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The Silent Death of Sonochrome

When thinking of the transition to sound pictures in early cinema, there is a tendency to think of the transformation in (literally) black and white. The silent era had the days of tints, tones, and hand-drawn colors that suddenly disappear into sound-accompanied grayscale, not to reappear until the dawn of Technicolor. In this version of the past, Kodak Sonochrome appears to be an anomaly at first glance. Released in 1929, Sonochrome was a pre-tinted 35mm film stock that was compatible with optical sound—and was marketed as such to film studios. For Sonochrome to have any market success, it would mean a different landscape of color in the early era of sound pictures. In this paper, I will discuss the colorscape of cinema during Sonochrome's creation, its technical aspects, the evidence of its use in the 1930s, and on-going preservation concerns. Through a look into this rarely discussed piece of technology, I will attempt to illustrate how Sonochrome represents a much more colorful transition into photographic color than is acknowledged in film history.

Color in the Silent Era

Though Sonochrome appears to be a relic of its time, the demand for pre-tinted stock came years earlier. Throughout film's evolution in the silent era, audiences had come to expect the use of color in one form or another. During the 1910s, eighty to ninety percent of all films were either partially or entirely colored.[1]This was predominantly through the use ofapplied color processes, in which color would be added directly onto the positive, black and white film prints. These practices included tinting, toning, hand-coloring, and stenciling. It became common

[1] Roderick T. Ryan. "Color in the Motion-Picture Industry." *SMPTE Journal 85*, no. 7 (1976): 496. https://doi.org/10.5594/j13260.

practice for filmmakers to combine these processes for added depth.[2]However, even one of these processes tended to be labor intensive and left room for error. In the case of tinting, the film stock is submerged in a dye bath that tints the entirety of the stock even to the perforations. However, tints could come out uneven, and the chemicals used could cause the film to become brittle, especially when faced with the heat of a projector bulb.[3] In addition, tinting could disrupt other color processes already applied onto the film. While tints dyed the entirety of the stock, toning targeted the silver in nitrate's emulsion, leaving only the picture colored. As tinting needed to be done after the toning process, it could transform the tones into unwanted colors.[4] Kodak presented its solution to this issue in 1921 by releasing pre-tinted stocksin nine different colors.[5]With pre-tinted film, the base is colored rather than the gelatin so that the color is not disturbed by the developing or fixing process. It also provided ease in combining processes. Around 1925, Agfa released their own pre-tinted stocks in twelve different colors.[6] With other film manufacturers following suit and releasing their own products, pre-tinted stocks were even sold at the same price as un-tinted stock by the mid 1920s.[7]

The end of the 1920s, however, saw the increasing use of optical sound. By 1928, five Hollywood studios had adopted the optical sound system created by Western Electric.[8] With a growing demand for sound in cinema, film manufacturers also began creating photosensitive

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[2] Paolo CherchiUsai. "The Color of Nitrate: Some Factual Observations on Tinting and Toning Manuals for Silent Films." *Image* 34(Spring/Summer 1991): 29-38. http://search-ebscohost-com.proxy.library.nyu.edu/login.aspx?direct=true&db=asu&AN=505553898&side=eds-live.
[3] Ibid, 33.
[4] Ibid.
[5] Barbara Flueckiger. "Tinted Film Base / Kodak Sonochrome." Timeline of Historical Film Colors, 2012. http://filmcolors.org/timeline-entry/1330/#/.
[6] Ibid.
[7] Paul Read. "'Unnatural Colors': An Introduction to Colouring Techniques in Silent Era Movies." *Film history* 21 (1). 14. 2009. https://search-ebscohost-com.proxy.library.nyu.edu/login.aspx?direct=true&db=edsjsr&AN=edsjsr.27670755&site=eds-live.
[8]Leo Enticknap. "The Transition Process – from Experimentation to Standardisation." In *Moving Image Technology*, 114. London: Wallflower, 2005.

film stocks that would accommodate the printed soundtracks.[9] This created issues when combined with tinting and toning processes. The dyes would interfere with the soundtrack, in many cases destroying the sound quality. In other cases, especially with the use of pre-tinted stocks, the different colors would absorb different amounts of light, causing the volume levels to jump from color to color.[10]This left studios with a grave dilemma; to choose sound or color? It is here that history tends to purport that sound became the obvious and uncontested choice in the end. However, studios were not willing to give up on color so easily. Even if they had, such a massive change would not come without nuance or time. It was in this time of crisis that Sonochrome would be introduced.

Sonochrome Technical Aspects

Sonochrome was developed by Loyd A. Jones, Kodak's lead researcher at the time of its release in 1929. Jones detailed his findings and the specifications of Sonochrome in a paper written for SMPE Vol. XIII entitled "Tinted Films for Sound Positives." There are two major components that stand out in Jones's paper: his methodology for addressing the issues with volume variation between hues, and the overall artistic and psychological use of color in film.

In order to address the volume variation, lighter hues were chosen so as not to absorb as much radiation from the photo-electric cell.[11] Changes in volume were inevitable as different colors would have different effects on the film, however Jones discovered a range of variation that was passable to the human ear. Overall, he concluded that there could be no more than a

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[9] Ibid.
[10] Barbara Flueckiger, Eva Hielscher, Nadine Wietlisbach, Michelle Beutler, and Ulrich Ruedel. "Tinting and Toning: The Luminous Beauty of Chemistry from Silent to Sound Film." Essay. In *Color Mania: The Material of Color in Photography and Film.* Fotomuseum Winterthur, 2020.
[11]Loyd A. Jones, "Tinted Films for Sound Positives." *Transactions of the Society of Motion Picture Engineers* 13, no. 37 (1929): 199-226. https://doi.org/10.5594/j10216.

four-decibel difference between colors. This meant the maximum photo-electric density was 0.3, with the minimum being 0.1.[12] Sonochrome was mostly compatible with Western Electric's potassium gas-filled optical sound bases, however the stock also proved compatible with Radio Corporation of America's caesium types (with slight volume differences depending on which was used).[13] This led to seventeen different fully sound compatible stocks (sixteen colors and one clear base to maintain volume consistency).

The sixteen colors are generally much lighter in hue when compared to Kodak's or Agfa's pre-tinted stocks from earlier in the decade, with an absence of a deeper red shade. Jones goes on to explain the "visual and psychological characteristics" of each shade.[14]For nearly every color, he gives example scenarios of scenes or emotions for which the colors could be used. It is perhaps his belief in the psychology of color in film that led him to give each color more unconventional names that suggested their potential use. Color names can be seen in the figure below:

[12] Ibid, 206-208.
[13] Ibid, 201-204.
[14] Ibid, 221.

TABLE I

Visual characteristics of the series of tints

No.	*Color Name*	*Hue* λ	*Hue* No.	*T* %	*Description*
0	Clear base	—	—	100	Hueless, clear
1	Rose Dorée	633	1.0	57	Deep warm pink
2	Peachblow	619	4.0	61	Flesh pink
3	Afterglow	603	7.5	66	Orange
4	Firelight	596	12.0	66	Yellow-orange
5	Candleflame	585	17.5	75	Orange-yellow
6	Sunshine	579	23.0	83	Yellow
7	Verdante	520	36.0	57	Green
8	Aquagreen	505	40.0	40	Blue-green
9	Turquoise	490	43.0	46	Blue
10	Azure	484	47.0	28	Sky-blue
11	Nocturne	476	51.0	28	Violet-blue
12	Purplehaze	455	56.5	38	Blue-violet
13	Fleur de lis	—575	60.0	25	Blue-purple
14	Amaranth	—557	64.0	31	Red-purple
15	Caprice	—537	67.5	53	Cool pink
16	Inferno	—508	71.5	36	Red-magenta
17	Argent	—	—	71	Hueless

Figure 1[15]

While some titles speak for themselves, names like “peachblow” or “fleur de lis” do little to market the actual colors. In general, its difficult to imagine how a filmmaker might navigate the exact colors they needed in the 1930s without a guide to help determine the exact shades. This is especially the case when determining between “afterglow,” “firelight,” and “candleflame.” Some scholars have derided Jones’s overly symbolic titles, and it’s hard to argue that they do present some degree of absurdity. However, with a lack of edgecodes to properly distinguish Sonochrome tints, the distinct names are now an unforeseen grace when attempting to find evidence of Sonochrome’s use. It’s breadcrumbs like these that help show its prevalence in the burgeoning era of sound.

[15] Ibid, 209.

Market and Cultural Impact

It's a shame to say that there are so few known prints of Sonochrome in museums or archives. Often times, the evidence of its use doesn't even come in the form of a print, but from director's notes, film reviews, or complete happenstance. Because of this, it's almost impossible to know the full impact of Sonochrome nor its true prevalence. Despite this, the evidence that is known shows a number of prominent directors and films that have survived history, even if the colors have not. One of the most notable uses of Sonochrome is in *Dracula* (Tod Browning, 1931). The library of congress holds evidence of the original negative with "VERDANTE" written on several reels, indicating the use of green throughout the film.[16] The green color was meant to create a sense of fear and was such a prominent creative decision that early posters for *Dracula* were printed in green.[17] However, it's doubtful that Browning's use was a specialized situation. Anthony L'Abbate, preservation manager at George Eastman Museum, developed a fascination with Sonochrome prints and has ventured to find as many as possible, even if he admits that the task is comparable to "looking for a needle in a haystack."[18] In his search he's been able to confirm Sonochrome's use in *The Virginian* (Victor Fleming, 1929), *Glorifying the American Girl* (Millard Webb, 1929), *Let's Go Native* (Leo McCarey, 1930), Popeye short *A Dream Walking* (Dave Fleischer, 1934),[19]*Bird of Paradise* (King Vidor, 1932), *One Hour with You* (Ernst Lubitsch, 1932), and *Arizona* (Wesley Ruggles, 1940).[20]

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[16] Sarah Street and Joshua Yumibe. "Color and the Coming of Sound." In *Chromatic Modernity: Color, Cinema, and Media of the 1920s.* Film and Culture. New York, NY: Columbia University Press. 2019. 267-268. https://search-ebscohost-com.proxy.library.nyu.edu/login.aspx?direct=true&db=edsmzh&AN=202019302768&site=eds-live.

[17] Ibid.

[18] Kyle Westphal. "The True Story of Tinted Talkies: An Interview with Anthony L'Abbate." Chicago Film Society, September 3, 2012. https://www.chicagofilmsociety.org/2013/09/03/the-true-story-of-tinted-talkies-an-interview-with-anthony-labbate/.

[19] Anthony L'Abbate. "L'aventure Des Films SonoresTeintes et Vires Aux Etas-Unis." *1895*, no. 71 (December): 136. 2013. doi:10.4000/1895.4777.

[20] Westphal, "The True Story of Tinted Talkies."

It's important to note other color processes happening around the same time period to put these works properly into context. Photographic color was already starting to take hold in the film industry, with Technicolor III, a 2-color subtractive process, being first released in 1927. Multicolor (later bought out by Cinecolor), Vitacolor, Fox Color, and Technicolor IV were all processes that marketed their compatibility with sound.[21] The success of photographic color was undeniable, and these early processes foreshadow the eventual normalization of color in film (which would lead to a more definitive death of applied color). In comparison, it's difficult to see Sonochrome's ability to compete. It was a monochromatic process, the adding of other applied colors (the basis of pre-tinted stocks' initial marketing) was comparatively labor intensive, and the use of Sonochrome introduced editing inconveniences because of the 20-frame difference between the image and optical soundtrack.[22] However, these more elaborate processes were no small expense that studios couldn't afford to incorporate too frequently during the depression.[23]It's possible that the cost of photographic color meant that applied colors could still transition into the sound era without facing total destruction. While Sonochrome was a convenience in its sound capability, filmmakers still sought to use traditional methods of applied color with sound films. L'Abbate provides examples of films that used tints and tones, such as *Dante's Inferno* (Harry Lachman, 1935), *Hell's Angels* (Howard Hughes, 1930), and *A Midsummer Night's Dream* (Max Reinhardt & William Dieterle, 1935).[24]

The continued use and refinement of tints and tones, Sonochrome, and photographic color all illustrate a time of colorful experimentation in the late 1920s and throughout the 1930s. Something that is further displayed in MGM's sepia-tone process. Developed in 1937 by John M.

[21]Street and Yumibe, "Color and the Coming of Sound," 229-238.
[22] Read, "Unnatural Colors," 24.
[23] Street and Yumibe, "Color and the Coming of Sound," 238.
[24]L'Abbate, "L'aventure Des Films SonoresTeintes," 136.

Nickolaus, the process is most notably known for its use in *The Wizard of Oz* (Victor Fleming, 1939). Nickolaus used Sonochrome as the base for the two to three color toning process to give it its distinct color.[25]The process was developed with chemicals that wouldn't harm the optical sound, as previous toning chemicals were known to destroy the soundtrack.[26]Sepia-tones gained a particular popularity in the late 1930s, and the use of pre-tinted stocks in general became common practice for these methods.[27]If Sonochrome and applied colors were doomed to be forgotten in the era of sound, it's interesting to note the advancements made in sepia-toning so late into the 1930s. What would be the need if photographic color had replaced all early color methods and optical sound had killed the rest? This makes *The Wizard of Oz* an interesting case study in 1930s film color. The use of bright, beautiful technicolor is combined with applied film processes that were both developed and commonplace in the silent era. It's entirely possible that the novelty of this is a modern revelation, while audiences in the 1930s were seeing the marriage of two everyday practices playing out on the silver screen.

Preservation Concerns

Sonochrome's absence from film's historical consciousness already illustrates a lack of proper care for these films. It's unfortunate that there are so many factors working against its preservation, leaving scholars and archivists with little to work with in its recovery. As stated previously in this paper, Sonochrome's lack of specialized edge codes make it difficult to identify. However, Paul Read notes how to tell the difference between pre-tinted and lab tinted stocks:

[25] Westphal, "The True Story of Tinted Talkies."
[26] Street and Yumibe, "Color and the Coming of Sound," 265-267.
[27] Westphal, "The True Story of Tinted Talkies."

> The method of identifying this on an original tinted print is to scratch the emulsion off in an area outside the perforations. If the scratch is clear and uncoloured the film was tinted in the film laboratory using dye solutions; if the scratch is the same colour as the picture highlights, the film base was dyed before coating. (This can be confused by some nitrate film bases that have discoloured and have a yellow stain).[28]

However, without the knowledge of pre-tinted sound stock in the first place, the lighter hues of Sonochrome can be confused for color fade.[29]In addition, many Sonochrome prints were presumably lost in the 1950s when nitrate prints were transferred onto acetate stock for the purpose of television broadcast.[30] Preserving tints and tones was a lower priority to studios when television was in black and white, and as a result many of the applied colors of the 1930s have been lost. Even when television became colorized in 1954, re-transferring or re-printing versions of films with their tints and tones was seen as a needless expense.[31]This, of course, only extends to already known and preserved prints of the time—not much can be done about the amount of lost nitrate release prints of film in general.

The matter of finances is a constant challenge that archives must face, as well. Preserving color, especially applied color, is an expensive and complicated endeavor that many institutions may not be equipped to handle. Paolo CherchiUsai elaborates on this further in his own article, discussing how many applied methods of color are now extinct because of their reliance on the silver halides in nitrate stock.[32] Archives often must choose between printing from color negative stocks, or on a tinted base from a black and white negative.[33] Neither options produce completely accurate results, especially considering both methods require some level of recreation from modern technicians. Even without specialized consideration for Sonochrome and other

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[28] Read, "Unnatural Colors," 14.
[29] Paul Read and Mark-Paul Meyer. "Using Pre-Tinted Positive Film on Which to Make the Print." In *Restoration of Motion Picture Film,* 184-85. Oxford: Elsevier Science, 2000.
[30] Street and Yumibe, "Color and the Coming of Sound," 265.
[31] Westphal, "The True Story of Tinted Talkies."
[32]Usai, "The Color of Nitrate," 36-37.
[33] Ibid.

applied color processes, the reality of historical color is that it is doomed to fade. Archives can only do so much to slow the process, but stopping it altogether is an impossibility.

Conclusion

Though the evidence of its use is concentrated to the 1930s, Kodak would continue to release Sonochrome until the 1960s. After its role in the transition of film colors, it would predominantly be used as a theater snipes or advertisements.[34] The end of the 1930s would mark a definite decline of Sonochrome'sdemand—and of applied colors in general—illustrated by Kodak reducing the number of colors released in 1940 to only three.[35]

Though Sonochrome's presence in film history is scarce, it is far from insignificant. Kodak's endeavor to create a product of this type is an indicator of how applied color was sought after at the end of the silent era. The loss of Sonochrome today in archives and institutions indicates an entirely new perspective to cinema during the introduction of sound. One that proves that color did not simply fade away in the 1930s, and that its continued existence was not remarkable because of how common it might have been. L'Abbate speaks in an interview about tracking down Sonochrome prints through film reviews, thinking that publications would surely mention the tints and tones of a film because of how novel it must have been. Instead, he discovers that the lack of attention on Sonochrome in the 1930s most likely implies that color on film was something audiences already expected.[36]

Photographic color processes are carefully documented because of the technological advances they represented. However, Sonochrome represents something different. Most likely, it represents the maintenance of a status quo in film exhibition. This can never be truly known

[34] Westphal, "The True Story of Tinted Talkies."
[35] Street and Yumibe, "Color and the Coming of Sound," 263.
[36] Westphal, "The True Story of Tinted Talkies."

today because of the significant losses Sonochrome and applied color have suffered. However, evidence makes it clear that Sonochrome played a part in the process of cinema's color evolution. Archivists and restorationists that have devoted time to bringing such subjects to the forefront should be commended, as these findings let us know that there was far more color in an era that we can't help but see in black and white.

Bibliography

CherchiUsai, Paolo. "The Color of Nitrate: Some Factual Observations on Tinting and Toning Manuals for Silent Films." *Image* 34 (Spring/Summer 1991): 29–38. https://search-ebscohost-com.proxy.library.nyu.edu/login.aspx?direct=true&db=asu&AN=505553898&site=eds-live.

Descriptive article on the different types of applied colors from early cinema and their archival/preservation implications. Article gives descriptions of tinting, toning, hand-coloring, and stenciling. It also takes into consideration the combination of processes and their effect on each other. Usai also discusses the usefulness of historic tinting manuals for restorationists attempting to recreate color processes.

Enticknap, Leo. "The Transition Process - from Experimentation to Standardisation." In *Moving Image Technology*, 111–122. London: Wallflower, 2005.

Enticknap's book provides a basis/timeline of different technologies in motion picture history. In order to commentate on Sonochrome, understanding optical sound was a necessity. Enticknap gives detailed descriptions of technology, studios, manufacturers, and cultural elements that became elements in film sound's evolution. Other chapters also provide details on color camera, exhibition, and preservation technology.

Flueckiger, Barbara. "Tinted Film Base / Kodak Sonochrome." Timeline of Historical Film Colors, 2012. https://filmcolors.org/timeline-entry/1330/#/.

Barbara Flueckiger has provided an invaluable resource to anyone who wishes to know more about the many different color technologies, techniques, and processes throughout film history. The timeline entry on Sonochrome provided a very helpful jumping off point from which I was able to expand my research for this paper. Included in the timeline entry are primary sources from Kodak, and scans of the different Sonochrome shades from old Kodak sound tests.

Flueckiger Barbara, Eva Hielscher, Nadine Wietlisbach, Michelle Beutler, and Ulrich Ruedel. "Tinting and Toning: The Luminous Beauty of Chemistry from Silent to Sound Film."

Essay. In *Color Mania: The Material of Color in Photography and Film*. Fotomuseum Winterthur, 2020.

Ruedel's essay on tinting and toning provided more context for applied colors transition into the sound era. Though Sonochrome is never mentioned by name, sound compatible pre-tinted stocks are discussed. However, this essay discusses laboratory tinting and toning in the sound era and provides examples of its continued use, despite numerous sources discussing the effect the dye chemicals had on the soundtrack. Though Sonochrome was a convenient resource at the time, this put into perspective how prevalent applied colors continued to be even after the silent era.

Jones, Loyd A. "Tinted Films for Sound Positives." *Transactions of the Society of Motion Picture Engineers* 13, no. 37 (1929): 199–226. https://doi.org/10.5594/j10216.

Primary source for Sonochrome's technical aspects. Written by Loyd A. Jones for the purpose of marketing and information on the new film stock. A full description of how the colors interact with optical soundtracks, what was done to address volume variation, and the process of how the colors were selected is included. Jones spends a good portion of the second half of the paper discussing the different colors on a psychological level, and gives examples for what different colors could be used for in a creative setting.

L'Abbate, Anthony. "L'aventure Des Films SonoresTeintés et Virés Aux États-Unis." *1895*, no. 71 (December): 133–43. 2013. doi:10.4000/1895.4777.

Unfortunately, there is no translation for L'Abbate's paper. This source was used mostly as a supplemental source to L'Abbate's interview with the Chicago Film Society.

L'Abbate is one of the few scholars who are in active pursuit of different Sonochrome

prints, and in his interview he mentions having found over 70 features. This paper appears to be an account of his finding on Sonochrome and applied colors in sound. I am not proficient in French so unfortunately the deeper analyses were lost on me, but I had enough linguistic ability to decipher a number of prints that L'Abbate discovered to be printed on Sonochrome. A list of films that used traditional tinting and toning was found in the paper, as well.

Read, Paul. "'Unnatural Colours': An Introduction to Colouring Techniques in Silent Era Movies." *Film History* 21 (1): 7–46. 2009. https://search-ebscohost-com.proxy.library.nyu.edu/login.aspx?direct=true&db=edsjsr&AN=edsjsr.27670755&site=eds-live.

Paul Read is provides an overly pessimistic view of Sonochrome and its market impact. He writes as though Kodak and even Loyd A. Jones were delusional for having released the product, going as far as to call Sonochrome a marketing embarrassment. While I wholly disagree with his assessment of Sonochrome's place in history, he does provide valuable points regarding Sonochrome's technical issues. In particular, new challenges in editing with tinted base on optical sound prints. His perspective provides a balance when discussing Sonochrome – though I don't agree that the film stock was a failure, its complete absence from film history shouldn't be overlooked.

Read, Paul, and Mark-Paul Meyer. "Using Pre-Tinted Positive Film on Which to Make the Print." In *Restoration of Motion Picture Film*, 184–85. Oxford: Elsevier Science, 2000.

A deeper look into the restoration of films. The section cited is from a brief section of the book also provided on Barbara Flueckiger's website. Read and Meyed give a more

technical view into the issues that lead to a demand for pre-tinted stock. What I found particularly informative was the mention that Sonochrome could be mistaken for color fade due to its lighter hues.

Ryan, Roderick T. “Color in the Motion-Picture Industry.” *SMPTE Journal* 85, no. 7 (1976): 496–504. https://doi.org/10.5594/j13260.

An informative and succinct source on many different color processes throughout time. It’s surprising to see Sonochrome mentioned in such a general setting, especially considering the section on tints and tones is so brief. The article also mentions different approaches to tinting and toning such as Pathecolor and Famous Players-Lasky’s multicolor lithograph. Overall, this article provided detailed context to different color technologies of the time.

Street, Sarah, and Joshua Yumibe. “Color and the Coming of Sound.” In *Chromatic Modernity: Color, Cinema, and Media of the 1920s*. Film and Culture. New York, NY: Columbia University Press. 2019. https://search-ebscohost-com.proxy.library.nyu.edu/login.aspx?direct=true&db=edsmzh&AN=202019302768&site=eds-live.

A thorough analyzation of the different color processes and their relation to the optical sound era. Street and Yumibe put into context the time period in which Sonochrome was introduced, its importance and impact from what evidence there is, and issues of its preservation that stem from the 1950s. MGM’s sepia-tone is also discussed in this article, however it’s mentioned in the context of applied processes that existed in the sound era, not as having a direct connection to Sonochrome.

Westphal, Kyle. “The True Story of Tinted Talkies: An Interview with Anthony L'Abbate.” Chicago Film Society, September 3, 2013. https://www.chicagofilmsociety.org/2013/09/03/the-true-story-of-tinted-talkies-an-interview-with-anthony-labbate/.

Anthony L’Abbate’s interview with the Chicago Film Society was invaluable source for this paper. L’Abbate has spent an incredible amount of time researching and seeking out Sonochrome prints. It’s in this interview that he mentions MGM’s use of Sonochrome for John M. Nickolaus’s sepia tone process. L’Abbate also gives a compelling argument for Sonochrome’s absence from history at the time and how audiences in the silent era were much more accustomed to seeing color on screen than we give credit for.