



Value Texture & Color

by Nick Pettit

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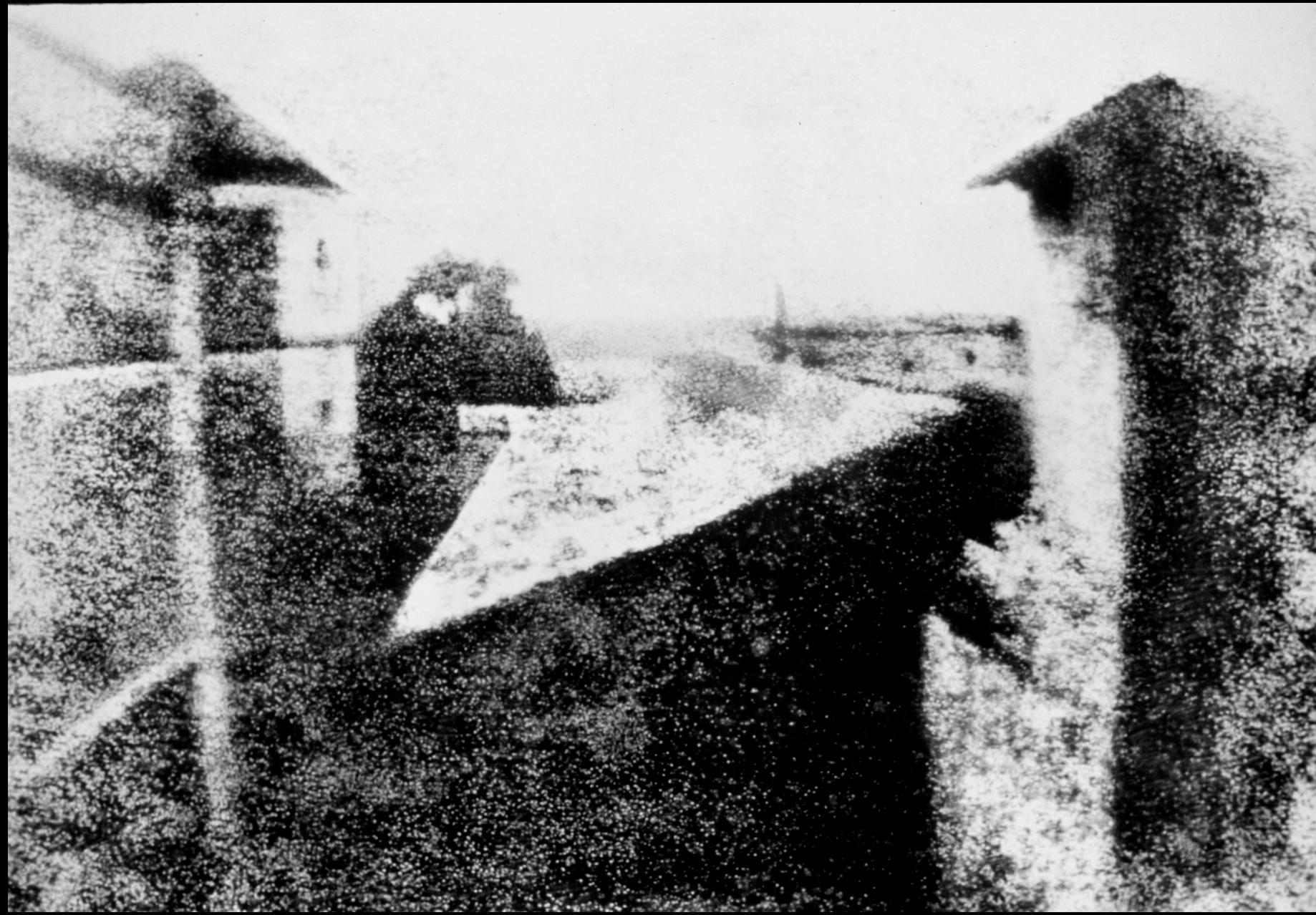
Preface

This is the second book in the *Art and the Web* series. In the first book, we explored three of the most fundamental elements of art: line, shape, and form. The elements of art allow for the existence of the principles of art. However, before we can start learning about the principles, we must finish learning about the basic elements. In this book, we'll explore value, texture, and color. There is one more element, known as space, but we'll leave that for later.

Value, texture, and color, all make an interesting group. We'll focus on value first, because it intimately interacts with both texture and color. Then, we'll explore texture, and by the end you should have an understanding of how to carefully build up layers of texture on a webpage. Finally, we'll end with color, which is likely the most complex element or principle of art. Color is unique amongst the elements and principles because it continues to evolve in the modern age. Our understanding of color is very much based on physics, and with the advancement of computer graphics, the application of color is being radically pushed in new directions.

The web is a young medium, and like any youngster, it could greatly benefit from the wisdom of its forerunners. Together, let's take another giant leap into the world of art.

value



Joseph Nicéphore Niépce, *View from the Window at Le Gras* (1826)

Introduction

The first permanent photograph *View from the Window at Le Gras* was taken by the French inventor Joseph Nicéphore Niépce around 1826. Niépce began his experiments based on a 1727 discovery by the German professor Johann Heinrich Schultz: when silver nitrate (AgNO_3) is exposed to light, it will darken in value. Using a glass lens to focus the light onto a plate of silver nitrate, the manner in which the material darkens can be tightly controlled. Today, the ability to capture an image continues to be a never-ending technological quest, with each new imaging device capable of capturing more megapixels than the last.

We can now see the full visible spectrum of light and beyond in unprecedented detail, and yet this grainy image that Niépce produced is still detailed enough for us to see some visual structure. There were undoubtedly many failed experiments and less detailed exposures before this image was created, and that's part of what makes the photo so remarkable; It's not just the first photograph, but rather, it's the first silver nitrate exposure that's detailed enough called a photograph (a mix of Greek words meaning *light drawing*). The picture may be severely lacking in fine detail, let alone color, but it's still possible to see the major parts: the ground plane, some buildings and roofs, and even a few windows. The element of art that is primarily responsible for this amazing image, and all black and white photography, is *value*. So then, what is value exactly? Let's establish a formal definition.

Value is the use of light and dark in an image.

Value is an element of art that refers to areas of light, areas of dark, and everything in between. This does not mean that in order to utilize value, there must be an absence of color. Rather, value and color are two separate elements of art that can stand strong on their own just as much as they can interact with one another. This is perfectly evidenced by photography: There are color photographs with rich areas of light and shadow, and there are equally beautiful photographs that are devoid of color. Furthermore, most color photography is still recognizable even when the image is completely desaturated. This is because our human eyes are more sensitive to changes in value than to changes in color.



The Value Scale



This illustration is known as a value scale. The left side of the value scale is completely white, and the right side is completely black. In between, there is a gradual progression of light and dark grays. At the top of each value in the value scale is a number, which you can think of as a percentage of darkness. A value of 0 is completely white and contains 0% darkness, a value of 10 is at 100% darkness, a value like 4 is at 40%, and so on. Thinking of value this way might seem a bit backwards to a digital designer, because most programs measure value in terms of brightness or luminance. However, in the fine art world, a canvas or a piece of paper will usually start out as white, and then colors and values are added to it.

The value scale portrays a full spectrum of dark and light, but in reality, every image has its own individual value scale. In other words, the brightest value in a design doesn't necessarily have to be completely white, and the darkest color might not be completely black. However, the designer should make conscious decisions about the values in a design, being very careful to maintain enough room between the upper and lower limits of the value scale. If the whitest white and the darkest dark are two gray values that are close together, the image or web page can end up looking muddled, with little visual contrast. An extremely low contrast image might make sense for an exploration in fine art and visual perception, but for a functionally driven medium like web design, it's almost always best to utilize a rich spectrum of value.

Every designer should strive to maintain a keen awareness of visual boundaries, like the limits of light and dark. As mentioned previously, humans perceive the contrast between two values much more easily than differences in color, so understanding the boundaries of value is especially important. Developing an intuitive sense of value and folding this into your own design process can be difficult. This skill or awareness of value can be developed through a few simple exercises.



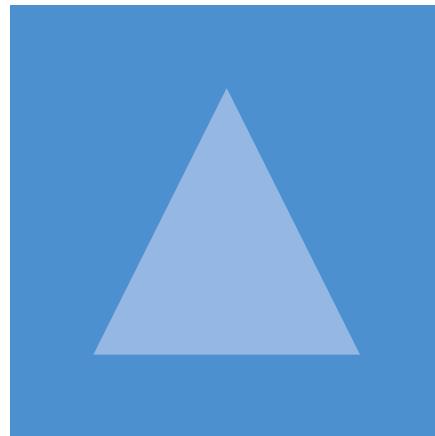
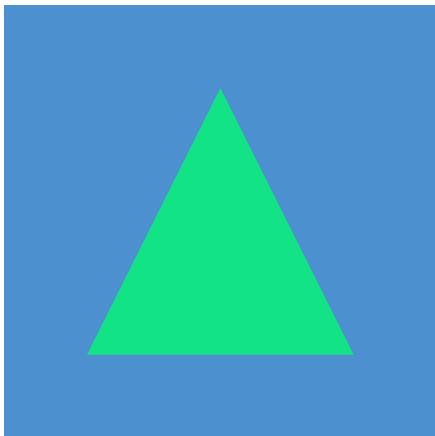
Ansel Adams, *The Tetons and the Snake River* (1942)

Developing a Sense of Value

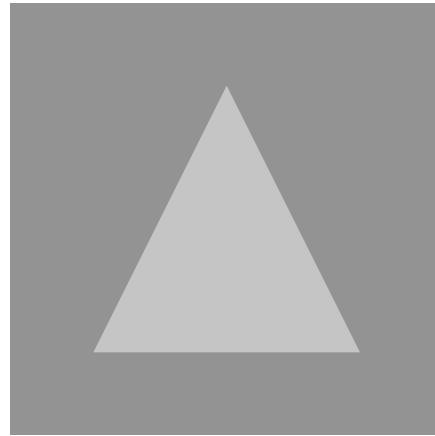
All colors have a value, but not all values have a color. Our eyes are more adept at seeing value rather than color, but as emotional beings, it can be difficult to decouple the two concepts. We often will give meaning and feelings to various colors (which we'll talk more about in the chapter on color), but this fragile way of thinking makes it difficult to see the world in shades of grey. To combat this and retrain our brains, here are a few exercises that will help develop a better sense of value.

The Value Guessing Game

One way to develop a better sense of value is to play a guessing game. First, pick a value or a color that you see in real life or on a digital screen; large untextured shapes work best. Then, try to guess where it falls on the value scale. Finally, compare your guess to an actual value scale, and see how close you were. Picking out a pure white or a pure black is usually pretty easy, but everything in between is more difficult. When first starting this exercise, often times your guesses will be way off or it will be difficult to even determine the correctness of the guess (without the aid of a computer, of course). With practice this becomes easier, and values should start to become more apparent. It's especially wise to practice this while working on a design.



Colored Shapes



Same Shapes
after Desaturation

These four images demonstrate how value is independent of color. The triangles in the bottom row are the desaturated versions of the triangles in the top row. Regardless of whether or not color is present, the values are still the same. While it may appear as though the value of the triangle in the upper left is different than the value of its background, in reality, it is only a contrast of color. A contrast in color doesn't necessarily mean a contrast in value.

Desaturating Colors and Designs

Novice web designers will often focus heavily on the color scheme of a website, but they will overlook something that's even more important: contrast in value. A color scheme is no good if all the values are the same. When considering values in a color scheme, it's important to look for an extreme dark, an extreme light, and lots of steady variety between. This makes the challenge of picking a great color scheme a bit more difficult, because it's difficult to have an intuitive sense of what the world looks like in black and white. Even master painters will spend extra brain power thinking about contrast in value, beyond just the colors. Fortunately, because our medium is digital, we have some very powerful tools available to us that make this easy.

In modern times, it has become popular for web developers to write tests for their code, and designers should take note. There are several design “tests” that we can perform to determine the robustness of both our color schemes and our page layouts, and one such test can help us improve the contrast between values. When creating a new color scheme or design, take a screenshot and open it in an image editor (like Photoshop, for example). Then, desaturate the image completely. With the color now gone, finding the areas of high and low contrast is a trivial task. It's important to focus on the areas of low contrast and find ways to make them stand out more. Doing so will be beneficial to all users, and especially beneficial for users with color blindness and other vision impairments. Remember, the contrast between two elements should never rely on color alone.

Texture



Vincent van Gogh, *The Starry Night* (1889)

Introduction

It's rare for an object to be perfectly smooth in the real world, and yet in the realm of computer graphics, nearly everything lacks texture unless it is explicitly and carefully added. This is a bit different than some of the other elements of art that are implicitly present, and as a result, there has been a dearth of texture on the web up until recently. As always, times are changing, and many designers have discovered the magic of textural page elements and backgrounds.

Like every other element and principle, we must ask: What is texture, exactly? It can be difficult to define for a number of reasons, but let's start simple with a formal definition:

Texture is the quality of a surface.

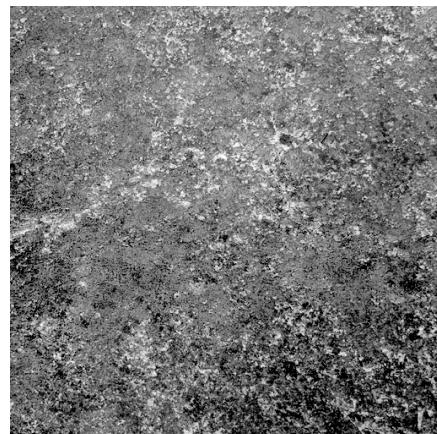
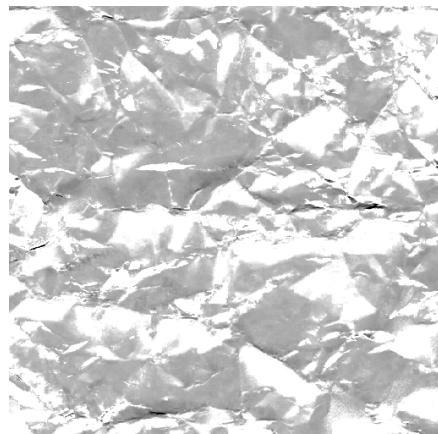
In the real world, we tend to experience texture with our sense of touch much more than with our vision. For the uninitiated, it can seem strange to frame texture in terms of visual aesthetics. In fact, when creating a 2D work of art (or a website), visual texture is purely an illusion. However, texture is a fantastic way to add emotional depth and visual variety to any design.

Realistic and Implied Texture

Visual texture on websites is an illusion, and there are two basic types; realistic texture and implied texture. It's important to understand the difference between the two, because their communicative effects are dramatically dissimilar.

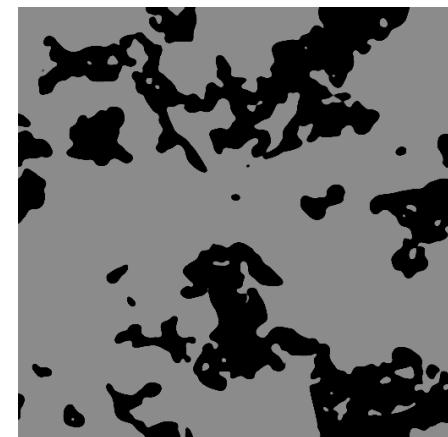
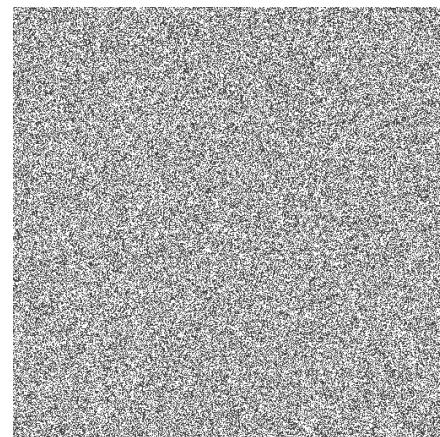
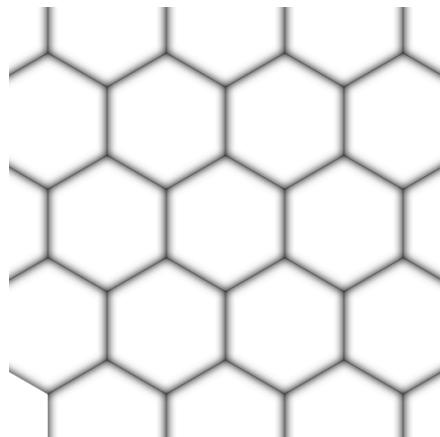
Realistic Texture

Just as the terminology implies, realistic textures attempt to recreate natural-looking textures in order to add realism to a page. An example of this might be a background that looks like rough stone, or perhaps some crumpled paper. Adding some realistic texture will often send a more literal message to the site visitor and can make the site feel more like a physical place. This effect isn't necessarily positive or negative, but it's definitely important to be aware of. Additionally, realistic textures can be difficult to execute, so they should be used carefully and sparingly.



Implied Texture

Implied texture isn't intended to look like anything, but it can add lots of emotional depth to a page. This type of texture is abstract and isn't meant to be touched, similar to most decorative wallpaper or fabric with printed designs. Implied texture can even lack definition to the point that it just looks like noise, intended to add some slight visual variation beyond flat colors. Flat areas of color don't always need texture, however, it is a good habit to add a bit of noise to gradients. When noise is added to gradients, the transitions in value tend to look more natural with less color banding.





Georges Seurat, *A Sunday on La Grande Jatte* (1884)

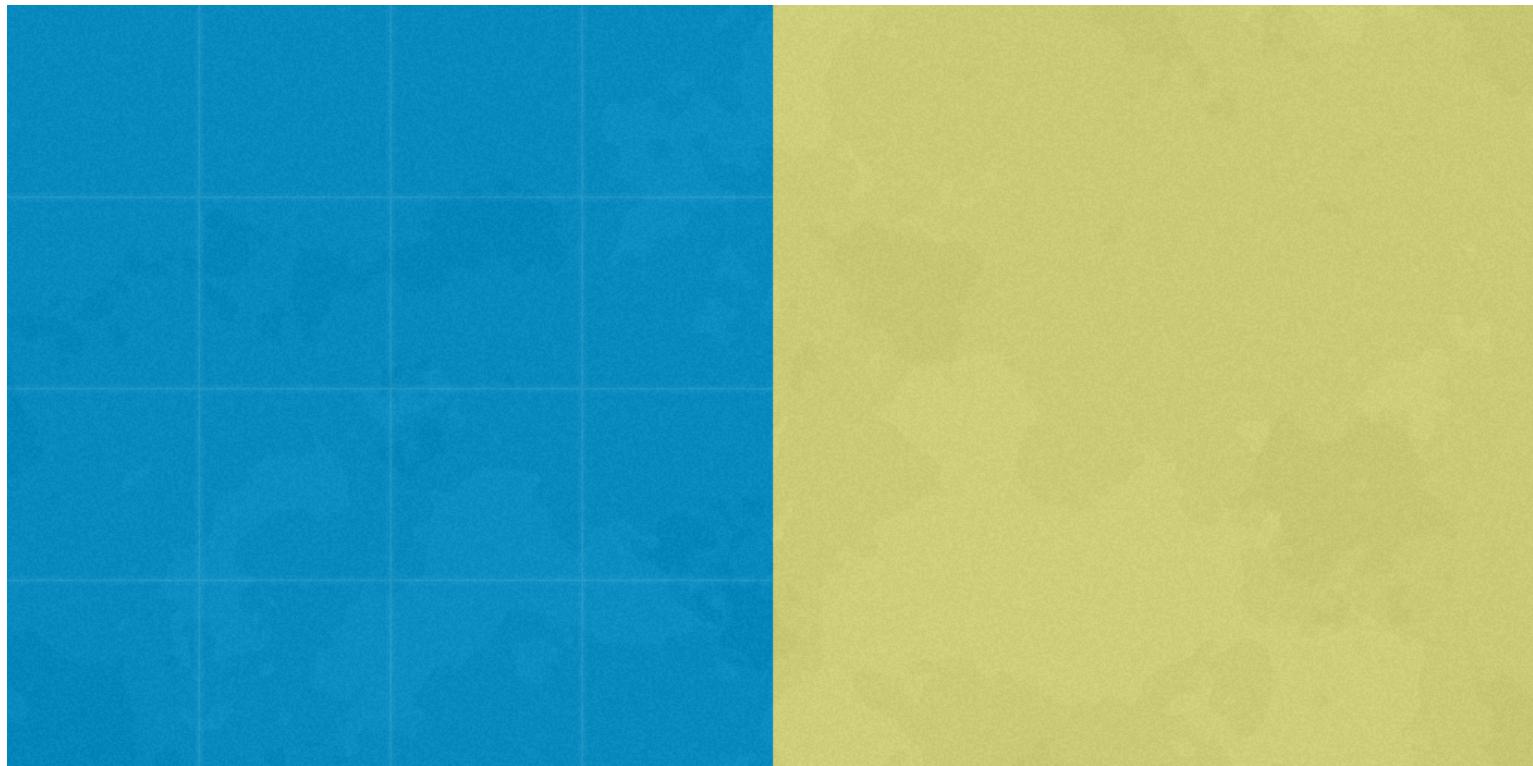
Layering Texture

Gleaned wisdom from contemporary fashion designers and interior decorators might indicate that you shouldn't have too many patterns or textures in a single composition; and they're right: textures should be used sparingly. However, when textures are built up in delicate layers, rather than thrown together in a random hodgepodge of patterns, they can be carefully controlled and crafted into a purposeful design. In fact, on most websites, it's impossible to include only one texture because blocks of text typically read as textural elements. This technique of layered texture plays a different role with implied textures and realistic textures, so we'll focus on each one individually.

Layering Implied Textures

It's difficult to layer textures directly on top of one another when creating implied textures, because while the results have the potential to be aesthetically pleasing, the page element with the layered implied textures can also be too distracting. Implied textures that are layered onto a single element only tend to work when they're subtle and light in opacity, although like anything else in art, there are always exceptions to the rule. However, at a more macro level, implied textures can work very well together when they're adjacent to one another in a composition. In practice, textures can be combined with colors and values to create distinct content areas in a single layout.

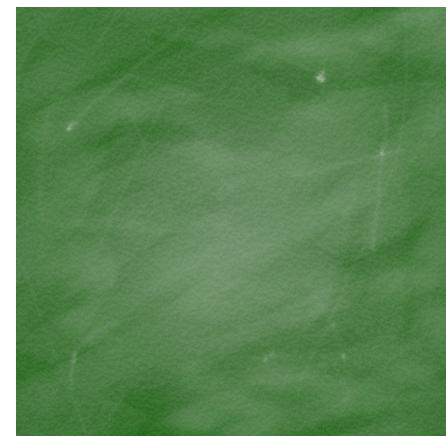
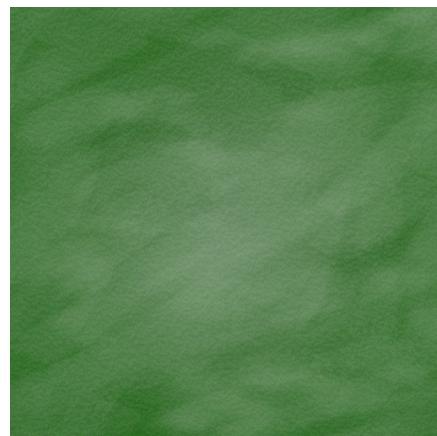
In the example below, the left area features a grid texture that is combined with a blue color. This page element is placed adjacent to a muted green. These two content areas are tied together with an abstract pattern that looks similar to stucco or a watercolor painting. Finally, a layer of noise is placed over everything to further gel the two areas together. Please note that for the sake of clarity in this example, the textures may be slightly more opaque (and less subtle) than normal. Also note, that while the interaction between the geometric grid and organic stucco pattern is visually interesting, text placed on top would need to be very bold in order to stand out.

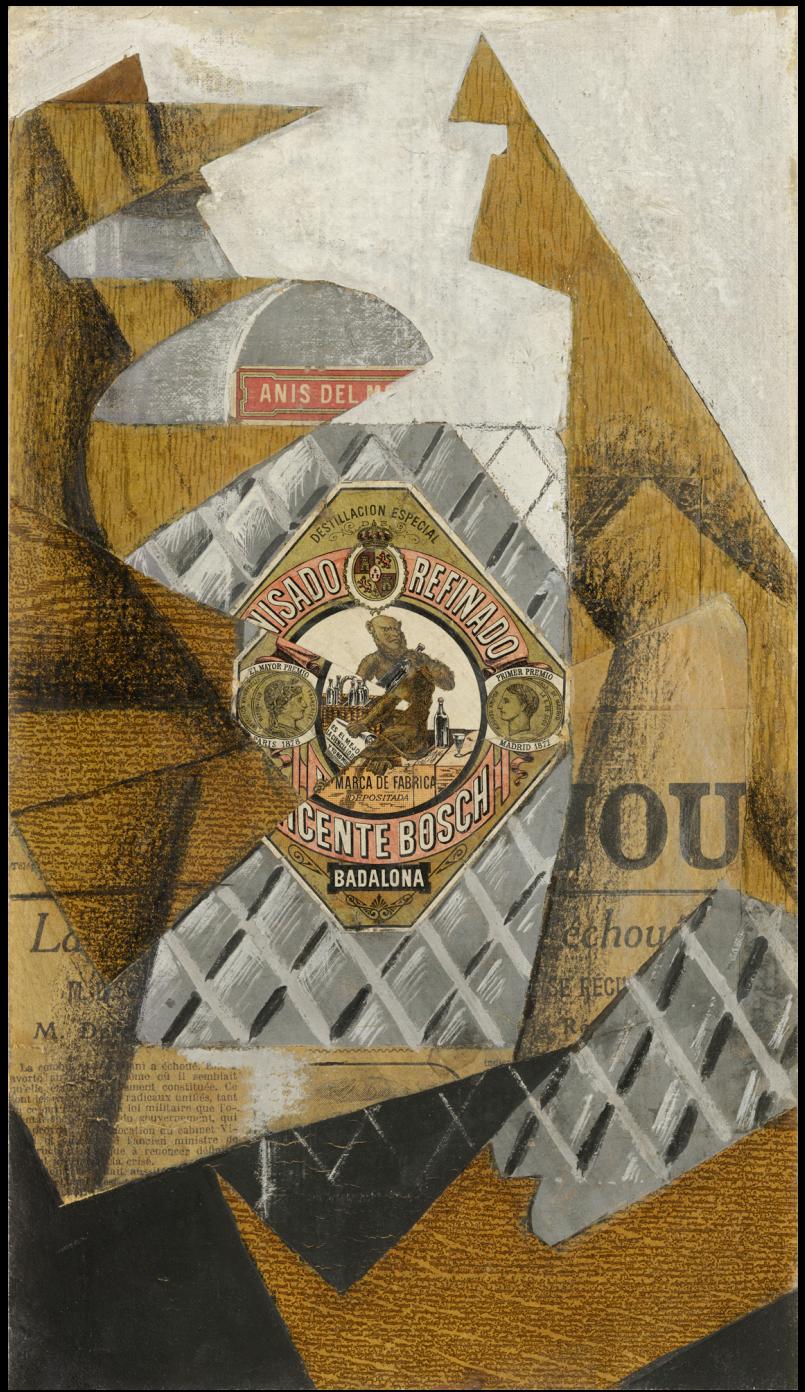


Layering Realistic Textures

In real life, hardly any surface features a purely homogeneous texture, so layering realistic textures is actually much more natural than creating a solitary realistic texture. This isn't the case when using photographs directly in a design, but when creating realistic textures artificially in an image editing program, it's especially important to think in layers.

As an example, let's create a chalkboard texture. First, we can start with the basic grain and bumpiness of the surface (left). Then, assuming this isn't a brand new chalkboard, it probably has lots of erase marks and chalk dust built up on the surface (center). Finally, it's typical for there to be a few stray marks or slightly less-erased spots (right). All of these layers are subtle details, so when creating realistic textures, it's important to observe the real world very carefully.





Juan Gris, *The Bottle of Anís del Mono* (1914)



Detail View

Color

Introduction

The relationships between colors are fairly complex. This may also be why we frequently hear the term “Color Theory” but not “Value Theory” or “Texture Theory” for example. In the chapter about value, we said that values can exist without color, but color cannot exist without value. While this is true, it’s not the whole truth. Every color has a value, but it’s completely possible for several colors in a group to all have the same value, thus negating the contrast between light and dark. To see this in action, a color spectrum or a “rainbow” can be desaturated. Saturation calculations are typically very rough and a truly desaturated rainbow should simply appear as a flat grey block, however, a rough approximation is enough. In the images below, notice how the color version has several areas where the colors appear to be separated. Then in the image on the right, see how the desaturated version features fewer clear bands of separation.

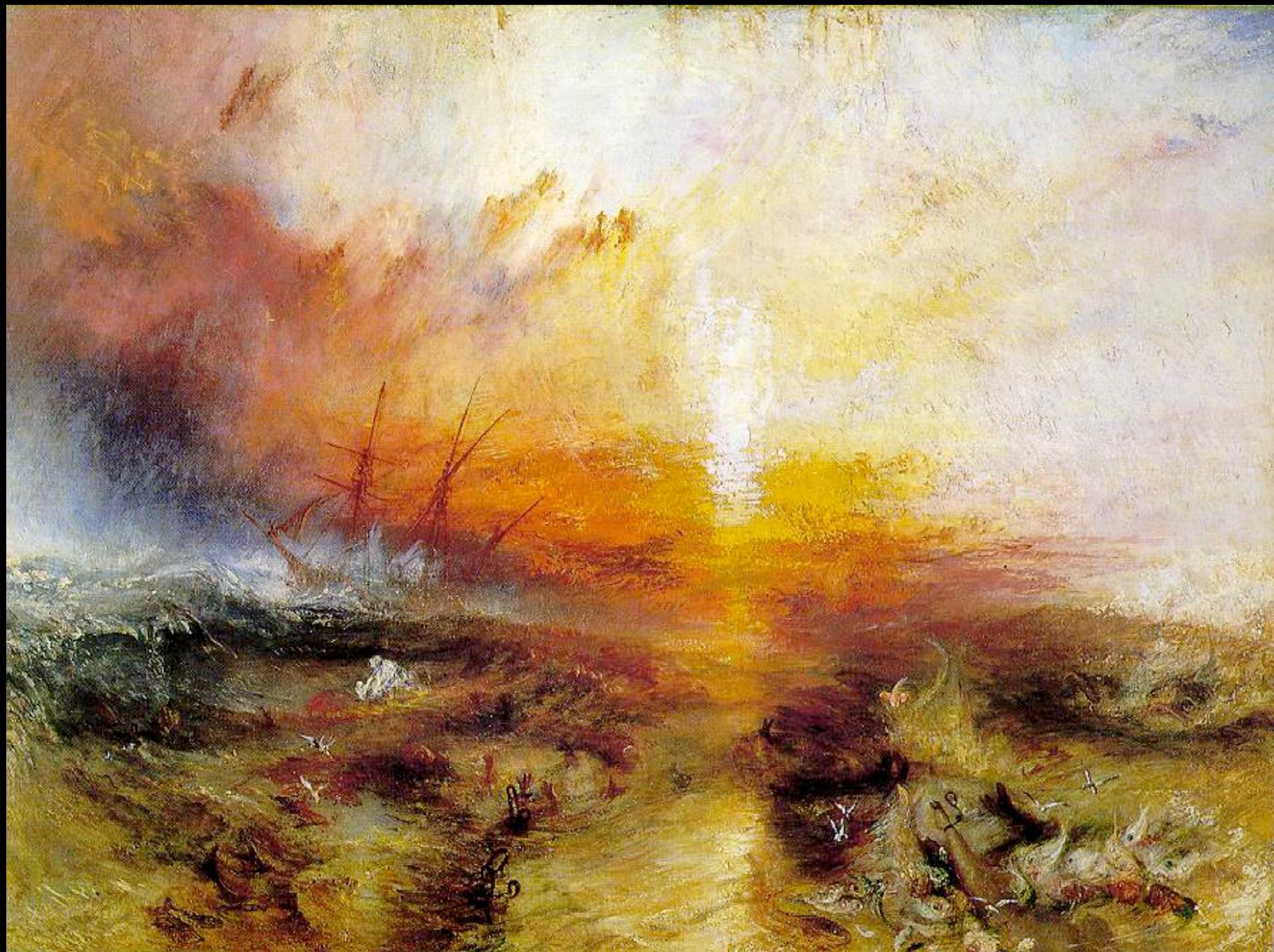


For thousands of years, various meanings have been applied to colors. In many cultures, red is the color of love, while blue is considered to be strong and masculine. However, for our purposes, meaning in color isn't useful as much as it's something to simply be aware of. For example, while red is associated with love and weddings in Chinese culture, it is also associated with good luck and fortune. In the western world, green tends to be the color that's most associated with good luck and fortune. When designing websites, colors should be chosen more carefully when designing a site for an unfamiliar audience or culture.

It's almost impossible to define color without the use of scientific terms, because it's not easily relatable to other senses. For example, if an individual with a vision impairment were to ask about the elements of art, things like line, shape, form, and texture would be fairly easy to convey. Color is much less tangible, and changes in the wavelength of light are as fleeting as changes in the pitch of a sound. However, for sighted individuals, here's a formal definition:

Color is the use of hue in an image.

This definition isn't very satisfactory for anyone, but the truth is, color is probably the most complex element or principle of art. It's difficult to reduce the idea of color to a sentence or two, and again, this is why artists and scientists alike benefit from the use of color theory.



William Turner, *The Slave Ship* (1840)

Color Models

Color theory in its unabridged form is very complex and a bit beyond the scope of this chapter. However, as web professionals, there are a few aspects with which we should be familiarized. The first concept we'll focus on is what are called color models, which create a framework that describes how colors should interact and behave. There are two categories of color models: additive and subtractive.

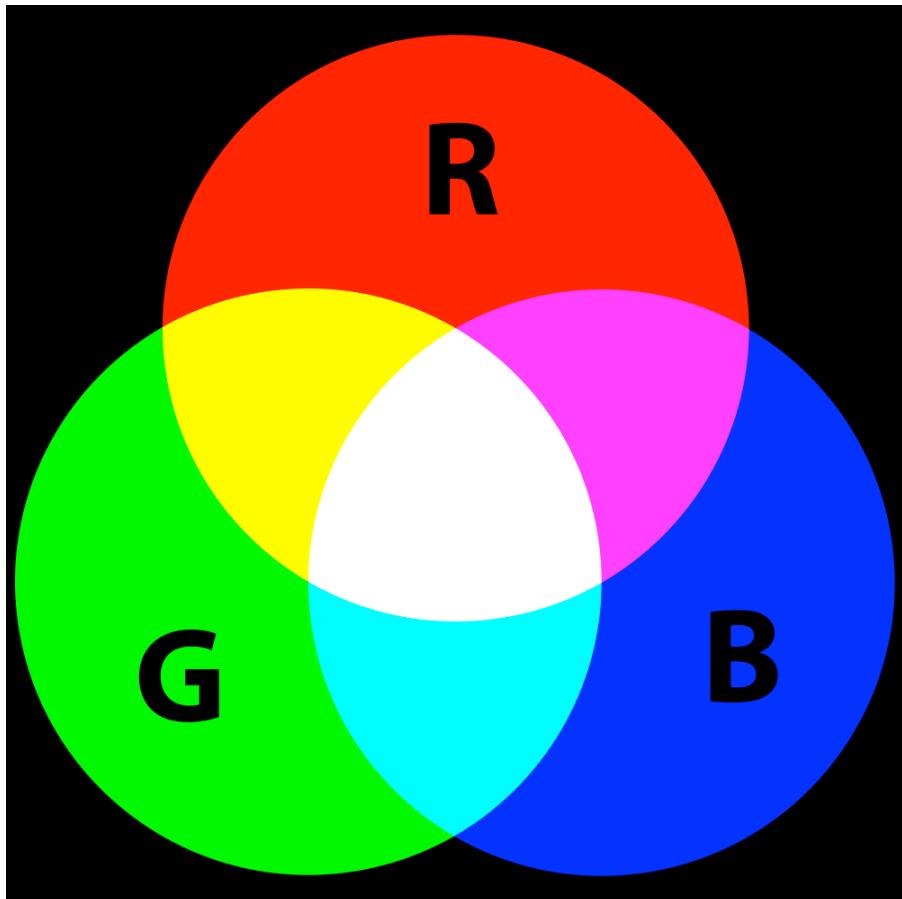
Additive Color

During the 19th century, the Scottish theoretical physicist James Clerk Maxwell pioneered the world's understanding of additive color. In 1861, he took three black and white photographs of the same object. One photograph used a red filter, one used a green filter, and the last one used a blue filter. After developing the images, he set up three projectors, using the same red, green, and blue filters. When the light from the three projectors was composited into a single image, it formed a full-color picture, thus demonstrating the additive color model.

When all the wavelengths of light in the visible spectrum combine, they form white light. The basic premise of additive color models is that if you start with the absence of light (black), various colors can be added together to make other colors. The more color that is added together, the whiter the color becomes. As an example, the RGB (red, green,

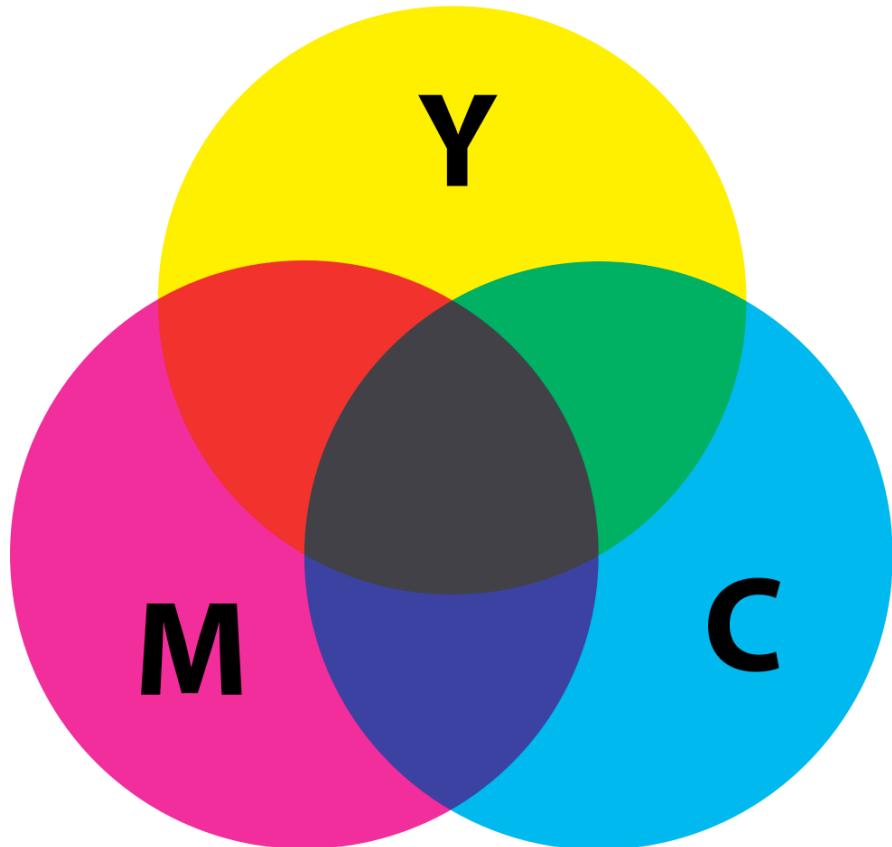
blue) color model that is used in computer graphics is an additive model. In fact, the RGB model goes deeper than that. The human eye has trichromatic red-green-blue vision. Long, medium, and short “cone” cells in the retina allow us to perceive red, green, and blue light, respectively. When these three wavelengths are combined, other colors emerge, allowing us to see the visible spectrum (some colors better than others).

This understanding of color isn't the full picture, however. Historically, in all color models, it has been believed that three primary colors can create all other colors in the spectrum, and red, green, and blue are considered to be the additive primaries. This is, in fact, false. The truth is, electromagnetic radiation travels at different wavelengths, and when the length of the waves and the intensity are modulated, different colors are produced. Primary colors are a helpful construct in discourse on color theory, but in reality, they are imaginary and only capable of producing a subset of all possible colors, called a gamut. RGB is one such example of a gamut.



Subtractive Color

As the term implies, subtractive color is the opposite of additive color. Instead of adding color to black, color is subtracted from white. This is not the way that light or the human eye works, but it is indeed how paints, inks, and dyes work. When a colorant medium is placed on a piece of paper or a canvas, some wavelengths of light are blocked and others are reflected. This is why most paper or canvases start out white; they reflect as much light as possible before it is blocked by ink or paint.



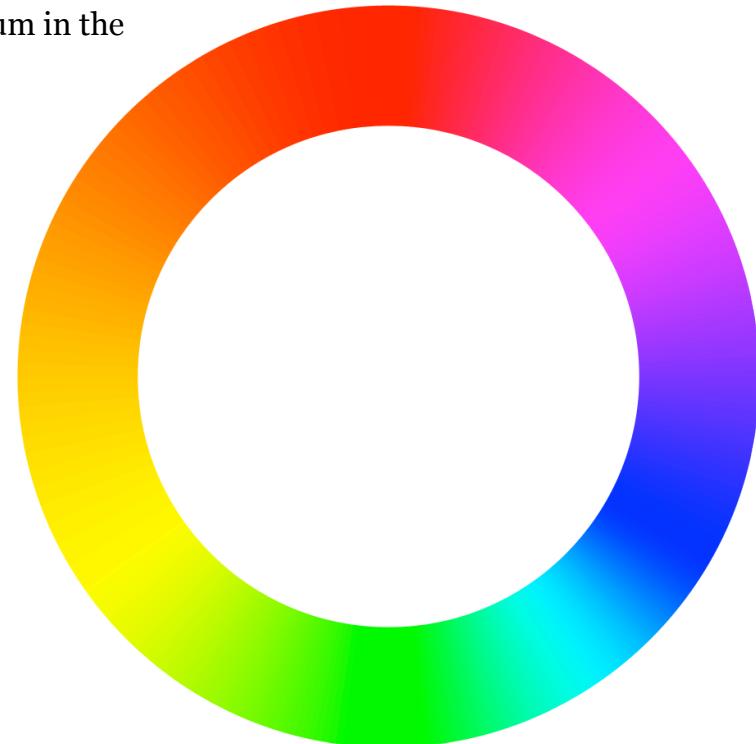
The CMYK color model is an example of a subtractive color model, making it a common choice for print work. The “primary” colors are cyan, magenta, and yellow, although an undertone of black is typically used as well. These primary colors are not far from the primary colors, red, yellow, and blue, that are typically taught to young children in school. As a result, most people understand subtractive color mixing quite well: red and yellow make orange, yellow and blue make green, and blue and red make purple.



Wassily Kandinsky, *Composition VII* (1913)

Color Schemes

A color wheel is an abstract representation of the color spectrum in the shape of a circle. Normally, the color spectrum is seen arranged in a straight line, but a circular arrangement makes it much easier to see and understand the relationships between colors. These relationships, sometimes referred to as “color schemes,” are analytical methods of mixing colors. There are an infinite number of ways to create color schemes, but here are a few examples.



Monochromatic



A monochromatic color scheme is a set of colors that all have the same hue, but different values (known as tints and shades). These color schemes tend to feel stoic, authoritative, and sometimes they can even feel melancholy.

Analogous



Analogous colors are three colors that are adjacent to each other on the color wheel. For example, orange, yellow, and green, is an analogous set. Analogous schemes tend to feel relaxed and are frequently found in nature such as in fall leaves or in a summer sunset.

Complementary



Every color on the color wheel has a compliment, or color opposite. To find the color opposite of any color, simply find the color directly across from it. Common complimentary pairs include red and green, blue and orange, and purple and yellow. These color schemes tend to be extremely vibrant and bold, so they should be wielded carefully.

Warm and Cool



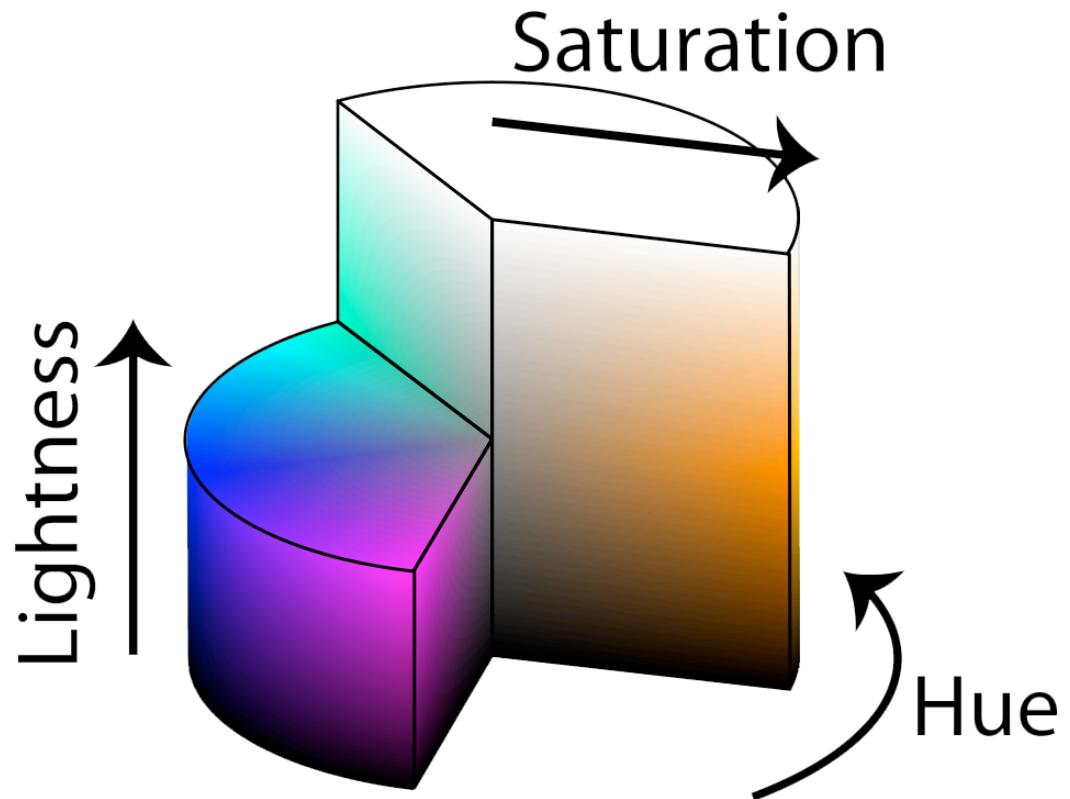
Warm and cool color schemes represent two halves of the color wheel. Warm colors such as red, orange, and yellow, tend to feel “hot” like fire. Cool colors such as green, blue, and purple, feel “cold” like ice.

Hue, Saturation, and Lightness

While color is the use of hue in an image, again, this is the truth, but it isn't the whole truth. In addition to hue, there's also saturation and lightness. Together, they form HSL, which is a common representation of the RGB color space. HSL, along with several other representations, were developed in the 1970s for use in computer graphics. Today, HSL drives color pickers and many other graphics related tasks. The HSL representation is visualized as a cylinder.

Hue

Hue itself is difficult to define outside of wavelengths of light energy, but at best, hue might be described as a visual sensation that corresponds to one of the named colors. In essence, hue is pure color, and in the HSL model it is represented by the radius of the cylinder. Each degree is a different hue, separate from saturation and lightness.



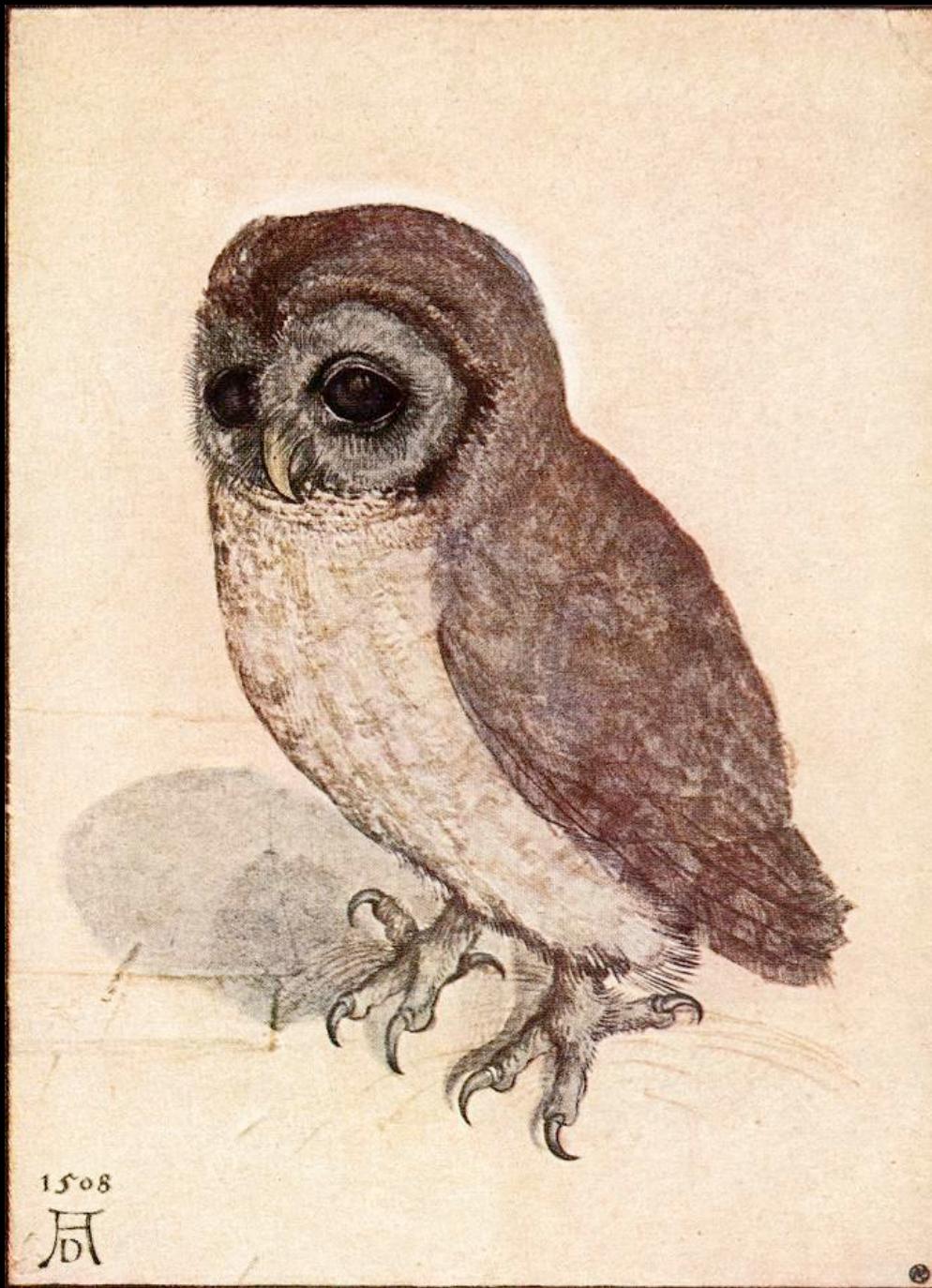
Saturation

Saturation is much less straightforward than hue or even lightness and, mathematically, most color models are only capable of making rough approximations of saturation. For our purposes, there's no practical need to delve into the technical complexities, so we'll commit the color-science-sin of defining saturation in the same way that the HSL model defines what is called chroma. Basically, saturation is the brilliance or intensity of a color. In the HSL cylinder, the central core is completely desaturated, while the outer edges are at full saturation.

Lightness

Lightness (sometimes referred to as value or lightness) can be thought of as the amount of white or black present in a color. The bottom of the cylinder is completely black, and the top is completely white. In between, white and black are added to the slices of color. In the exact center of an HSL volume, the color is completely desaturated and perfectly between black and white, producing a middle grey. In a similar representation known as HSV, lightness is replaced with value, which we covered in a previous chapter. The bottom of an HSV cylinder is black and the top is pure color, or the *absence* of black, rather than having white added. In an HSV cylinder, the center of the very top “slice” is the only place where pure white is present. It should also be noted here that HSL and HSV have different goals as color models, and one isn't necessarily superior to the other.

Drawing



Albrecht Dürer, *The Little Owl* (1508)

Introduction

I strongly believe every web professional should possess some degree of artistic skill. The ability to draw allows us to quickly mockup a page layout or a visual idea and share it with others. In our domain of abstract ideas and fuzzy logic, drawing is capable of communicating many things that mere words cannot. Furthermore, I say that drawing is a *skill* because I also believe that drawing is not something that people are born with or something that they pick up accidentally. Just like writing, drawing is something that must be practiced in order to be perfected. However, while most individuals continue writing after the age of five, many do not continue to draw, and their artistic development comes to a grinding halt. It's time to pick the pencil back up (for a beginner, any pencil will do).

In the series “Art and the Web”, we’re exploring the elements and principles of art, and nothing reinforces concepts better than putting them into practice. In the last short book, we started with the elements line, shape, and form. Now, let’s take a look at how we can further develop our sense of value, texture, and color.



Paul Cézanne, *Rooftops and Tree* (1888)

Exercises

Drawing takes a lot of practice, so don't be discouraged if your first (or twentieth) attempts are bad. Perhaps even more importantly, **never** throw your artwork away. Many skills do not produce material results that can be referred back to, so the fact that we're able to look back on our work and monitor improvement is a tremendous advantage that shouldn't be wasted. Drawing also takes a lot of concentration, so if you start feeling a wave of mental exhaustion after an hour or even a few minutes, then you're doing it right.

Shade a Sphere

Most beginning drawing students will focus heavily on using lines to reveal the form of objects. There may be some shading involved, but it's usually far too light. In the real world, we experience the full value scale on a daily basis, so in every drawing there should almost always be areas of complete darkness, bright white, and everything in between. Intermediate drawing students realize this and will sometimes overcompensate. Often there will be many darks and lights, but not enough subtlety and variety in the grays. Fortunately, this exercise is designed to develop skills and break the bad habits of any artist, beginner to master.

First, find a smooth and relatively spherical object. Something like a river rock, a ping-pong ball, or an egg, will work perfectly. For a real challenge, find a spherical object that's highly reflective, like a metal ball bearing. Then, place the subject on a flat surface and shine a strong light source at it. A small desk lamp works best, but if you draw fast enough, even sunlight could work.

With the scene set up, try to draw the subject and its shadows as realistically as possible. To start, pencil in the basic shape of the object and its shadow very lightly. Then, shade in the object and its shadow, using the full range of value. In your rendering, there should be a full or near-black value, as well as areas that are nearly or completely white. When shading, don't simply draw the object and then start to fill it in; use your eyes to very carefully observe the shape of the object, the shape of the shadows, and how the values gently gradate into one another.

Gather Textures

It's not always easy to define a texture, but we know it when we see it. For example, if a texture is enlarged to a great size, at what point does it cease to be a texture and transform into shapes, lines, and values? Beginning drawing students will often render textures as a muddled mess of values, but with careful observation, you'll begin to notice that there's more to texture than a jumble of visual noise. Texture at the most granular level is a pattern of other art elements.

With a paper, pencil, and possibly a solid drawing surface in hand, draw 9 small squares in a 3x3 pattern. Then, look for textures around your home, in your office, outside, or wherever you happen to be. Some great subjects include carpeting, wallpaper, trees, and wood grain. Once you stumble upon an interesting texture, try to create a “thumbnail” image of the texture in one of the boxes. Again, try to pay careful attention to the composition of the texture; what is it that actually makes the surface textural? After you’ve finished drawing a texture, move on to the next one, until you’ve filled all the boxes. When you’re done, compare the textures to one another, and reflect on the differences and similarities. This exercise should yield insights into the atomic structure of textures.

Study a Color

Mastering drawing, especially color, is just as much observation as it is action. There’s a style of abstract art called Color Field painting that emerged in New York during the 1940’s. The style is characterized by (very) large areas of flat color placed adjacent to one another, or just one color filling the entire canvas. To gain a better understanding of color and its subtleties, try filling an entire piece of paper or canvas with a single color, using colored pencils, paint, or any other coloring medium. When you’re done, just stare at the colored area for a while. The logical side of the brain is tempted to categorize the page as being “red” or whatever color you chose. However, try to hunt for all the different shades, tints, and values. Furthermore, if you’re using a more visceral medium like oil or acrylic paint, you may even start to see some slight variations in hue. Concentrating on one color like this allows the mind to appreciate the complexity of light all around us.

Appendix

This concludes our exploration of value, texture, and color, but don't let that stop your own personal exploration. The elements and principles of art are easy to learn, but difficult to master.

Attribution

All of the fine art in this book is in the public domain. All illustrations demonstrating the elements and principles are either in the public domain, or they were created by the author, Nick Pettit.

About the Author

My name is Nick Pettit, and I'm a web designer and teacher for [Treehouse](#), an educational video tutorial service that teaches web design, web development, and iOS. I've studied fine art for most of my life, and I have a passion for technology. Currently, I reside in sunny Orlando, Florida with my girlfriend Tiffany and our two cats. When I'm not designing, teaching, or speaking, I enjoy watching movies, taking photographs, and playing video games.

The book series *Art and the Web* is never intended to be finished and will be continuously updated. If you have a suggestion for improvement, or if you'd just like to chat, feel free to get in touch. Thanks for reading!



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