

Understanding Color

How to Use It to Express Your Creative Vision

Mark Fitzgerald

Mark@DDRoom.com ~ (503) 977-2400

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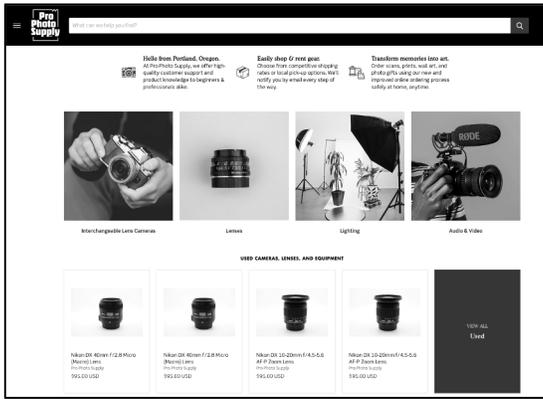


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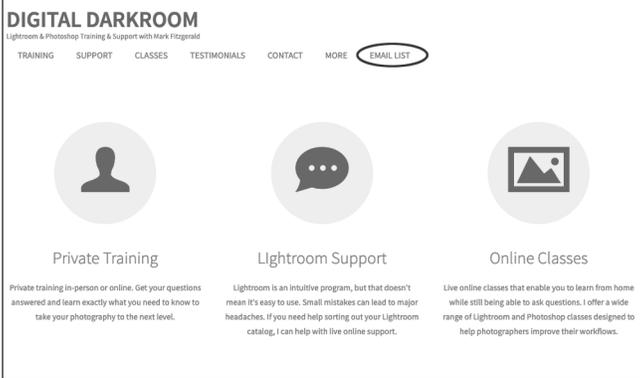


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https://www.ddroom.com



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This Class is Being Recorded

I will email the class video link by Monday



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Overview

- ✓ Color is an important element of the visual arts. As photographers we often need to work with the color presented to us in the scenes we photograph. With that said, we still have significant control of color in postproduction.
- ✓ We adjust white balance, hue, saturation and other aspects of color but we often don't think about how colors work together – or against one another. Understanding color and how viewers experience it is an important concept that is often overlooked.
- ✓ The primary goal of this class is to take you deep into the subject of color: how we see and experience it and how we can manage it in our photography to intentionally make the creative statements we want to make instead of leaving it to chance!

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Day 1 – Exploring Concepts

1. Color & How We See It
2. Psychology of Color
3. Comparing Color Systems
4. Exploring Color Schemes
5. Understanding Simultaneous Contrast
6. Simultaneous Contrast's Influence on Art

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Day 2 – From Concept to Practice

1. Questions from Last Week?
2. Color Models & Color Spaces
3. Measuring and Evaluating Color
4. Color Correction vs. Color Grading
5. Adjusting Global Color
6. Adjusting Local Color

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Color & How We See It

*“Color is the most relative medium in art.”
Josef Albers, Interaction of Color, (1963)*

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What is Color?

- ✓ In 1665 **Isaac Newton** discovered that white light is composed of individual color ranges (wavelengths). He used a prism to bend white light into a visible spectrum.
- ✓ **We see a particular color** when light strikes the surface of an object. The object absorbs some of the light wavelengths and reflects others back to us. The reflected light is the color we see. White results when all wavelengths are reflected. Black is when none are reflected.
- ✓ **Wavelengths of light:** 390 nm (nanometers) to 700 nm is known as visible light. (Blue=short, Green=medium, Red=long,).
- ✓ The color of an object **depends on two factors** – the color of the light source and which wavelengths of light the object reflects.

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How We Perceive Color

- ✓ The human eye has **photoreceptors called Rods and Cones**. Cones have light-sensitive pigments that enable the eye to perceive color. Each cone is sensitive to **red, green or blue light**.
- ✓ It's estimated that humans with good color perception can distinguish up to **10 million variations** in color.
- ✓ **Our eyes compensate and adjust to** changes in the brightness and the color of light. Our color perception diminishes when light levels are reduced.
- ✓ **Retinal fatigue** (Color Fatigue): Caused by staring at one color or tone for too long, the cells that detect that color will become fatigued. The after image is a result of photoreceptors not being balanced. It takes between 10–30 seconds for the fatigue to wear off and restore balance.

📌 *Rods are mostly sensitive to changes in brightness, not color.*

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Why Do We See Color Differently?

A number of things affect our individual color perception.

- ✓ **Color is a learned skill** – color memory – Can we accurately remember the exact color of a known object?
- ✓ **Surrounding Colors** – simultaneous contrast – Colors affect other surrounding colors.
- ✓ **Color of the light** illuminating an object. *Metamerism* is when two different colors look alike due to the light source.
- ✓ **Blood glucose (sugar) levels** - Diabetics can have a blue-yellow vision deficit.
- ✓ **Age** can affect perception in people 70 and above.

☞ *A person's two eyes often distinguish color differently.*

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Human Color Deficiencies

- ✓ Types of **Color Deficiencies**:
 - **Deuteranomaly** is the most common type of red-green color blindness. It makes green look more red.
 - **Protanomaly** makes red look more green and less bright.
 - Someone with both protanopia and deuteranopia is unable to tell the difference between red and green.

- ✓ 1 out of 255 women and 1 out of 12 men have some form of color vision deficiency.

☞ <https://www.color-blindness.com/color-blindness-tests/>

☞ <https://www.xrite.com/hue-test>

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Psychology of Color

How Does the Color We See Affect Us?

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From Physics to Perception

- ✓ **Johann Wolfgang Goethe** (1749-1832) wrote *Theory of Colours* in 1810 where he developed the concept of emotions in color and color harmonies.
- ✓ He ignored the wavelength theory and **concentrated on the perception of color.**
- ✓ Newton was scientific. Goethe was interested in perception and subjectivity that reveal the essential character of color. **Visual phenomena are more important than theory.**
- ✓ Goethe - *Theory of Colours* (721). *“To place the doctrine of colours nearer, in this sense, within the philosopher’s reach, was the author’s wish...”*
- ✓ He **wanted to develop rules** for the use of color, much like rules for composition, etc.

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Color Psychology

- ✓ **Color influences perceptions** that are not obvious and can cause certain subconscious emotions.
- ✓ **Egyptians** studied the affects of color on mood and believed they could be used for healing processes.
<https://www.ancient.eu/article/999/color-in-ancient-egypt/>
- ✓ Psychiatrist and psychoanalyst **Carl Jung** (1875-1961) is most prominently associated with the pioneering stages of color psychology. He once said, *“Colors are the mother tongue of the subconscious”* and that they are a primary element of our existence.
- ✓ Jung believed we have a **universal response to color as well as a societal response.**

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6 Principles of Color Psychology

- ✓ Color Psychology is based on six basic principles.
 1. A color can have a specific **meaning.**
 2. Meaning is either based on **learning and/or biology.**
 3. We **automatically evaluate** colors as we perceive them.
 4. **Behavior is influenced** by the evaluation process.
 5. The influence of a color is **typically automatic.**
 6. It is important to consider **context** when evaluating the meaning of color.

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Color & Marketing

- ✓ Color can influence many of our decisions depending on what their meaning.

Color Meaning in the West

| Red | Yellow | Green | Blue | Pink | Violet | Orange | Brown | Black | White |
|------------|-------------|--------------|--------------|----------------|----------------|------------|--------|----------------|-----------|
| Lust | Competence | Good Taste | Masculine | Feminine | Authority | Warmth | Rugged | Grief | Happiness |
| Power | Happiness | Envy | Competence | Sophistication | Sophistication | Excitement | | Sophistication | Sincerity |
| Excitement | Inexpensive | Eco Friendly | High Quality | Sincerity | Power | | | Expensive | Purity |
| Love | Low Quality | Health | Corporate | | | | | Fear | |
| Speed | | | Reliability | | | | | Death | |
| Anger | | | | | | | | | |

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Color Meanings Worldwide

- ✓ Color can mean different things to people in different cultures.
 - For example: The color red in **the West** is linked to passion and excitement.
 - In **Asian cultures** it is the color of excitement and celebration.
 - In **Latin America** it is the color of religion when paired with white.
 - In the **Middle East** it's associated with caution and danger.
- ✓ <http://www.six-degrees.com/pdf/International-Color-Symbolism-Chart.pdf>
- ✓ <https://www.webdesignerdepot.com/2012/06/color-and-cultural-design-considerations/>

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Color Psychology

- ✓ Color can affect the **choices we make**, such as the food we eat the things we buy, and the way we feel.
- ✓ <https://www.naturesgardencandles.com/blog/the-psychology-of-color-in-fragrance/>
- ✓ Color affects **how things smell** to us, perfume for example: <https://www.medicaldaily.com/smelling-colors-our-brains-associate-odors-color-fruity-smells-are-pink-294002>
- ✓ Color affects **how things taste**, wine for example: <https://pubmed.ncbi.nlm.nih.gov/31732050/>

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2 Color Systems

Reflected Light & Transmitted Light

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Two Main Color Systems

- ✓ A color system is a method of **logically understanding** color and color variation. It also details the results of mixing different colors together and the relationships of colors to each other.
- ✓ There are two main color systems:
 - ✓ **Additive Color:** Color primaries of Red, Green, Blue. Relates to reflected light. Called Additive because equal amounts of primary colors added together = white.
 - ✓ **Subtractive Color:** Color primaries are Red, Blue, Yellow. Mostly relates to transmitted light. Called Subtractive because equal amounts of primary colors subtracted = white.
- 📌 *Primary colors are basic colors that cannot be created by mixing other colors.*

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Additive Color System

- ✓ Color primaries are **Red, Green, Blue** (RGB). When these primaries are combined equally, the result is white. Additive color theory deals with **transmitted light**.
- ✓ **Computer displays** use RGB transmitted light.
- ✓ **Cameras** use RGB photo receptors on their sensors.
- ✓ **Editing apps** like Lightroom Classic and Photoshop use an additive system when mixing or correcting color.
- 📌 *Displays, cameras, and apps use additive color to create subtractive colors.*

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The Additive Color Wheel

- ✓ **Primary colors:** Three basic colors that cannot be created by mixing other colors. They are *Red, Green, and Blue*.
- ✓ **Secondary colors:** Created by mixing two primary colors. There are 3 of these. *Cyan, Magenta, Yellow*.
- ✓ **Tertiary colors:** Created by mixing a primary color with an adjacent secondary color. There are 6 of these. *Orange, Chartreus, Spring Green, Azure, Violet and Rose*.
- ✓ **Complementary colors:** Two colors that are opposite each other. *Red-Cyan, Green-Magenta, Blue-Yellow*. Complementary colors cancel one another out.
- ✓ **Gray:** A tone that does not have a color hue.
- ✓ **White:** Equal amounts of primary colors = white.

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Subtractive Color System

- ✓ **Color primaries are Red, Blue and Yellow.** When these primaries are combined equally, the result is black*. It's called subtractive because to achieve a white canvas, all pigment must be removed.
- ✓ Subtractive color theory deals with **reflected light**. When light shines on an object, pigment absorbs some color wavelengths and reflects others that we see.
- ✓ The subtractive color system is **used when mixing pigments**, such as paint and inkjet ink.

* When mixing pigments like ink and paint, equal amounts of *RYB* usually results in a muddy brown. Black is added to create darker, black-like tones.

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The Subtractive Color Wheel

- ✓ **Primary colors:** Three basic colors that cannot be created by mixing other colors. They are *Red, Blue and Yellow*.
- ✓ **Secondary colors:** Created by mixing two primary colors. There are 3 of these. *Green, Orange and Violet*.
- ✓ **Tertiary colors:** Created by mixing a primary color with an adjacent secondary color. There are 6 of these. *Red Orange, Yellow Orange, Yellow Green, Blue Green, Blue Violet, and Red Violet*.
- ✓ **Complementary colors:** Two colors that are opposite each other. *Red-Green, Blue-Orange, Yellow-Violet*.
- ✓ Complementary colors **cancel each other**. Combining complementary subtractive colors reduces hue with the result being similar to gray.

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Knowing the Difference

- ✓ **Why is it important** to know the difference between Additive and Subtractive color?
- ✓ Most of the **art and design world uses the subtractive** color model when creating, evaluating and comparing color.
 - As photographers we are often using the subtractive color model when we evaluate colors . *(For example when examining color harmonies in the next section.)*
- ✓ When working with color in film darkrooms or using digital editing programs, we need to be fluent with the **Additive color model because it is the color language of light and photography.**

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Subtractive Color Schemes

Relating Colors to Each Other

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Basic Color Terminology

- ✓ Color is comprised of *Hue, Saturation* and *Brightness*.
 - **Hue:** The name of a particular color, such as red or blue. Hue is measured in degrees depending on location on color wheel. Starting with red at 0 degrees, the main hue changes every 30 degrees to 12 distinct hues.
 - **Saturation:** The purity of a color which is sometimes referred to as Intensity. Desaturate a color by adding gray or by adding its complementary color
 - **Brightness (Luminance):** The lightness or darkness of a color. *(Sometimes referred to as Value.)*
- ✓ **Neutral Gray:** A balanced combination of equal amounts of all primary colors.

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Color Harmony

- ✓ To create color harmony, select the **most important color** and then add secondary and/or accent colors to support main color.
- ✓ Color harmony can sometimes be **balanced or discordant** (analogous or complementary).
- ✓ Create **harmony or tension** by controlling the proportion, saturation and brightness of colors.
- ✓ Less saturated colors are more harmonious while saturated colors create more *color contrast*.
- ✓ Add complementary tints and shades of the **key color** to the neutral colors in the composition.
 - **Tint:** White added to a color.
 - **Shade:** Black added to a color.

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Common Color Schemes

- ✓ **Monochromatic** color is created by adding black, white or gray to a single hue. This creates multiple tints, shades and tones.
- ✓ **Analogous color:** Next to each other on color wheel. Can induce a calm, harmonious viewing experience. When placed next to one another, they tend to soften each other.
- ✓ **Complementary:** Colors on opposite sides of the color wheel. Produces maximum color contrast. Complementary colors intensify each other especially when placed side-by-side and become more vivid.
- ✓ **Split complementary:** One key color and two other colors adjacent to its direct complementary.
- ✓ **Double Split Complementary:** Two adjacent colors paired with two adjacent complementary colors.

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Exploring Color Schemes

- ✓ Here are a couple of good resources for exploring color schemes.
- ✓ **Adobe Color Wheel:** This is a great place to begin.
<https://color.adobe.com/create/color-wheel>
- ✓ **Paletton:** A fun place to explore color schemes. paletton.com
- ✓ If you are a **Photoshop** user you can use the Adobe color themes Photoshop extension – *Window > Extensions > Adobe Color Themes*
 - 📺 *An excellent video that shows color schemes in photography:*
<https://www.youtube.com/watch?v=mC8oI2-V7Ck>

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Simultaneous Contrast

Color Does Not Exist in Isolation

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What is Simultaneous Contrast?

- ✓ A color is affected by the surrounding environment.
- ✓ In his book, "*The Law of Simultaneous Color Contrast*" (1839), French chemist Michel Eugène Chevreul developed the rule of simultaneous contrast. One of the things it suggests is that if two colors are close in proximity, each will take on the hue of the complement of the adjacent color.
- ✓ When our eyes are exposed to one color or brightness for a period of time, the **color begins to lose** some of its saturation and appear more gray as our eyes adapt to the color, which can affect the way other colors appear.
- ✓ **This can affect** the way an image looks in print or onscreen as opposed to the original scene we photographed.

📌 Also called *simultaneous color contrast* or *simultaneous color*.

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Effects of Simultaneous Contrast

- ✓ A color will **influence an adjacent color's hue** causing the adjacent color to display some of the hues of the complement of the first color.
- ✓ Simultaneous contrast is affected by **proximity and saturation**. The closer the adjacent colors are to each other, and the more intense they are, the greater the effect.
- ✓ The effect of simultaneous contrast **is lessened** when a neutral colored area is placed around one of the colors.
- ✓ Simultaneous contrast **intensifies when** adjacent colors are highly saturated; simultaneous contrast is weaker when adjacent colors are less saturated or more neutral.
- ✓ A saturated color will look more saturated next to a less saturated color. A less saturated color will look less saturated next to a highly saturated color.

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Simultaneous Contrast Examples

- ✓ **Dark next to bright** makes the bright color look brighter and the dark color look darker. To make a light color look lighter, place a darker color next to it.
- ✓ If two colors are of a **similar brightness**, the less bright they'll both look when placed next to each other.
- ✓ Simultaneous contrast is **most intense** with complementary, saturated colors.
- ✓ To make a **warm color look warmer**, place it next to a cooler color and vice versa.
- ✓ To make a **color look more intense**, place it next to a less intense color.

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Simultaneous Contrast Examples

- ✓ **A bright color next to a muted color** makes the muted color look duller.
- ✓ Placing a **color next to its opposite** in *hue, value, or saturation* intensifies simultaneous contrast.
- ✓ **Lowering tonal contrast lessens** the effect the two adjacent colors have on each other.

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Successive Contrast

- ✓ Successive contrast is the effect a **previously viewed color** (inducing color) has on the currently viewed color. *Think of retinal fatigue.*
- ✓ The **after-image of the previous color** affects the current color and alters its appearance.
- ✓ The best **way to mitigate** this is to choose an *inducing color* that is neutral gray. For example a bright, saturated color behind your computer display can affect your color perception when looking at the display. It's better to have a neutral color behind your display.

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Simultaneous Contrast & Art

Chevreul's Book Changed Everything

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Impressionist Painting

- ✓ When Chevreul's book was first published, it was not widely read. **It took a several years for the art community** to take notice. Eventually it was one of the main elements responsible for the development of the Impressionist painting style.
- ✓ Impressionist painters tried to **capture the effects of light**.
- ✓ Before Impressionism painters would represent subjects with different tones of the **local color** (actual color of the object they were painting) to show volume as well as light direction and intensity that illuminated the subject.
- ✓ Impressionist painters were more interested in **using color that was perceived by the eye** under the lighting and atmospheric conditions affecting the subject. *For example, the color of light affects white balance but the actual color of the subject (local color) remains constant.*

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Expression Through Color

- ✓ **The Night Café** – Van Gogh in a letter to his brother, Theo, said that he was trying to convey "the terrible passions of humanity" through the use of clashing colors.
- ✓ *"Instead of trying to exactly what I see before me, I make more arbitrary use of color to express myself more forcefully."*
Vincent Van Gogh (*Letter to Theo van Gogh, 11 August 1888*)

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Color Selection

- ✓ Impressionists tended to use **complementary colors next to** one another, rather than mixing colors together. This allowed the colors to mix when viewed due to simultaneous contrast.
- ✓ Many impressionist painters used a **limited palette**. This was often a few warm and cool colors and white.
- ✓ Impressionists **tended to avoid the dark earth colors** such as umbers, siennas, and lamp black that were common in traditional painting at the time. They chose instead to work in hues closer to the colors of the light spectrum: violet, indigo, blue, green, yellow, orange, and red, often mixed with white.

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Color in the Shadows

- ✓ The Impressionists were known for using simultaneous contrast in the shadows. **They abandoned the old idea** that the shadow of an object was made up from the color of the object with some brown or black added. Instead they used saturated color in their shadows that was mixed with the complementary of the object casting the shadow.
- ✓ For example, blues and violets would be **mixed into shadows** of objects that were orange and yellow.
- ✓ Many **impressionists did not use black**. The Impressionist Renoir is quoted as saying "No shadow is black. It always has a color. Nature knows only colors...white and black are not colors."
- ✓ If a shadow is cast on something white, like snow, the **shadow is rarely just a different shade gray**.

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Impressionist Used Simultaneous Contrast

- ✓ "To exaggerate the fairness of hair, I come even to orange tones, chromes and pale yellow ... I make a plain background of the richest, intensest blue that I can contrive, and by this simple combination of the bright head against the rich blue background, I get a mysterious effect, like a star in the depths of an azure sky."
(Letter to Theo van Gogh, 11 August 1888)
- ✓ **Monet eventually stopped using earth colors and browns.** *"The point is to know how to use the colors, the choice of which is, when all's said and done, a matter of habit. Anyway, I use flake white, cadmium yellow, vermilion, deep madder, cobalt blue, emerald green, and that's all."* *Monet by Himself*, p196, edited by Richard Kendall, MacDonald & Co, London, 1989.

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Useful Videos

- ✓ Secrets of Color Grading – Joanna Kustra
<https://www.youtube.com/watch?v=mC8ol2-V7Ck>
- ✓ Using Adobe Color Themes
<https://helpx.adobe.com/photoshop/using/adobe-color-themes.html>
- ✓ Munsell Color website – <https://munsell.com/>
- ✓ Color philosophy: <https://newrepublic.com/article/121843/philosophy-color-perception>
- ✓ Color grading by country. An interesting analysis.
https://www.boredpanda.com/different-places-hollywood-movies/?utm_source=google&utm_medium=organic&utm_campaign=organic
- ✓ Story of Kodak's Shirley Card:
<https://www.npr.org/2014/11/13/363517842/for-decades-kodak-s-shirley-cards-set-photography-s-skin-tone-standard>

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Interesting Books

- ✓ *Theory of Colors* – Johann Wolfgang Goethe
- ✓ *On the Law of Simultaneous Contrast of Colors* – M.E. Chevreul & Dan Margulis
- ✓ *Interaction of Color* – Josef Albers (There is also a really nice interactive mobile app of this book: <http://interactionofcolor.com/>)

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