that due to the imperfect technique of colour in the early period, lack of artlessness or naturalness in colour cinema, it did not provide a film artist with a potentially positive medium of expression; in this context, black and white was offered incredibly vibrant and remarkable effects. Black and white has for many years been recognized as the most effective medium because of the insignificance of artistic possibilities of colour in cinema (Arnheim 1957). Earlier, colour was used for unrealistic purposes also, and there was a perception behind the colour and black and white in cinema, so the argument of Edward Buscombe (1985) that counters the realist use of colour is the association of colour with 'unrealistic' genres. The subsequent progression of cinema from black and white into colour mode has thrown some striking revelations into our midst, mainly in its genesis, subject and framework. Films that dealt with fantastic adventures, fairy tales, and animation were normally made in colour, in contrast to those in cinemas that were related to realistic stories and day-to-day man's affairs, which continued to be released in black and white.

According to Richard Misek (2010), "The 'emergence' of this new relation between colour and black-and-white was simply a reorientation of classical Hollywood's paradigm of chromatic opposition. In hybrid films of the 1930s and 1940s, black-and-white signified the here and now of perceptual reality, and colour signified divergences from it (dreams, fantasies, memories, etc.) (Misek 2010; 94)." Then, the reality in cinema became the reality of black and white. That means black and white had a significant role in creating reality in cinema, cementing that reality in cinema /visual reality is created only by black and white shades. However, the realistic perception behind the black and white was gradually declined. Richard Misek (2010) highlighted the historical turning point in Hollywood during the 1965s between colour and black and white. His argument mainly concentrated on the final stage of American network television's transition from black and white to colour, as well as the increased number of colour film productions in Hollywood simultaneously. He also mentioned how the changes in television newsreel from black and white to colour had become a turning point in the perception of colour and black and white. "Newsreels did not always represent viewers' here, but they did come close as film could come to representing their now. When news reports also became colour, colour became a format of the present-of current affairs- and black and -white, by default, became a format of the past (Misek 2010; 84)."

Richard Misek (2010) discussed in his book, in his book that after 1965, the black and white sequences in colour cinema became a means of portraying instances or memoirs of the past. It was sure that the past was filmed in black and white with the help of technology of monochrome cinematography, rather than past itself was not at all black-and-white. It means that prior to 1965, the world was not in black and white but it was filmed in black-and-white. To be simple, in cinema black and white represented as a past was a technologically mediated representation of past only. This process he mentioned like as a cinematic nostalgia of past, "given the fact that black-and-white references past representations, I believe it is specifically an expression of cinematic nostalgia. Cinematic nostalgia has even taken the form of technological nostalgia for black-and-white process

(Misek 2010; 110).” He also added but the association of black-and-white with mediated reality continued into the 1970s. Meanwhile some of the film makers used black and white indicated realism and others were as to mean by past.

Conclusion

This article provides detailed historical narratives/ stories of colour in early cinema. It traces its origin and usage from hand colouring techniques to the technological innovations that shaped the photographic natural colour processes. This article discussed in detail the artificial colour techniques like hand-colouring, stenciling, tinting and toning, their early technical and aesthetic usage and the challenges of early colour methods in cinema. This article also explained technological innovations like additive and subtractive processes and how they developed different natural colour cinematographic processes. The evolution of colour in early motion pictures reflects a complex interaction between filmmakers' imaginative enthusiasm and scientific advancement. While the early methods and techniques were primitive, time-consuming, labour-intensive and limited, following inventions permitted filmmakers to explore colour's complete potential, transforming it from a novelty, fantasy and attraction into a fundamental part of cinematic storytelling and visual narration.

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