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Digital Color Technologies: Color Grading, Restoration, Archives and Criticism

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Overview

As part of a broader exploration of digital film aesthetics, this lesson plan focuses on trends in film color facilitated by new post-production technologies, including an increased reliance on the process of color grading. The focus on color technologies fits with broader aims and themes within media studies; namely to develop critical skills in the analysis of media aesthetics, including their historical development, and the corresponding influence of color technologies on audiences and representational norms. The lesson builds on a range of scholarship on color within film studies, including *Color: The Film Reader* (eds. Dalle Vacche and Price, 2006) and *Color and the Moving Image: History, Theory, Aesthetics, Archive* (eds. Brown, Street, Watkins, 2013), as well as broader analyses of the significance of color to human experience, including *Contemporary Color Theory and Use* (Bleicher, 2005).

The screening for the week, *Amélie*, allows for close analysis of digital color processes and what Vanderschelden (2007) refers to as “digital painting”. I consider the emergence of software for analysis of film color, why digital filmmakers are increasingly returning to black & white palettes, and several other ways in which digital technologies and culture are impacting film color through processes of restoration, archiving, and popular criticism. My treatment of the topic addresses five main areas:

1. Digital color trends and their analog history
2. The digital restoration of analog films
3. Digital tools for color analysis
4. Digital archiving of analog film process
5. The digital appreciation of film colors on social media platforms like Instagram.

Students will be introduced to key critical and creative debates related to the history of screen color technologies, which will be developed through a number of case studies. Students will apply their learning through the creation of a color palette task, to be completed using a freely available app.

Rationale

The topic of Digital Color Technologies is taught in the first half of an advanced undergraduate class on Digital Theory and Practice, for students in the 3rd or 4th year of a Film degree. The course content is divided into two related parts, beginning with six weeks on digital data, archives, and aesthetics. Other topics examined in the first section include: glitch art, database cinema, eye tracking software and stereoscopic media. Part two of the

class focuses on various kinds of digital bodies and performers. This involves studies of the relationships between digital media and the human body, as well as the “body” of the screen itself (as theorized by sensory scholars). Topics covered include motion capture performance, computer animation and 3D printed puppets, and studies of the technologized voice. In keeping with the course’s broader aims, the lesson on Digital Color Technologies allows students to combine critical theories with practical applications: namely, to consider how formal conventions (the aesthetics of color) have developed across screen history, and how they intersect with wider media culture and power dynamics. For example, by examining how color technologies were developed with a view to recording white skin over all other skin tones, the lesson conveys how media technologies are not “neutral” but culturally determined and reflective of broader social hierarchies (see, for example, Dyer 1997; Roth 2009; Brown 2013). Furthermore, by using color theory to explore how color can be used to influence audiences’ emotional responses, the lesson will underscore the potentially far-reaching significance of screen aesthetics.

Across the course, students are required to engage in a number of related practical tasks. These provide them with more experiential forms of understanding and encourage embodied reflection on the topics under focus. The tasks also aim to increase students’ awareness of the range of easily accessed digital tools and to instill increased confidence when it comes to incorporating such tools into production-based work.

General Timeline

This Digital Color Technologies lesson plan is designed for a 2-hour timeslot, made up of a traditional 1-hour lecture followed by a 1-hour discussion-based tutorial. Students are expected to have completed the required reading and required screening – *Amélie* (2001) — in advance of the class. This topic also includes a practical task for students to complete in the same week and after the class. Within the course structure outlined above, the lesson takes place in week 2, as part of the first half of the Digital Theory and Practice course on the topic of “digital data, archives, and aesthetics.”

Detailed Lesson Plan

Introduction to Analog and Digital Color

Drawing on Richard Misesk’s (2010) scholarship on digital color, I start the lecture by providing some technical information on color in digital media more broadly, beginning with a discussion of pixels as the basic unit of digital images, defined as a unit of color value assigned to a particular location on a screen.

Aims of the introduction:

- To highlight the technological significance of all digital images, even those presented in a black & white or greyscale, comprising of digital color in the form of pixels.
- To clarify that this technical definition differs from what is more commonly referred to as “digital color” in digital cinema: a phrase often used in relation to footage where the color values have been digitally manipulated or “graded”.

The lack of technological distinction between color and black & white, what Misek (2010) terms “the absorption of black-and-white into color” (166) is significant and the students will have the opportunity to reflect on this through practice in their color palette task when exploring how all shades are defined by pixel codes.

Key changes to communicate:

- How the digital manipulation of color can be achieved much more efficiently than analog changes, where colorists had to adjust each relevant frame of the film.
- That digital changes are carried out on groups of pixels, as determined by their color value or position on the screen. Algorithms are used and these can result in particular trends, such as an emphasis on teal and orange, or on desaturation.
- That many of these algorithmic effects have been developed to mimic analog techniques developed for coloring film stock, such as filtration and bleach bypass (see Misek 2010, 173).

Next, outline digital color grading:

- A term used to describe the practice of digitally manipulating colors using specialist software.
- It involves scanning footage to create a digital intermediate that can be manipulated, before being scanned back out onto film.
- That even before the widespread adoption of color grading tools, various films from the 1990s began to achieve what would later be considered digital color trends through photochemical means. Using different silver retention techniques, films like *Seven* (1995) achieved a high contrast look, while period war film *Saving Private Ryan* (1998) instead created a highly desaturated look.

Pleasantville (1998) as Digital Aesthetic Prototype

- *Pleasantville* is discussed as an example of what Scott Higgins terms the “demonstration mode” of digital color technologies (2003, 62-3).
- The film makes color manipulation central to its narrative premise, as it is focused on two teenagers of the 1990s transported into their television’s 1950s sitcom world, and whose presence in that world leads to the gradual eruption of color in an otherwise black & white mise-en-scene.

- Historicize the film's dramatic narrative use of color in relation to early trends in Technicolor use in the 1930s and 1940s through a comparison with *Becky Sharp* (1935) which showcased Technicolor's new 3-color process.
- Discuss how filmmakers of the 1930s were initially unsure about investing in film color, and how it took figures like Walt Disney, as well as guidance from Technicolor color specialists like Natalie Kalmus ("ringmaster to the rainbow") to convert many filmmakers.
- Play a scene from *Pleasantville* in which the mother, who has turned into color, has her face repainted in grey to cover this up (link provided below). Drawing on Higgins (2003, 66), and discuss the film's real-time approach to altering the color of skin tone in a continuous take.
- Historicize this in relation to early film color, when accurately capturing actors' skin tone was seen as the litmus test for different color technologies.



Figure 1. The dramatized removal of skin tone in *Pleasantville* (1998).

Racial Dynamics of Color Technologies

Building on the *Pleasantville* skin tone example, the lesson will then examine how both analog and digital color technologies have developed with a view to recording white skin tone over those of people of color.

- Play VOX (2015) video "Color film was built for white people. Here's what it did to dark skin" (link below).
- Discuss selected moments in the video in reference to Lorna Roth's (2009) study of color balance and image technologies.
- Further demonstrate how color technologies are not "neutral," but are often culturally determined and discriminatory, with reference to the experience of Lena Horne. During

lighting tests for MGM in 1942, the skin of light-skinned Black actress was deemed to not effectively “signal blackness,” leading to the development of a particular make-up shade, “Light Egyptian” to enhance it (see Pullen 2014, 94-5).



Figure 2. Sample shot of Kodachrome’s inability to capture dark skin tones from “Color film was built for white people. Here’s what it did to dark skin” video.

A Return to Black-and-White Media

- Examine the more recent trend for the complete negation of color: digital films presented entirely in black & white.
- Play a scene from *A Girl Walks Home Alone at Night* (2014) (link provided below) and ask the students to discuss how the lack of color impacts what they see in the shot.
- Bring in comparisons to German expressionist films like *The Cabinet of Dr Caligari* (1920), to discuss how the patterns and textures are particularly visible without the distraction of color.
- Draw a comparison between *A Girl Walks Home Alone at Night* and *Citizen Kane* (1941) in terms of their use of deep focus.



Figures 3-4. Expressive uses of shadow and shape in black & white footage, in *A Girl Walks Home Alone at Night* (2014) and *The Cabinet of Dr Caligari* (1920).

Several of Misek's (2010) insights can also be incorporated into this discussion:

- "Through digital color, black-and-white has been given new life. Monochrome images now appear on screen more often than they have at any time since the 1960s" (166).
- "Color is most all contemporary viewers know; seeing in black-and-white distances them because they are not being allowed to see the world in the manner in which they usually see it" (153).

The second example of digital black & white relates not to an original release, but to the special edition release of *Mad Max: Fury Road* (2015) termed *Mad Max: Black & Chrome* (2017).

- Play the trailer for the latter version, and compare it to the original release—which was characterized by a saturated blue and orange palette (reflecting the film's setting in a desert and against bright skies).
- Reflect briefly on what be missing or gained when the color is removed, including how the desert landscape can appear much more dystopian in the second version. It is also important to note the ease with which filmmakers can move between color and black-and-white versions as a result of color software.
- Briefly discuss the viral video from 2009 demonstrating that Hewlett-Packard's motion-tracking webcams were unable to "see" Black people (see: "HP computers are racist" video, link provided below), and thus providing further evidence that color technologies remain discriminatory.

The remainder of the lecture is dedicated to some brief considerations of three other elements of digital film course: 1) digital restorations and technical demonstration of digital tools for color analysis; 2) the digital archive of historical film colors; 3) digital appreciation of film colors on social media platforms like Instagram.

Digital Restorations and Color Analysis Tools

Due to the destructive effect of light on film stock, film prints fade considerably over time. Digital color correction tools can be used in the remastering of historical films, for release in newer digital formats like Blu-Ray or DCP. However, as Higgins (2007) notes "Chromatic memory is particularly unreliable" and this can lead to films like *Gone With the Wind* (1939) being reprinted in more saturated palettes over time (9).

- Outline an attempt to faithfully restore a film using digital tools, using the example of Jacques Demy's musical *The Umbrellas of Cherbourg* (1964), by playing four minutes of a video demonstrating how the film, shot on Eastman negative stock, was digitally restored (link provided below).

- Note how the video highlights the very slow and careful process required when restoring an analog film digitally, which is radically different from using color grading to alter a film shot on digital, or a digital intermediate.



Figure 5. Screenshot from the digital restoration demo of *The Umbrellas of Cherbourg* (1964).

- Briefly discuss the development of digital tools for analyzing film colors using forms of machine learning. These include a VIAN temporal segmentation and screenshot manager, developed by Gaudenz Halter as part of a European Research Council “FilmColors” project (2015), and which involved the development of computer assisted methods and tools for the analysis of film colors in the emerging field of digital humanities (see Flueckiger 2018).
- Briefly visit the Timeline of Historical Film Colors website (<https://filmcolors.org>) with a view to highlighting its structure and value. This project offers further insights into how digital color and digital technologies are in constant dialogue with the history of film colors.

Digital Color Appreciation

- Outline the trend for color appreciation within digital film culture, with an emphasis on the Instagram account “Color Palette Cinema” (www.instagram.com/colorpalette.cinema/). Using a repeated format, the account has posted approximately one thousand color palettes of single film stills, amassing over one million followers in the process.
- Discuss how much critical information can actually be gleaned from such posts, given that the practical task for the week requiring the students to develop two such palettes (detailed below).

- Note how each post lists only the various people responsible for the film still/palette in question: director, cinematographer, production design, set decoration, costume design, and (lastly) the colorist.



Figure 6. A screenshot from Instagram account ColorPalette.Cinema.

Seminar Discussion Points

The first 10 minutes of the one-hour seminar are spent discussing the combination of digital and on-set color techniques in this week's required screening, *Amélie* (see Vanderschelden 2007). I then move on to the following questions, which provide opportunities to revisit material from the lecture and the required reading.

- In his article, what does Scott Higgins mean by “color consciousness” when discussing creative uses of cinema color in the digital age?
- Have you noticed any trends in relation to digital color grading? What kinds of color effects do you see most often?
- In pairs, discuss the following quotation from Richard Dyer’s “The Light of the World” (1997, 89): “The photographic media and, *a fortiori*, movie lighting assume, privilege and construct whiteness. The apparatus was developed with white people in mind and

habitual use and instruction continue in the same vein, so much so that photographing non-white people is typically construed as a problem.”

- Do you think the use of black & white footage in digital cinema is ultimately a gimmick, or might it be considered a form of restraint when compared to other color grading trends?
- Why, and in what ways, is the metaphor of painting used in relation to digital color?

As part of this discussion, play a clip of “pure digital color” via rotoscope animation in *Waking Life* (2001) (Link provided below, see Misek 2010, 179-180).

- Can you think of any examples where a film’s expressive use of color has influenced your emotional response to particular characters or events?

As part of this discussion, make reference to Christine. N. Brinckmann’s *Color and Empathy: Essays on Two Aspects of Film* (2014) and “Colour Psychology” in *Contemporary Color Theory and Use* (Bleischer 2005, 35-50).

Color Palette Task and Digital Portfolio

This week’s topic is accompanied by a practical task, as detailed below in the Teaching Materials section, and which will be explained in the last 5 minutes of the seminar. The task requires students to create two digital color palette diagrams, following a template, and for inclusion in their Digital Portfolio, one of the class’s two assignments.

All students on the module must complete a short digital portfolio, comprised of the outputs from 3 practical tasks and a related reflective essay (1800 words).

Students complete 5 short practical tasks over the course of the semester, of which the color palette cinema exercise is the first:

- Week 2: Color palette cinema exercise
- Week 4: Glitch art exercise
- Week 6: Database cinema task with video phone recreation of archival shots
- Week 8: Sensory-driven short video
- Week 11: Voice-changing exercise

For their digital portfolio, students upload the corresponding files or links from three of these five tasks, along with an 1800-word reflective essay. The essay should make detailed reference to at least three of the practical tasks they complete over the course of the semester. The goal of the essay is to explore the following questions:

- What did I learn about digital technologies by completing these tasks?

- How did my experience of working on these tasks relate to the theories of digital media covered in this module?

These are open-ended prompts, and so students can take them in whatever direction they think is most relevant to their experiences with the digital tasks and theories. However, they are provided with the following points that they may like to address:

- Moments in which their hands-on experience enriched or enabled your theoretical understanding of a topic
- The ways in which the tasks provided experiences that supported theoretical arguments
- The ways in which the tasks provided experiences that departed from (or seemed to disprove) theoretical arguments
- Shortcomings of the technologies
- Ideas for alternative tasks that might also facilitate a greater understanding of the relationship between digital theory and practice, as explored in the module content.

Teaching Materials

Instructions for “Color Palette” Task

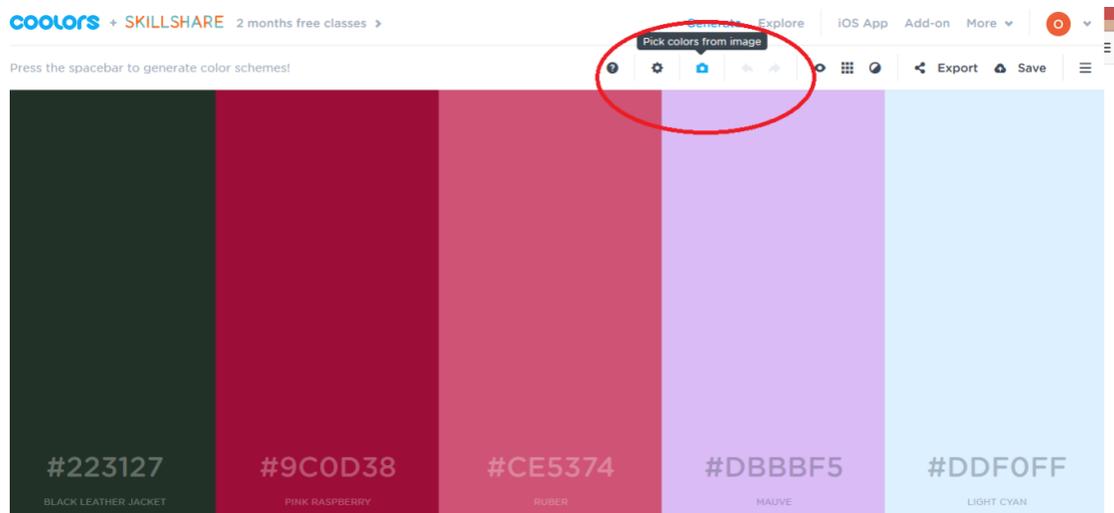
Create color palette impressions using a single screenshot from 2 films of your choosing. That is, you need to create 2 different color collages, using 2 different screenshots.

For reference and inspiration please visit the “Color Palette” cinema Instagram account: <https://www.instagram.com/colorpalette.cinema/>.

Next, create a free account <https://colors.co/>

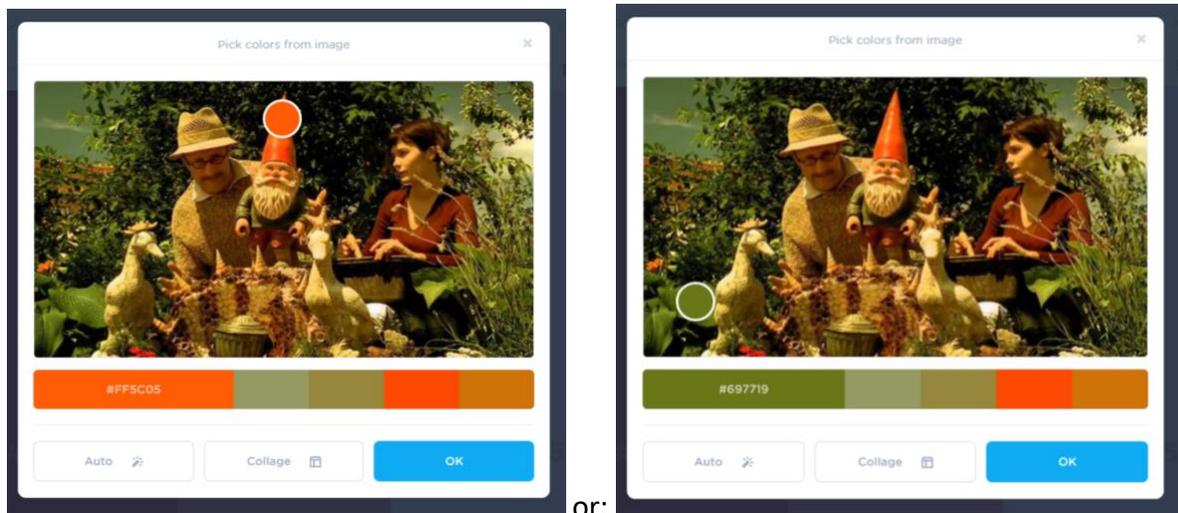
Select “Generate” from the menu to use the following app: <https://colors.co/app>

Select the “pick colors from image” option, by clicking on the camera icon:



Following the prompt provided, upload an image (a film still) or else provide a link to the desired film still.

When your image is uploaded to the app, click on different parts of the image to reveal the pixel codes associated with the highlighted area. Clicking on the image will add this color to the palette bar below the image. Alternatively, clicking on the colors already in the palette bar (as automatically generated by the app) will highlight a part of the image where this color is present. For example:



or:

When you are satisfied with the five colors/shades in the palette bar then select the “Collage” icon from below the color palette and this will give you a prompt to save the file to your computer in the following format, which also lists the colors/shades by code:



Note: while the app allows for “random” palettes, you may wish to arrange your palette by shade (say, light to dark shades of green in the above screenshot from *Amélie*), or to use the palette to highlight the most prominent colors within the selected screenshot. For example, the following “collage” highlights shades of green from light to dark:



Complete these steps to create two collages for your Digital Portfolio (detailed above). Please remember to keep notes on your experience of using the app, in relation to this week’s critical discussion.

Required readings

Vanderschelden, Isabelle. 2007. “Digital Painting: Color Treatment in the Cinema of Jean-Pierre Jeunet.” In *Questions of Color in Cinema: From Paintbrush to Pixel*, edited by Wendy Everett, 67-84. Bern: Peter Lang.

Higgins, Scott. 2003. “A New Colour Consciousness: Colour in the Digital Age.” *Convergence* Vol 9.4: 60-76.

Roth, Lorna. 2009. "Looking at Shirley, the Ultimate Norm: Colour Balance, Image Technologies, and Cognitive Equity." *Canadian Journal of Communication* Vol 34: 111-136.

Recommended readings

Dyer, Richard. 1997. "The Light of the World" in *White: Essays on Race and Culture*, 82-145. London and New York: Routledge.

Misek, Richard. 2010. "Digital Color." In *Chromatic Cinema: A History of Screen Color*, 152-180. Malden, MA: Wiley-Blackwell.

Flueckiger, Barbara. 2017. "A Digital Humanities Approach to Film Colors." *The Moving Image: The Journal of the Association of Moving Image Archivists* Vol. 17, No. 2 (Fall): 71-94.

Flueckiger, Barbara. 2018. "Digital Tools for the Analysis of Film Colors." *FilmColors.org*, March 8, 2018. <https://filmcolors.org/2018/03/08/vian/>.

Recommended screenings:

Amélie (Jean-Pierre Jeunet, 2001) – required

Pleasantville (Gary Ross, 1998)

Sin City (Frank Miller and Robert Rodriguez, 2005)

A Girl Walks Home Alone at Night (Ana Lily Amirpour, 2014)

Media links

On the "demonstration mode" of digital color grading:

"Look at My Face - Gary Ross's PLEASANTVILLE (1998)," YouTube video, 7 January 2013, <https://youtu.be/y7PxbrKi2MQ>.

On the racial dynamics of color technologies:

VOX, "Color film was built for white people. Here's what it did to dark skin," YouTube video, 18 September 2015. <https://youtu.be/d16LNHIEJzs>.

"HP computers are racist," YouTube video, 10 December 2009, <https://youtu.be/t4DT3tQqgRM>.

On digital restorations:

"The Umbrellas of Cherbourg Restoration Demo," YouTube video, 21 July 2014, <https://youtu.be/IOdnOzMj1nQ>.

On digital archiving of analog film colors:

"The Timeline of Historical Film Colors," <https://filmcolors.org>.

On the digital appreciation of film colors:

"Color Palette Cinema," *Instagram account*, <https://www.instagram.com/colorpalette.cinema/>.

On "pure digital color" via rotoscope animation:

"Waking Life - Bridge Scene," YouTube video, 2 April 2013, <https://youtu.be/JfDONNFZgdU>

On black & white digital cinema:

"Mad Max: Fury Road: Black and Chrome," YouTube video, 25 October 2016, https://youtu.be/ctkS_5SHhMs.

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Brown, William. 2013. "'Those men are not white!': Neuroscience, Digital Imagery and Color in O Brother, Where Art Thou?" In *Color and the Moving Image: History, Theory, Aesthetics, Archive*, edited by Simon Brown, Sarah Street and Liz Watkins, 209-218. London and New York: Routledge.

Dalle Vache, Angela and Price, Brian. 2006. *Color: The Film Reader*. London and New York: Routledge.

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Roth, Lorna. 2009. "Looking at Shirley, the Ultimate Norm: Colour Balance, Image Technologies, and Cognitive Equity." *Canadian Journal of Communication* Vol 34: 111-136.

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