COLOR MIXING ESSENTIALS

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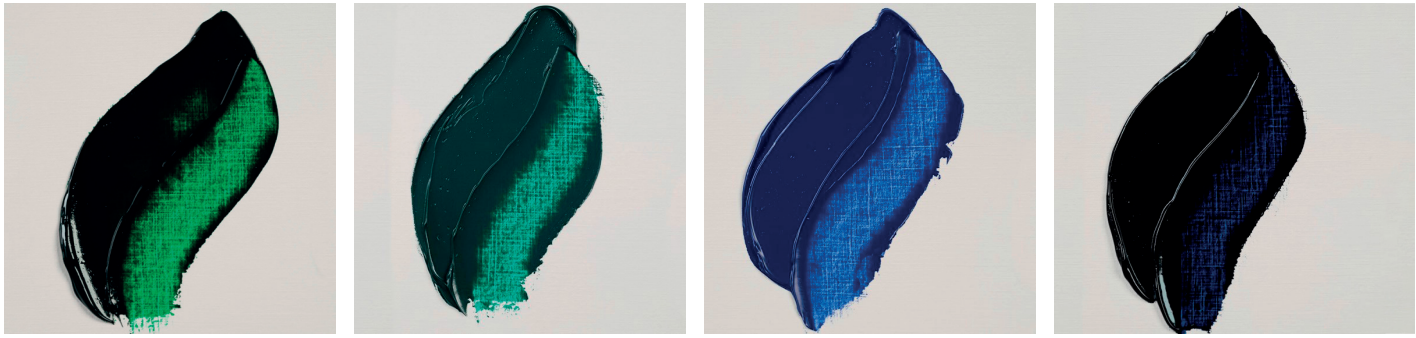
A contemporary beginner's guide to color theory and color mixing

MATE ART



COLOR MIXING ESSENTIALS

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EDITION NUMBER 1

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Introduction

You may be surprised by my subsequent statement right at the beginning, but did you know that colors don't really exist, and light is invisible?

You're probably wondering now if I've lost my mind. How can I write a book about colors and say such nonsense at the same time? No, don't worry, I'm not crazy, and in the following chapters I'll convince you of my claim.

Even though color does not physically exist, we perceive it all around us. Color makes it easier for us to distinguish things and to orient ourselves in space. For example, it would be hard to look for strawberries or blueberries on a bush if they were not different in color from the green leaves.

Color directly influences our emotions, feelings, and mood, and without exaggeration, we can say that indirectly it also influences our physical body and its condition. Imagine you are standing on the shore of a lake. The blue sky reflects on the surface of the water and the sun's rays hit the green vegetation. A gentle drizzle has conjured a bright rainbow over the horizon. What feeling does this scene leave in you? Positive feelings and mood are a reflection of your colorful surroundings. Now imagine the opposite. It's a gloomy day, the sky is overcast and dark grey, the colors lose their saturation, and everything is drowned in a colorless grey mist. This scenery would take the zest for life out of a die-hard optimist. Human emotions and color are, in short, inextricably linked, and thus to some extent affect the world around us.

A perfect command of color theory and color mixing is undoubtedly one of the basic prerequisites for creating a quality work of art or graphic design. I can reassure you right from the start. Color theory and mixing can be learned! It all relies on knowledge that you can study and master. Later on, as you will discover for yourself, the mixing process will become so obvious to you through practice and repetition that you will be able to mix any color.

The resulting appearance of colors in the image is influenced by the adjacent colors that surround the observed hue. We'll talk more about this in the next section

of the book. No color used can easily be considered good or bad for a given painting and design. Whether it is a highly chromatic, i.e., very saturated color, or a low saturated neutral gray, it can always be the right shade you need at the time. So, the problem is not the color itself, but the surrounding aspects that are directly related to the color.

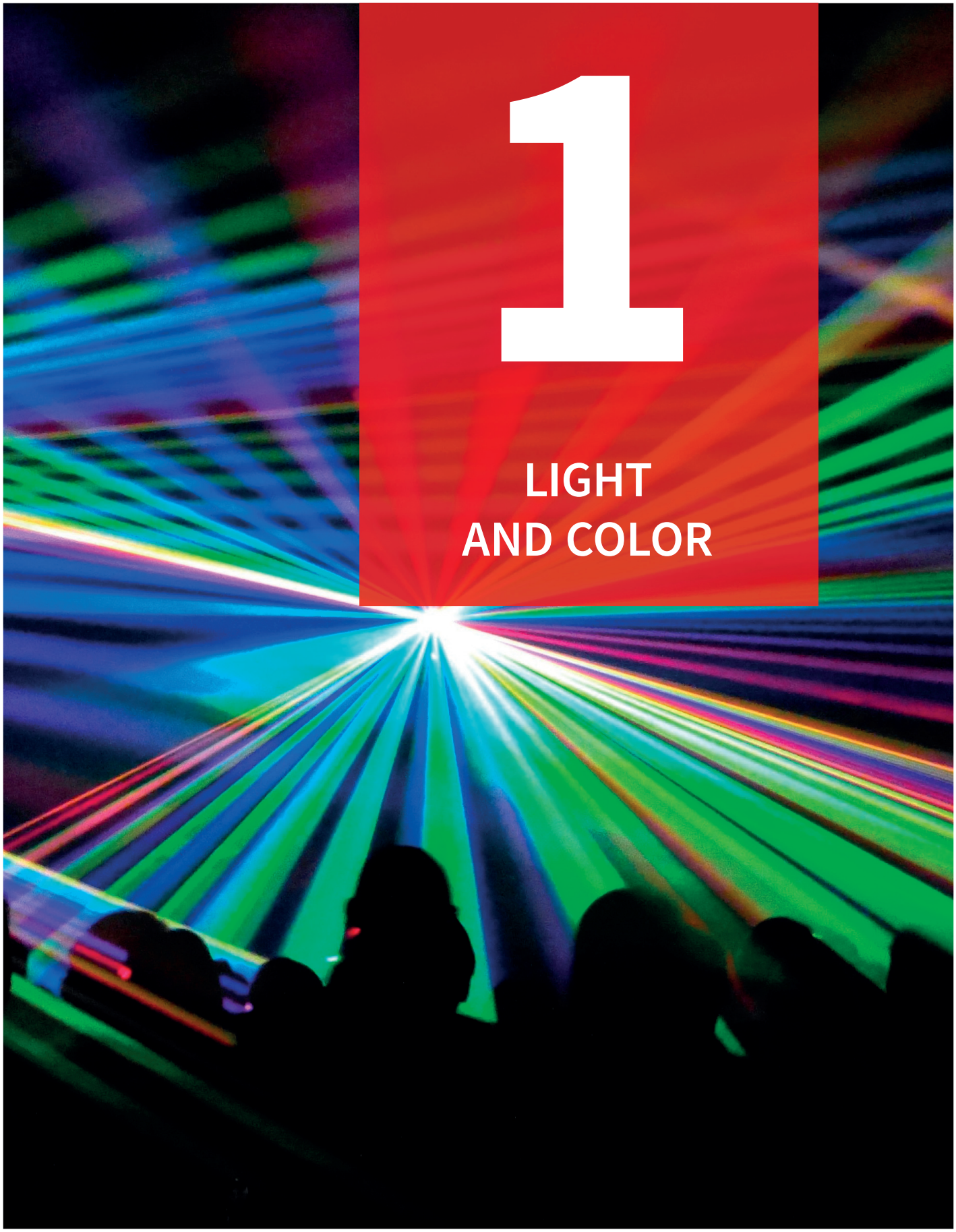
"There are no bad colors, only bad relationships between colors"

However, all the rules given in this book should be considered more as recommendations on which direction to take. Rules are meant to be broken. On the contrary, if you can free yourself from the shackles of exact theory, the possibility

of deeper understanding and more expressive expression opens up. Color theory as a discipline can be studied almost endlessly.

This book primarily aims to introduce the reader to the practical side of color. It will give you a helping hand in your own artistic creation and color mixing. It is aimed at artists, designers and, in short, anyone who wants to understand the essence of color and thus tap into a visual world that is incredibly beautiful!

Let me welcome you to the world of color!



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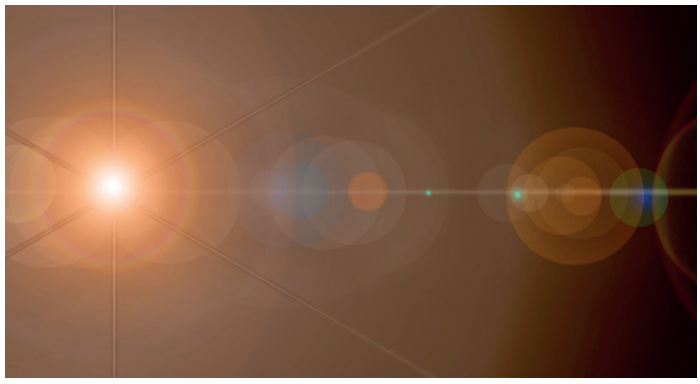
LIGHT AND COLOR

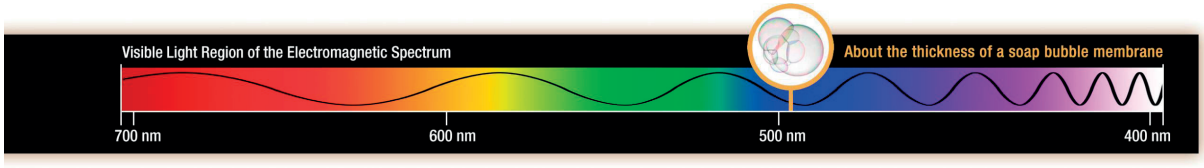
Let's start at the beginning. If it weren't for light, life would not have arisen on the planet. The rays that bounce off objects to the observer allow us to perceive space and things around us as we know them. Without the presence of light, nothing around us would exist. It is logical to deduce that if there were no light, there would be no colors.

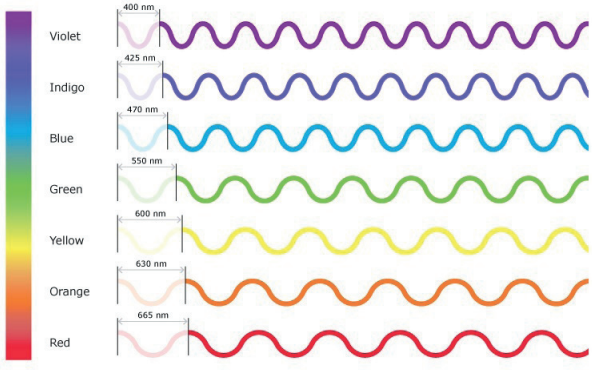
What is light and how does one perceive it? How is it that things around us are colored, dark, or light? Where does it come from that an apple is red or green? Where is the information about color found? Is an apple green because it has this information encoded in it, plain and simple? Do you think that if you turn off the kitchen light, the apple is still green?

It is generally known, and confirmed by many experiments, that light is composed of other spectral colors which it forms. Simply put, the sun's rays contain all the colors of the rainbow mixed together.



Visible light is a form of electromagnetic radiation, like radio waves, infrared radiation, ultraviolet radiation, X-rays, and microwave radiation. Sunlight encompasses the range of wavelengths necessary to sustain life on Earth: infrared, visible and ultraviolet (UV). We artists, however, are primarily interested in the visible part of the light spectrum, so we will deal only with that.





Visible light is generally defined as wavelengths that are detectable to most human eyes. The wavelengths of light, which are related to frequency and energy, determine the color we see. Thus, the longer the wavelength of light, the redder the color appears to us. Conversely, the shorter the wavelength, the more the color shifts towards the blue part of the spectrum. The human eye is therefore able to perceive colors from red, through yellow to blue. Colors that are outside the visible spectrum are of no artistic significance to us and will not be dealt with in this book.

THINKING ABOUT LIGHT

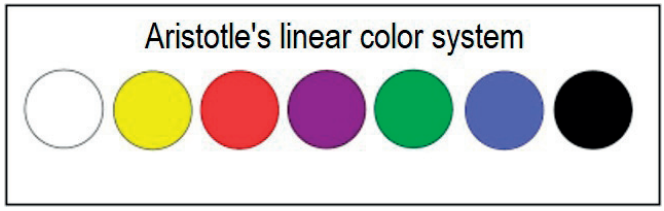
In the real world, you cannot observe a beam of light in isolation. The light itself is invisible until it hits an obstacle. It only manifests itself through reflection or decay, for example through molecules in the atmosphere or a glass prism. A beam of light can only be observed if it is surrounded by darkness. The same applies to darkness. Light and darkness are equal and exist simultaneously.

Rays of light

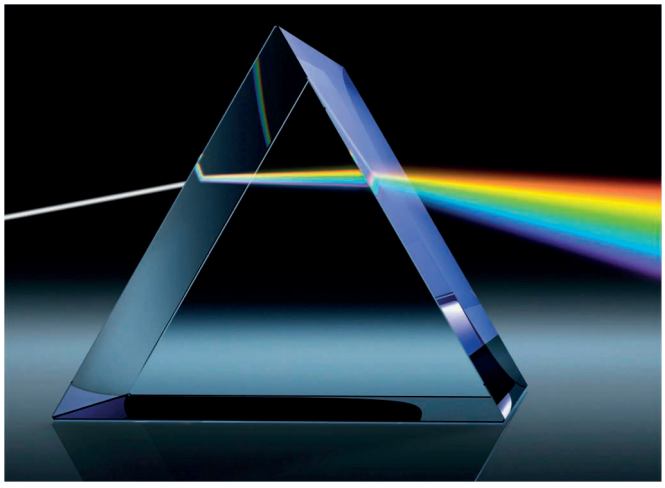
1.1 Where does the color come from?

People have been trying to figure out "how color works" since ancient times. The first person to write about color from an observer's perspective was the famous philosopher Aristotle. Up until then, philosophers had viewed color as a concept related to the workings of our universe. From an artistic point of view, almost no one has significantly dealt with color theory. Aristotle compiled seven basic colors, which he arranged in a linear system from lightest to darkest. However, this way of organizing colors was based only on the tonality of the respective hues. From the perspective of modern color theory, which ranks colors on the basis of their hues, the linear ordering of colors seems unusual. However, this system has served European culture for nearly two thousand years.

The first satisfactory answer to the question of where color comes from was found by Isaac Newton, who laid the foundations for modern color theory. In 1671, he published the first records of light refraction through a glass prism. As it turned out, white light passing through a prism breaks down into the individual visible colored parts of the spectrum. From this experiment, he concluded that pure white sunlight was composed of all colors. In order to prove this assertion, and at



The order of colors according to Aristotle



Light scattering by a glass prism

Isaac Newton

"Light and darkness, brightness and darkness, or, if we prefer a more general expression, light and its absence, are necessary for the emergence of color... Color itself is a degree of darkness."

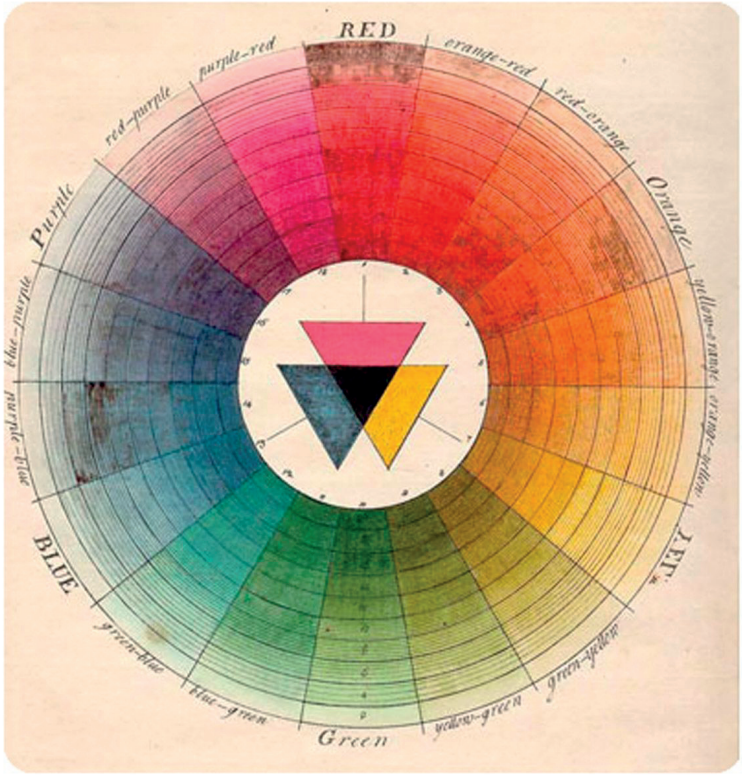
– Johann Wolfgang von Goethe, Color Theory

the same time to reassure the public that the prism was not behind the colors, he reversed the experiment and again refracted all the colors of light into a single point. The result of the sum of all the light colors was again white light. From this point on, no one doubted that the information about color is therefore contained in the light, which is either absorbed by the illuminated subject or reflected from the object and then processed by our brain into a visually familiar form (color).

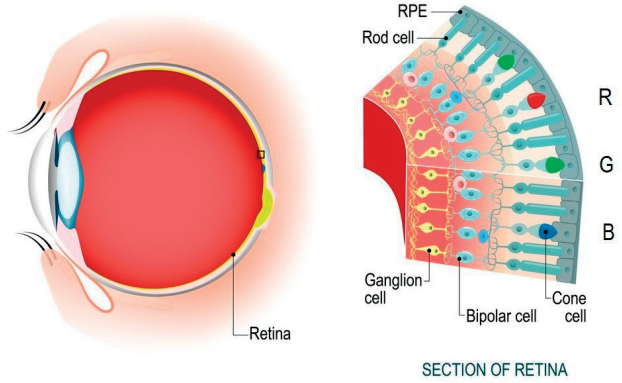
Almost 140 years later, Newton's theory was followed up by another figure who perfected and refined color theory into the practical form we know today. Johann Wolfgang von Goethe examined the color spectrum that Newton created by decomposing light through a glass prism and found that if the brightness was raised to its maximum value, the result would be a white image without color. Conversely, when the brightness is reduced to the minimum, the image turns black and again we see nothing but colorless darkness. Goethe thus confirmed experimentally that at a certain liminal position between light and darkness is where color is literally born.

One of Goethe's most radical conclusions was the refutation of Newton's ideas about the color spectrum. His argument suggests that darkness is an active component, not merely a passive absence of light. Not only light, but also its absence, are necessary for the formation of color. Color itself is a degree of darkness. The conclusions of his experiments and the addition of Newton's spectrum produced the color wheel which is generally known and used by the public.

Simply put, color itself does not exist and it is only the human perception of electromagnetic waves that the observed subject



Goethe's color wheel



Eye anatomy

reflects towards the observer. Due to the eye's reaction to light, color is found in the mind, not in the physical world. It could be stated without exaggeration that color is merely an illusion created by our brain through our eyes.

Part of the human eye are, among other things, rods, and cones, which, when struck by light, trigger chemical reactions whose final product is an electrical signal. This travels to the brain, which processes it into what we call color. Our visual system is so-called trichromatic, which means that visible colors can be created by combining red, green and blue light.

COMPLEMENTARY SHADOW COLORS

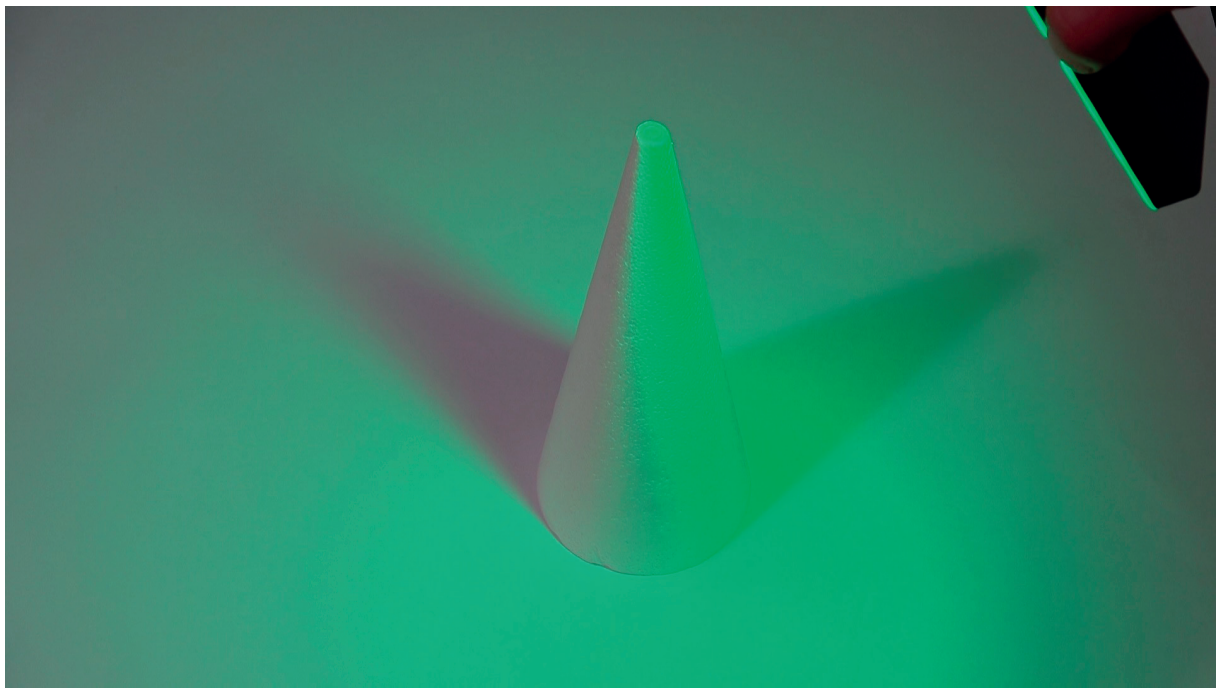
Every shadow has a certain color for a person, which is based on the main light source. Consider the following very simple experiment. If we illuminate a cone on a white ground unevenly on both sides with daylight of the same neutral temperature, a shadow will appear at the point of the weaker light source which is essentially a neutral grey hue. The situation changes, however, if we change the white light from one side and use a colored light source instead. As you can see, green light produces a reddish (magenta) shadow on the other side of the cone, blue light produces a shadow with a yellowish tinge, etc. But now comes the more interesting part of the experiment. If we zoom in close enough to the shadow area so that it is isolated from the influence of the surrounding color, we can see that the shadow has no color and is still a neutral gray! How is this possible?

Our visual system works in the context of the overall color environment. If a cone is illuminated on one side by colored light, our perception compensates for this by creating a complementary shadow color on the opposite side. This maintains a harmonious color balance in the system. The shadow, however, has no such color if we look at it very closely. So, from a physical point of view, the "shadow color" has no wavelength that is measurable, and that basically means it doesn't exist. But we can still see it.

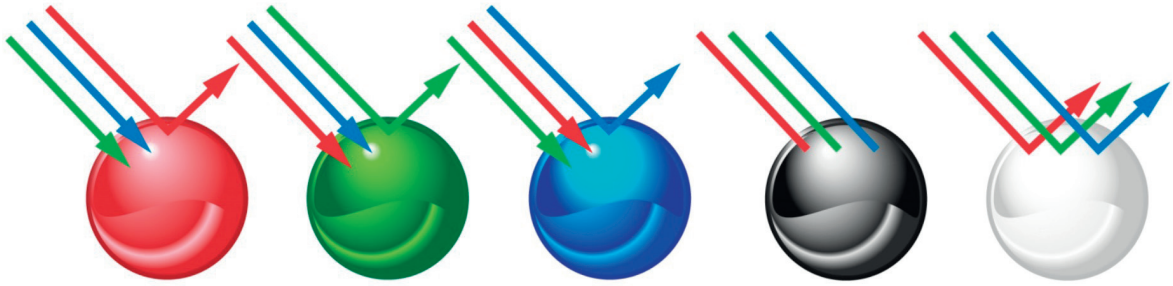
HOW WE SEE COLOR

Light, composed of primary light colors, falls on objects that absorb it more or less or reflect it towards the observer, depending on the type of material, texture, transparency, etc. For example, if an illuminated object absorbs wavelengths of green and blue light, it will reflect only the red part of the spectrum and appear red to us. If the light is absorbed, the object appears black. Conversely, if all wavelengths are reflected equally, the object appears white to us.

If we delve even further into color, we find that although we see, for example, a yellow or red flower, we cannot claim this information to be the absolute truth because, for example, insects, equipped with a different optical system, perceive



Example of a complementary shadow color



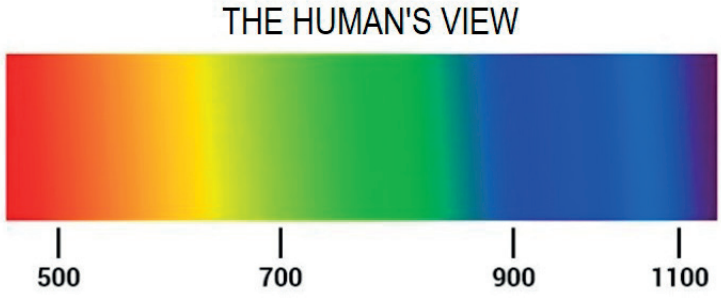
How we see colors

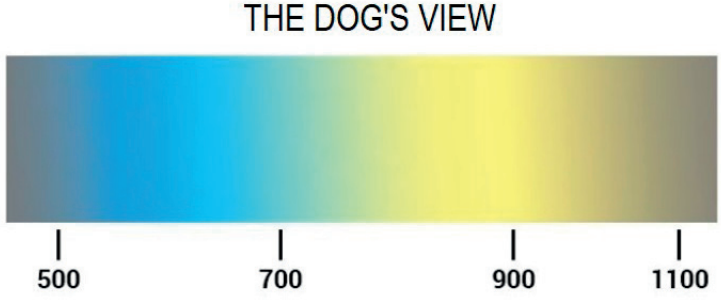
yellow and red flowers differently from us humans. For example, bees see light with a wavelength of 300 to 650 nm and, unlike humans, can see in the ultraviolet spectrum. The petals then teem with color patterns that are invisible to humans. These ultraviolet patterns help to navigate the insects to the "landing zone" where the plant stores nectar and pollen.

Most mammals have dichromatic vision, and their receptors focus primarily on the orange and violet regions. Because of this difference in cone sensitivity, your dog sees the world a little differently than you do.

If you want to score with your friends (or be a fool) ask them what color our sun is. Most of them will answer yellow orange, right? But our nearest star actually emits all colors unevenly. If red, blue and green light stimulate the three-color receptors on our retinas equally, the signal is mixed in the brain, and we see "white" light. Through our perception, through wavelength decomposition, atmospheric filtering, distance, and other factors, we see the sun simply as we see it. So, it can be said that not everything one sees is the real and absolute truth.

But let's leave the philosophizing and return to color theory. Newton first classified five colors in the visible color spectrum: red, yellow, green, blue, and violet. Later, however, he expanded the visible spectrum to include two more colors – orange and indigo. Newton's decision to add orange and indigo seems



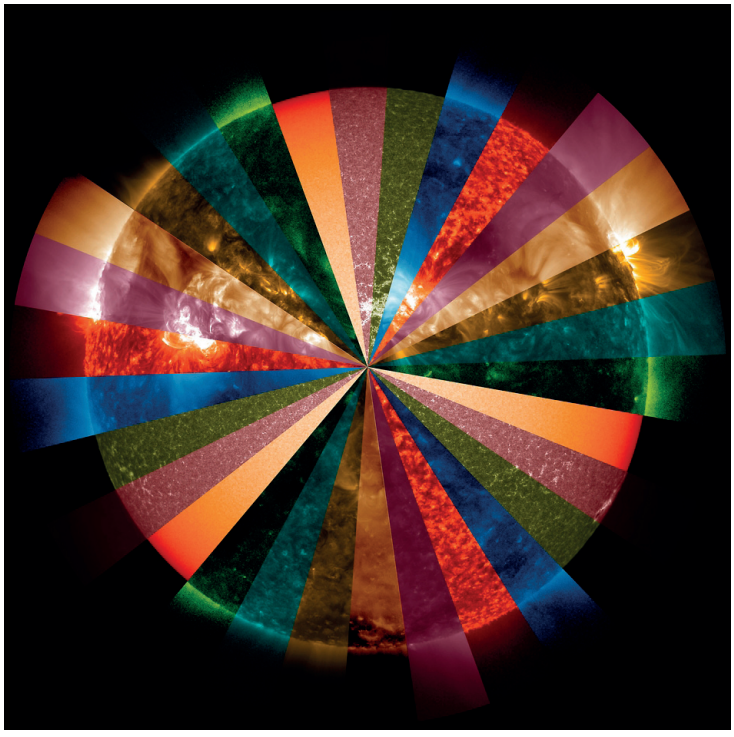


to have been based on the analogy between color and music (specifically the seven-tone scale). The classification of colors in relation to music was a new and very innovative idea, but one that has no fundamental scientific justification. In physical terminology, an octave is a frequency range from x to 2x. The ratio of frequencies is therefore 2:1 which means that a higher octave is obtained by doubling the frequency of the fundamental tone. If light behaved similarly to musical tones, the frequency of the photons would have to be the same as the frequency of the octave. Given the range of the visible spectrum, which in a vacuum is between 380 and 740 nm, this analogy is not directly equivalent.

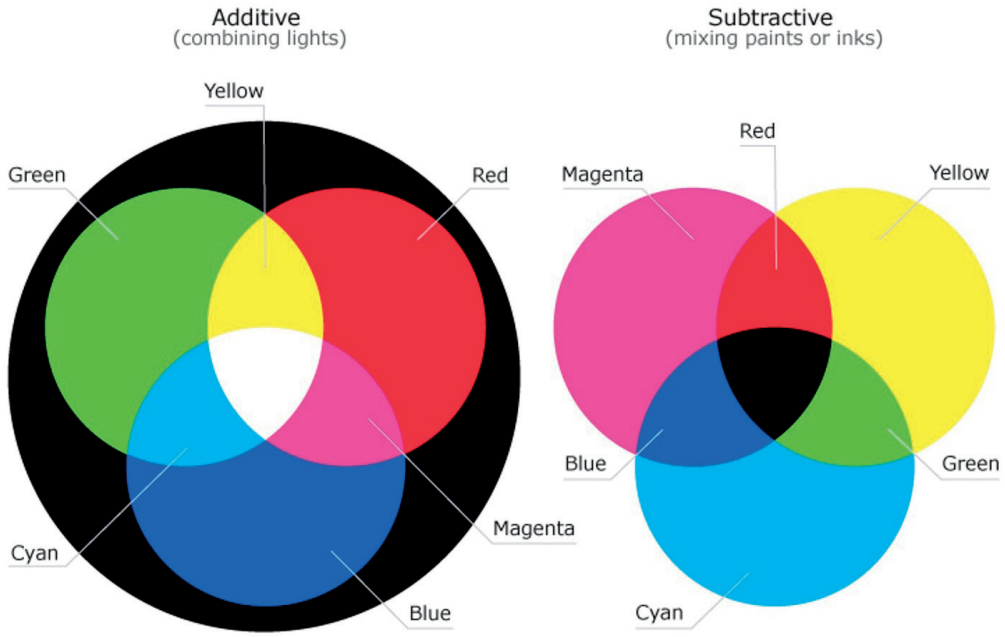
Although at first glance it might seem that tones and color are somehow related, I personally think that the search for analogies between colors and music has its essence in the natural human desire to find an organization that helps us understand and systematically use the acquired knowledge for a specific purpose. In some ways, however, the analogy makes sense. Few compositions begin right at the beginning on a full note. Most of the time a song or symphony has a gradual introduction, with additional instruments added later to create a gradation of notes to evoke strong emotions in the listener. Much the same is true for classical painting. The painting begins with the layout of the composition, the making of the drawing, then come the underpaintings, and finally the actual colors are added to bring the whole into its final form.

Whether or not Newton's analogy with music has merit from a physical point of view, it is certain that his approach and the results of his work were a fundamental step towards a deeper understanding of the nature of light.

Yellow flower under ultraviolet light



Composite image of solar wavelengths



Basic principles of color mixing

We will not deal in detail with the history of the discoveries here, and in the following chapters we will proceed directly to an explanation of color theory as we know it today. This will help us in the practical part to understand and master our own color mixing.

1.2 Methods of mixing colors

In principle, color mixing is divided into additive and subtractive. These two basic methods of color mixing are named according to the way in which the resulting color hues are achieved. The additive method of mixing works with colors of light (RGB) and involves adding colors and values (the lightness of the colors is added to produce a lighter color than the original color components). Conversely, subtractive mixing works with pigments (RBY) or also (CMYK) and involves the removal of colors and values (the lightness of colors is subtracted, and the mixing of colors produces a darker hue). This second method is therefore essential for artists using traditional media such as oil or acrylic paints.

Due to the different physical nature of these two principles, there is a certain contradiction in real creation. This dilemma is that you are trying to capture on canvas in a subtractive way, i.e., with pigment paints, what is created in the real world by light, i.e., by additive mixing. Let's imagine, for example, a traditional landscape. The colors of the trees, grass, rocks, and soil are all subtractive colors (light is reflected from these objects to the observer). The colors of the sky and the sun, on the other hand, are colors that arise from the light source and are therefore additive. The problem is that you have to use your pigment colors (the subtractive colors) to duplicate the effect of the additive colors (the light source).

As we will explain below, the color range of pigments lags colors of the light. Due to this limitation of pigment colors, it is very difficult to capture the same feeling and color range in an image as, for example, watching a real sunset. The task of any artist is not to copy the observed colors but to render only the illusion of color of the light, thus simulating on canvas the additive effects of light in a subtractive way. The convincing ability to transform reality into a painting in this way relies on knowledge of color theory, color relationships, contrasts, etc.

All the theoretical basics concerning primary and secondary colors are general. In this book they are illustrated by means of color wheels, shown in maximum saturation of specific hues.

COLORS IN PRACTICE

In reality, however, it is not only the individual hues that are involved in mixing pigment colors, but also their values and degrees of saturation. This means that it is not only the colors that are mixed, but also their darkness or, if you prefer, their lightness and chroma. The result is then

a color field of a million different hues, which are variations of the basic colors contained in the basic color wheel.

A color field of a certain range of colors identifiable by the human eye is called a color gamut. The range and area of a particular gamut depends on the display technology used (photography, LCD monitor, laser projector, etc.). The gamut therefore describes what colors a given device is capable of displaying or recording. Gamut areas are usually triangular in shape, as the most colorful reproduction is produced with three primary colors. The realistic gamut also depends on brightness, so to display all color variations it must be converted into a three-dimensional space.

COLOR RANGE

If some colors cannot be displayed within the limits of a certain color model, we call them "out-of-gamut colors". For example, pure red, which is included in the RGB color model, is "out of gamut" in the CMYK color model. For this reason, the monitor can display more colors and hues (additive RGB) than a printed photograph that is created by subtractive mixing (CMYK).

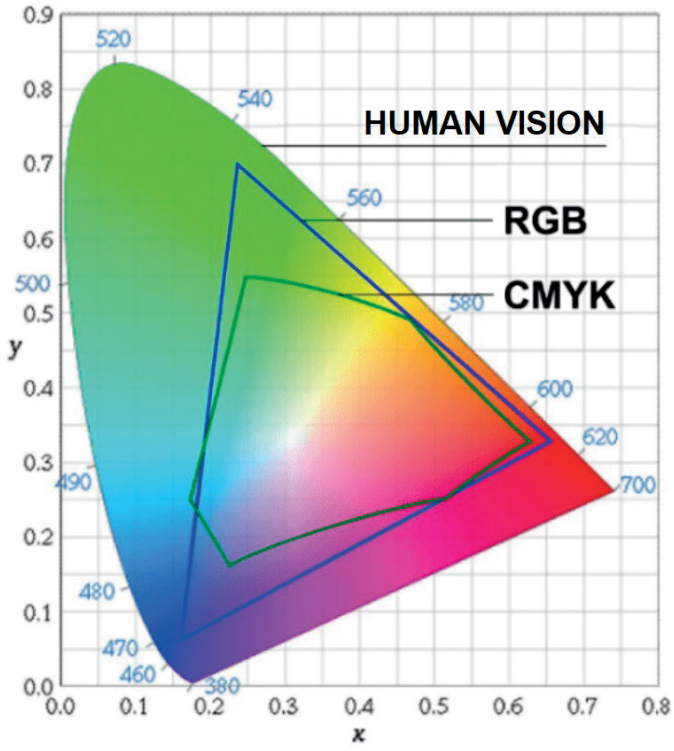
Color wheel with decreasing saturation

1.3 Additive mixing

This method refers to colors of light, which behave differently from pigment colors. In additive color mixing, the individual color components add together to produce light of greater intensity. The result is a lighter color that is the sum of the lightness of the colors used. Basic colors of the light include red, green, and blue. Thus, the commonly known RGB display system is derived from the English names of the colors Red, Green, and Blue. This color model is used in devices that emit light, e.g., computer monitors, data projectors, televisions, etc.

If you point cones of colored lights (red, green, and blue) at a single point, the result will be pure white light. Mixing the two primary colors produces a color that is complementary to the third primary color. The additive method works in exactly the opposite way to mixing pigment colors. The additive model works with a light source and "projects" each component with different intensities. By mixing in this way, essentially any additional color can be created.

Full chroma color wheel



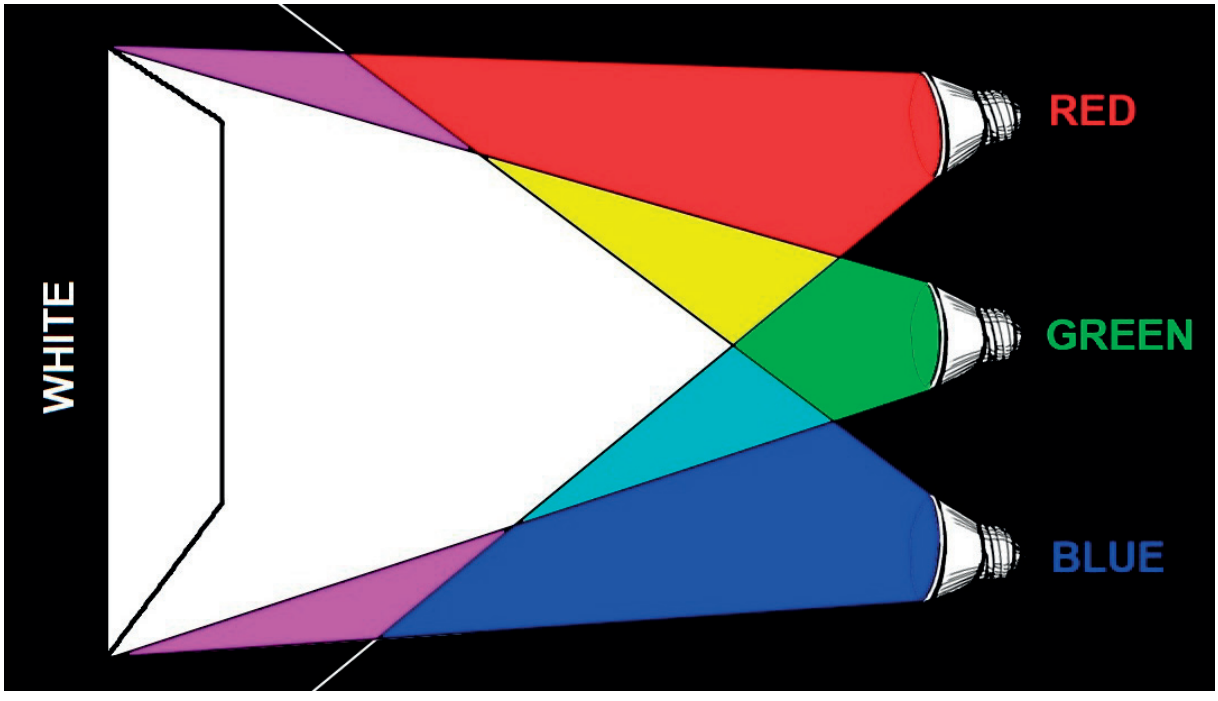
Comparison of color gamuts

In the picture we can see that mixing green and blue creates cyan, blue, and red create magenta and red and green create yellow. These resulting secondary light colors are the primary pigment colors. These pigment colors cannot be mixed from any other color.

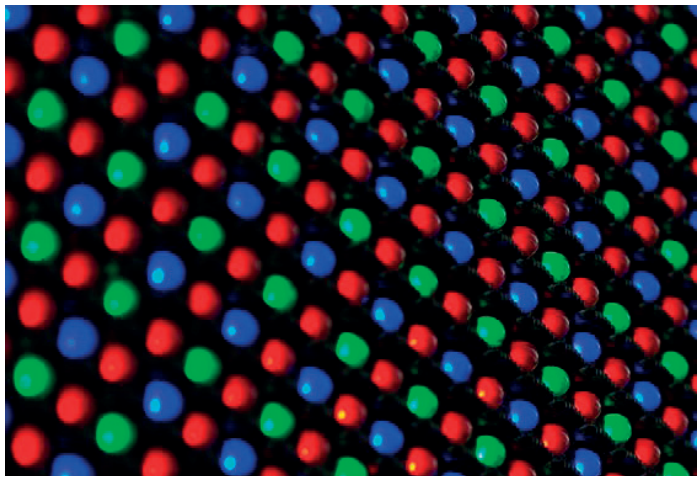
USE OF LUMINOUS COLORS

This principle is used, for example, in our computer monitors and mobile phones. If we look closely at an LCD monitor, we can see that the image area is made up of a series of tiny red, green, and blue dots. The monitor produces a wide variety of these colors which are produced exactly according to the additive method of mixing light colors described above.

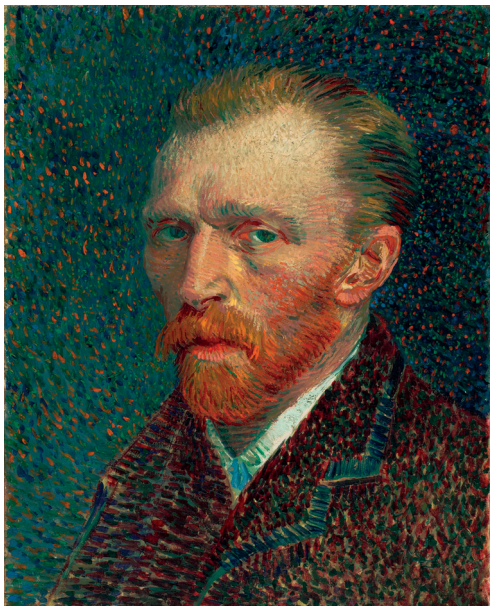
When painting and mixing pigment paints, the rules of additive mixing do not usually apply and therefore cannot be used. Nevertheless, there have been painters in the past who have tried to use the additive mixing principle in their work. At the turn of the 19th and 20th centuries, the so-called post-Impressionism emerged, which included various styles of painting focused primarily on the method of paint application. These included, for example,



Mixing of colored lights



Detail of the RGB LED monitor

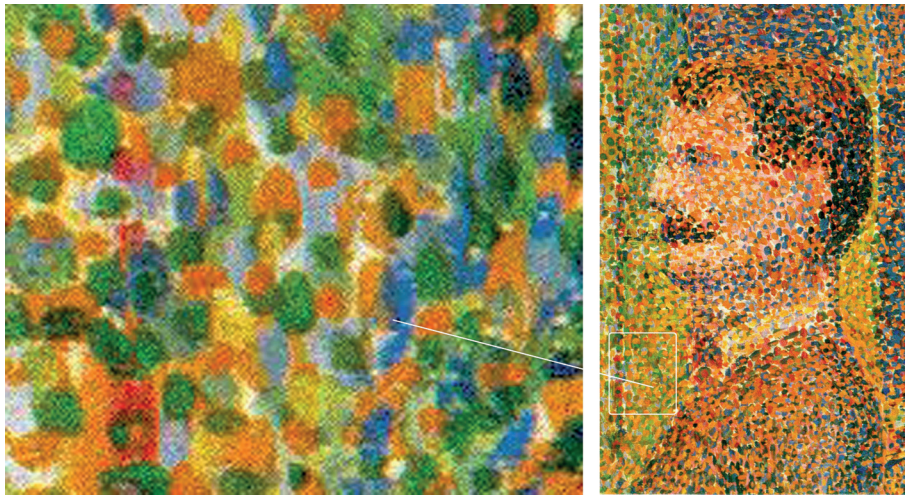


Vincent van Gogh – Self-portrait

Fauvism, Pointillism, Impressionism, etc. These artistic styles focused on the expressiveness of saturated colors and the use of the maximum potential of the visible color spectrum.

Some post-impressionists used a revolutionary technique to increase color brightness and contrast that was based on additive color mixing. Van Gogh, for example, wanted to achieve the effect of stained-glass windows in Gothic cathedrals on canvases. Colored pieces of glass placed side by side, transmit colored light exactly like light projectors through colored filters. Van Gogh was probably unfamiliar with the theory of the additive method of mixing colors of light and was keen to achieve the same effect using pigment paints. His style of painting was based on the juxtaposition of complementary colors. In this way he increased the color contrast of the individual color components, which then optically mix in the eye of the observer to create the desired color perception – this simulates the properties of colored light.

If you mix pigment colors, the resulting mixture loses its intensity and color according to the rules of subtractive synthesis. However, if the adjacent complementary color areas are small and lie close together, the light from such a location travel to the viewer's eye and additively mixes, creating a third resulting color. This color is therefore optically mixed only in the eye of the observer, who perceives the strong contrasts and bright colors that tantalize his senses. The additive mixing principle described above was further developed by other neo-impressionists, especially Georges Seurat, who invented the so-called pointillism.



Georges Seurat – detail of painting

This technique appeared at the end of the 19th century as an offshoot of Impressionism. Its essence is painting, usually with complementary colors, in the style of dots or very short brushstrokes

placed close together. For the record, this is basically the same system that computer screens (RGB) and printers use small pixels of only a few colors (most printers only have four inks, CMYK) and place them all so that they mix optically, and our eye sees a smooth color image. So, instead of mixing colors on a palette, the artist presents dots on a canvas that are literally mixed only in the eye of the beholder.

You can see a wide range of colors in the detail of the painting – yellow, orange, red, various shades of blue and shades of green. Now look from a distance at the whole from which the detail cutout came. In the overall view, the colors are optically mixed, resulting in a new hue that is visible only from a certain distance.

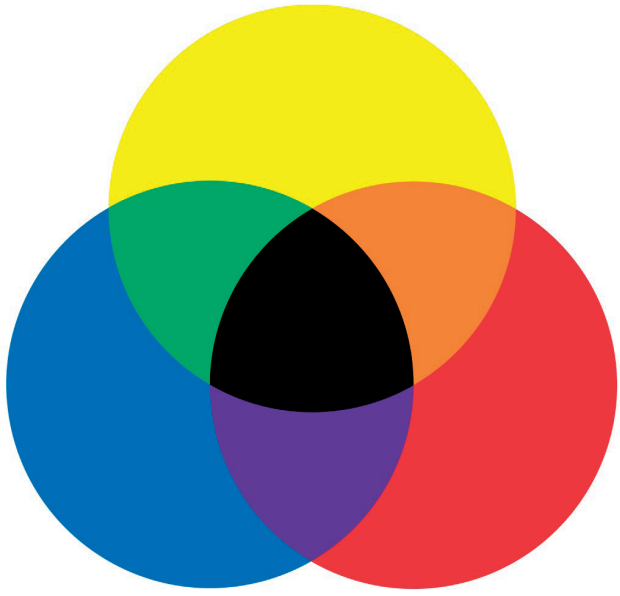
Black of primary colors

1.4 Subtractive mixing

This method is important for all artists working with traditional paints, as it is the basis for all pigment paint mixing. Subtractive mixing depends on the unique physical properties of pigments and additives (oils, thinners, etc.). When mixing pigment paints, wavelength absorption occurs because each color reflects only a certain portion of the light spectrum. Simply put, mixing adds the values of the individual colors in the mixture.

By mixing all the primary pigment colors, we get a near perfect black. To some extent it depends on whether the mixture is perfectly balanced in terms of the volume of all the colors. If, for example, red predominates in the mixture, the resulting black has a reddish tinge. The Impressionists in particular used this fact for their work. Their intention was to capture the atmosphere of a fleeting moment, and because they worked en plein air, their shadows were rich in color. From this point of view, black did not suit them, because adding black takes away the saturation of the other colors. Black, however, is a great help in painting and we shall say more about it in later chapters.

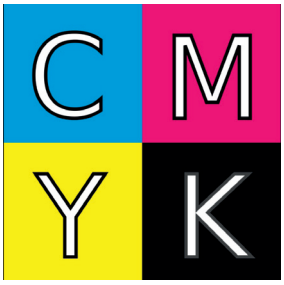
The subtractive system used by modern reproduction devices such as printers is abbreviated CMYK. It is a model based on subtractive color mixing and includes light cyan, magenta, yellow and black. These colors are derived from the primary light colors of the RGB system as described in the previous chapter. Ideally, only the first three colors (CMY model) would be sufficient, whose subtractive composition theoretically produces the color black. However, it is very difficult to produce a neutral black color when using real dyes and pigments. Also, from an economic point of view, it is easier to add black to the primary colors, as the CMYK system simplifies the whole process.



Subtractive mixing method

Nevertheless, it is sometimes stated that the primary pigment colors include red, yellow, and blue. This misconception is probably due to a misinterpretation of the exact hues, and it has already been proven that the CMYK system provides a greater range than the RYB system. However, the CMYK model is important primarily for display and reproduction by digital devices and printers.

PRINT vs MONITOR



CMYK colors

To print an image you have on your monitor; your computer must convert the additive RGB model to the subtractive CMYK model. However, because the RGB system has a wider gamut and CMYK does not cover all the potential color spectrum, the printed photo will not have the same color range as on the monitor. You can directly compare the color range of the two systems in the image from Wikipedia. However, this comparison is already heavily biased by the fact that you are looking at a printed image in a book.

1.5 Light and color

When we talk about colors, of course, we can't leave out other details about light. We already know that colors are created by light, which affects their appearance, and so it could be argued that light is essentially color. It is an essential element of any scene or painting. Its color, temperature, direction, intensity – all these factors contribute to the formation of the overall image.

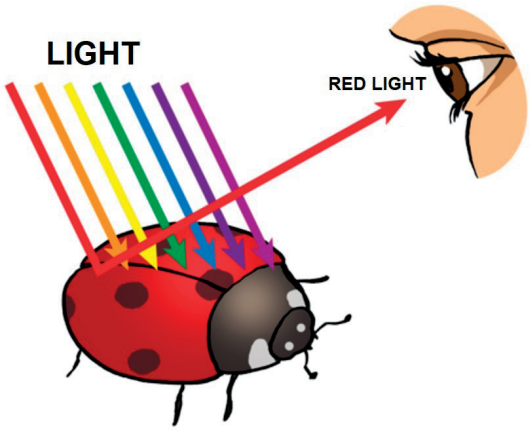
The light can have a warm yellow-orange or a cool bluish tint. Of course, there are other more saturated colored light sources that can significantly affect the resulting color. For our purposes, however, we will restrict ourselves to daylight or the light of an ordinary incandescent lamp. The temperature of light is given in Kelvin. The lower the value, the warmer the hue. Conversely, the higher the K value, the more bluish the tint.

For example, candlelight has a warm orange tint of about 1 800°K, daylight on a clear day about 5500°K, cool blue sky about 10 000°K, etc. Since light is the main source of color harmony, it is imperative to know these temperature and color tendencies. If you want to paint and interpret a real scene, the first thing you need to determine is what temperature and color the light source is.

In general, sunlight and blue skies can be considered normal daylight. A bright sunny day has essentially 3 light sources: the sun, blue sky and reflected light from illuminated objects. The sun as a warm yellow-orange primary light source is surrounded by a blue sky that produces cold diffuse illumination. This secondary illumination hits the model from several different directions. At higher altitudes, where the air is clear, the sky has a more blue-violet tint, and the shadows are darker and cooler. The more clouds there are in the sky, the greyer the blue will appear. So, if your scene or model is lit by this light, you need to take all 3 light sources into account when modelling a 3-dimensional object. These temperature changes must also be reflected in the subject.

An overcast sky with no sunlight produces more subtle diffuse lighting than a bright day. This kind of lighting allows you to view objects in their true color without significant tonal and

Comparison of CMYK and RGB color ranges



Light is color

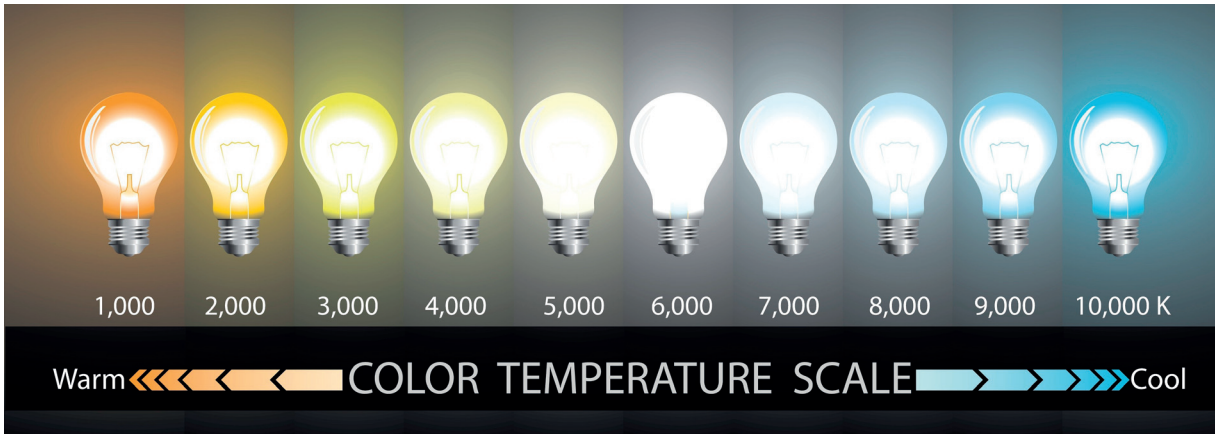
color contrasts between light and shadow. Shadows are not as sharp and the pattern transitions between light and shadow are more gradual. Surprisingly, the local color shows up in a purer form as it is not affected by direct light. The colors in the image appear richer due to the low chromaticity and the effect of contrast. This diffuse illumination does not change much during the day, allowing longer work on the painting without significant changes due to the lighting of the model.

Northern cool light has similar characteristics to the previous type of lighting. It has a bluer tinge, but this is also relative, as its color depends on the specific lighting conditions. This type of light is very popular, and many artists like to use it. They deliberately direct the windows of their studio to the north side. Their model then receives a cool steady diffuse light with a cooler bluish or greyish tinge, which does not change significantly during the day.

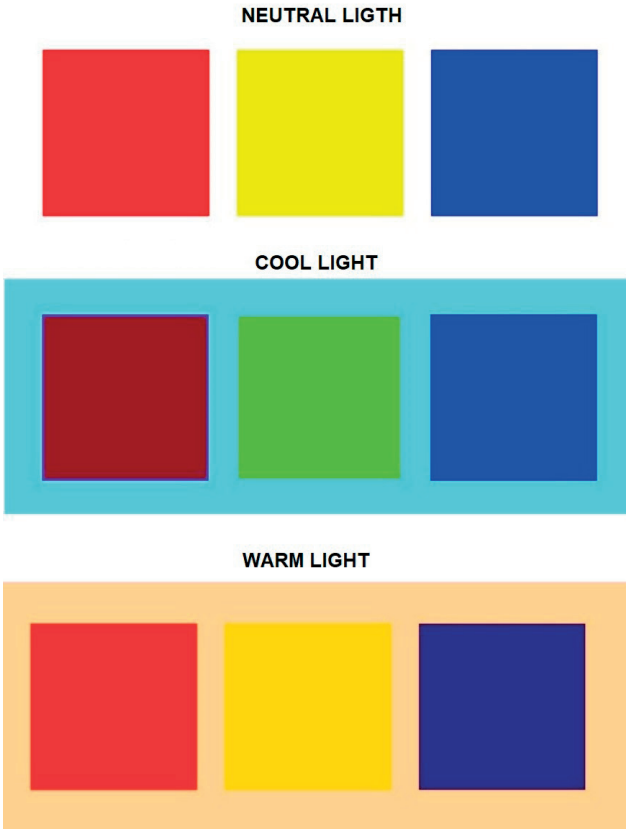
Artificial lighting generally follows the same rules as natural lighting. It is only necessary to be aware of the color and intensity of our artificial light source and then choose the color and temperature scheme of shadows and penumbrae accordingly. A bright light placed close to the subject being painted produces sharp shadows and edges. More distant light produces softer edges with a more gradual transition and gradation.

Using a simple example of primary colors, we will show how the temperature of light affects their final appearance. As always, the appearance of colors can only be determined by comparison with another color. In the middle column, the primary colors are illuminated by cool light. Compared to the top column, where they are under neutral light, you can see that the cool light affects the warm yellow and red colors. These hues are not as saturated and are cooled down by the cool light. The red shifts to a brownish hue and the yellow shifts to a greenish hue. Blue, on the other hand, is logically more pronounced and its saturation is slightly greater than in the case of neutral lighting. At the bottom of the image, the scene is illuminated by a warm light. When compared, the red gains in intensity, the blue takes on a more purple hue and the yellow shifts slightly towards the redder spectrum.

Basically, it's like looking at a scene through a color filter or stained glass. Depending on the coloration of the filter, the colors shift to a certain part of the color spectrum and more or less harmonize. This is because the filter absorbs certain wavelengths of light, resulting in the color shift. That's why it's good to have one light source that will illuminate both your model and the canvas, as well as the palette on which you're mixing the colors.



Light temperatures



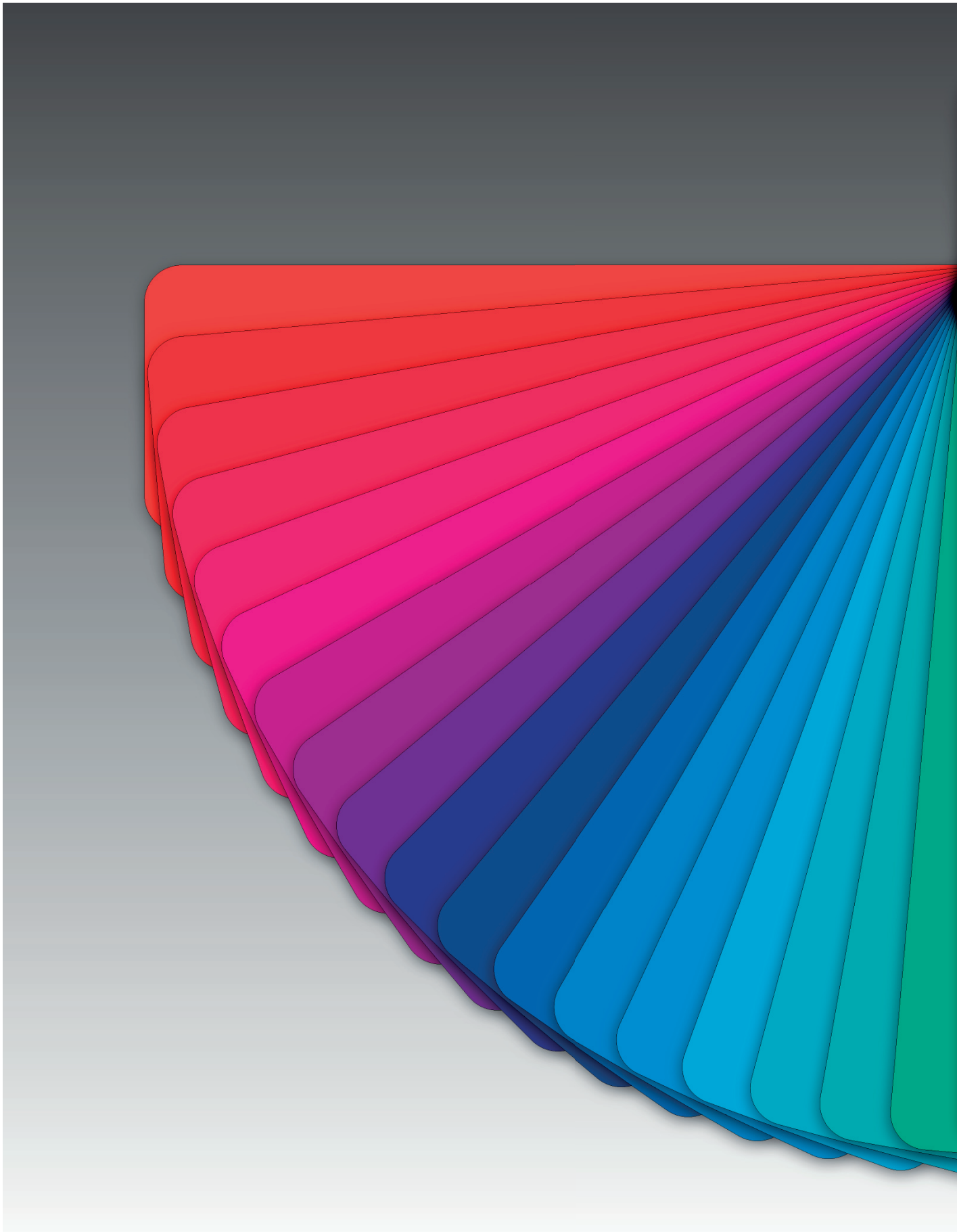
Color shift

It follows from the above that depending on the temperature of the light, the appearance of the colors also changes. In the real world, you can't have all 3 primary colors appear in full chromaticity at once under warm or cold light. What is true is that one of the colors is always highlighted, and the others either have their saturation suppressed or experience a slight color shift in the direction of the color and temperature of the light source.

In general, warm light produces cool shadows and cool light produces warm shadows. However, do not take this as dogma, but as a guide when deciding what shadow temperature to choose. The shadow temperature designated as warm or cool is determined on a relative relationship to the light source. See Section 4.4 of this book for more details on warm and cool colors.

SUMMARY

- Daylight is composed of other spectral colors. The sun's rays contain all the colors of the rainbow mixed together.
- Color itself does not exist and it is only the human perception of electromagnetic waves. Color is therefore found in the mind, not in the physical world. Color is literally just an illusion created by our brain.
- We see objects in color because a certain part of the color spectrum is reflected from them. If the light is absorbed, the object appears black to us. If all the colored components of light are reflected equally, the object appears white to us.
- Both light and darkness are needed to create color.
- Our eyes are most sensitive to green light.
- Color mixing is divided into additive and subtractive.
- The additive mixing method works with colors of light (RGB) and involves adding colors and values.
- Subtractive mixing works with pigments (RYB) or (CMYK) and involves the removal of colors and values.
- If you point cones of colored lights (red, green, and blue) at a single point, the result will be pure white light.
- The task of the realist artist is not to copy the observed colors, but to represent with the chosen artistic medium only the illusion of light colors – to simulate on the canvas the additive effects of light in a subtractive way.
- The color field within a certain range of colors identifiable by the human eye is called the color gamut.
- Color is not an absolute reality, and its appearance varies according to the visual system of the observer.
- Light is color, and if light creates color, it logically influences its final appearance.
- In general, warm light produces cool shadows and cool light produces warm shadows.



2

COLOR WHEEL

We already know from the previous chapter that light penetrating through a glass prism is distributed in a gradation of six specific colors. These hues are yellow, orange, red, violet, blue and green. By organizing these colors into a circle in which the colors gradually build on each other, a so-called color wheel is created. This abstract interpretation of color shows the relationships between primary colors, secondary colors, and tertiary colors. Most color wheels are based on the trichromatic model, i.e., three primary colors, three secondary colors and six intermediate shades created by mixing the primary colors with the secondary colors. These hues are referred to as tertiary colors. Depending on the type of medium used, one may also encounter color wheels that do not contain gradual color gradations. The individual colors are shown as specific blocks.

The ideal pigment colors are therefore cyan, magenta, and yellow. However, artists working with traditional pigments base their knowledge on the RYB model. That is why most artists consider red, yellow, and blue (Red Yellow Blue) as their primary colors. If you ask a painter which color tubes, he considers primary, he will probably reach for ultramarine blue, cadmium yellow and cadmium red.

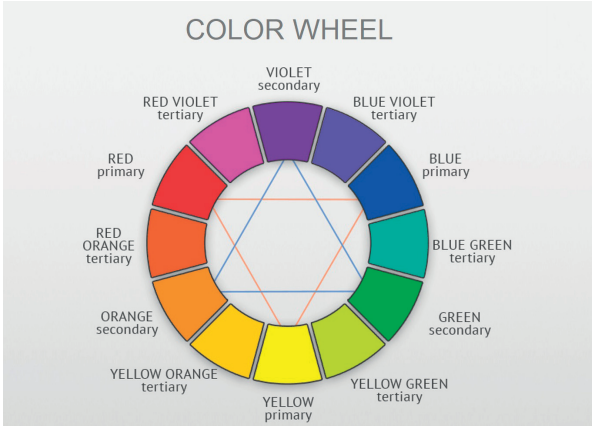
These colors can be easily mixed into rich reds and oranges, but the greens are greyer and less chromatic due to the ultramarine blue. The choice of specific colors is therefore, of course, directly influenced by the mixing result. However, if the intention of your mixing is a low chromatic green, the use of ultramarine blue is justified. It follows that it is not so important to determine as precisely as possible the appropriate hues to match the primary color, but to be aware of how such a chosen hue affects the final mixing.

The essence of primary colors is that these colors cannot be mixed from any other colors. Using the RBY system it is theoretically possible to mix any other color. In practice, however, this task is difficult to achieve as other factors come into play, such as purity and quality of pigment, type of medium, etc. Therefore, it is sometimes easier to reach for a ready-made tube with the desired hue rather than spend time mixing the required color from secondary and tertiary shades.

2.1 Color wheels

The artistic color wheel is an orientation tool, which is primarily used for comparing existing colors and for basic orientation in the color space (gamut). Even within the same color, there can be some variation in hues from one manufacturer to another, so some artists create their own color wheel to fully suit their individual needs.

Primary pigment colors (R, Y, B)



Color wheel

Deep red oil color

RGB color wheel

CMYK color wheel

RYB color wheel

ADDITIVE COLOR WHEEL (RGB)

Primary colors (red, green, blue). Secondary colors (cyan, magenta, and yellow).

This model plays a major role in fields that use the color of light for display, such as televisions, monitors, etc. Secondary colors are the sum of two primary colors of the same intensity. Each of the secondary colors is a complementary color to the one does not present in the mixture. Yellow is complementary to blue; magenta is complementary to green and cyan is complementary to red.

Color saturation is affected by the intensity of the light source. Thus, zero intensity gives the darkest hue, which means that black is not a color per se, but the absence of light. Conversely, full intensity illumination provides white, or the sum of the colors of light. Compared to the RBY and CMYK systems, this system can display a greater range of colors (gamut).

SUBTRACTIVE COLOR WHEEL (CMYK)

Primary colors (magenta, turquoise blue and yellow). Secondary colors (dark blue, green, and red).

A model used for reproduction equipment such as inkjet printers. CMYK works by partially or fully masking colors on a lighter, usually white, background. As with RBY, color mixing is based on the subtractive principle. The pigment, in the case of printer ink, limits and absorbs certain wavelengths of light, thereby "subtracting" colors. To improve color reproduction, black is added to the primary colors.

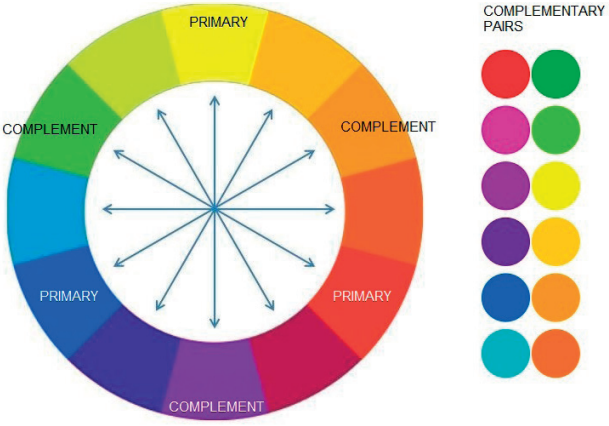
SUBTRACTIVE COLOR WHEEL (RYB)

Primary colors (red, yellow, blue). Secondary colors (green, orange, purple). Mixing primary colors with secondary colors gives tertiary colors. The RBY model plays a major role especially in traditional art disciplines working with color pigments. For this reason, in this book we will deal with the RBY color wheel in more detail and all the theory will be based mainly on this color wheel. As with the RGB system, secondary colors are made up of a mixture of primary colors. Each of the secondary colors is a complementary color to one that is not present in the mixture. Orange is complementary to blue, violet is complementary to yellow, and green is complementary to red.

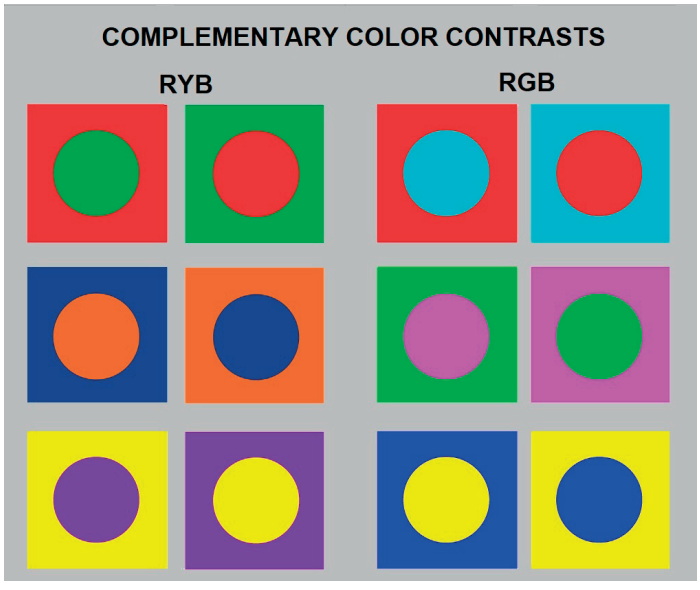
2.2 Color contrast

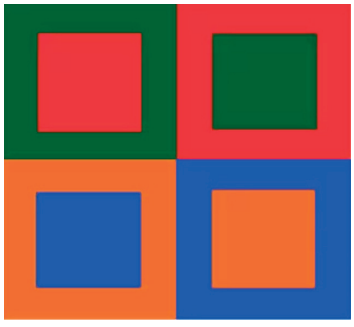
It is generally known that certain colors harmonize with each other and create a pleasant and harmonious image for the observer. Conversely, there are colors that are incompatible in color harmony and, in the extreme case, produce an almost unpleasant optical perception. This is due to color contrast.

The complementary colors are always opposite each other in each wheel. These colors always form the greatest color contrast with each other. This must be borne in mind. If your goal is a harmonious color palette, you need to choose colors that lie close together in the wheel. These colors will automatically match each other. Conversely, if you want to create a strong color contrast and make a particular hue stand out, you need to choose colors that lie opposite each other. We'll talk more about color harmony later.



Complementary colors





Simultaneous contrast

By mixing complementary colors with each other, the saturation of the individual color components in the mixture is reduced because the complementary colors create a balance between the primary colors. The result is a grey low chroma color, which in practice is rarely completely neutral. It usually has a certain hue tendency depending on the colors used and their proportion in the mixture.

Complementary colors (red – green, orange – blue, yellow – purple). In color harmony, these colors are incompatible in full saturation and form the maximum color contrast.

Simultaneous contrast – this is an optical phenomenon in which a color changes the appearance of the color adjacent to it. If we place two colors side by side, each from opposite parts of the color wheel, this is a color contrast. If these colors also have significantly different values, it is

Vincent van Gogh – Forum Square with café

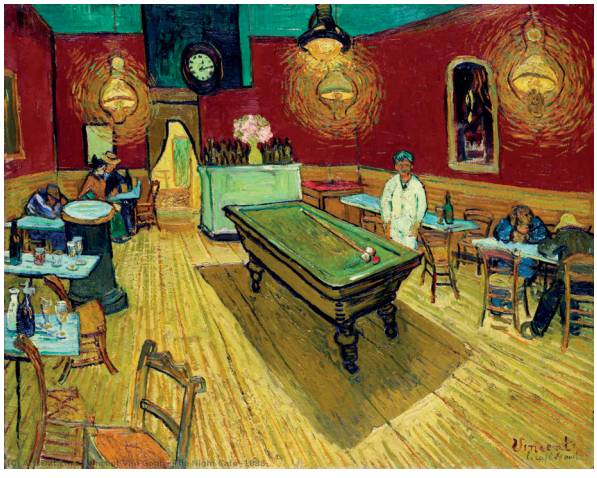
a simultaneous (double) contrast. Different color combinations (hue, saturation, brightness) can result in color changes, such as making a color appear brighter, darker, more saturated, less saturated, etc. French chemist Michel Eugene Chevreul determined that when two colors are close together, each color takes on the hue of the complement of the adjacent color. To understand this, we need to look at the basic hues that make up a particular color. For example, the visual complement of light yellow is dark blue-violet, and the complement of dark red is light blue green.

Simultaneous contrast was first described in the 19th century by the French chemist and physicist Michel Eugene Chevreul in his famous book on color theory, *The Principle of Harmony, and Contrast of Colors*, published in 1839. His work thus greatly influenced the visual arts of his time, especially Impressionism and Neo-Impressionism and other modern artistic styles. In his book, Chevreul systematically studied color and the perception of color and showed how our brains perceive the relationships of colors and values.

Among the first most famous painters who were fascinated by simultaneous contrast was Vincent Van Gogh, who used simultaneous contrast in his work. In his paintings, the colors "clash" against each other, creating a sense of uncomfortable intensity.

Consider, for example, his painting *Forum Square with Café, Arles* (1888), in which he used simultaneous contrast by applying light yellow and dark blue side by side. These bravas enhance each other and create a striking optical effect that cannot be achieved in any other way. He used a similar principle in his painting "Night Café at Arles" (1888) in which red and green shades are applied side by side. In one of his many letters to his brother Theo, van Gogh describes the café as 'blood red and dull yellow with a green billiard table in the middle, four lemon yellow lamps with orange and green glows. Everywhere there is a clash and contrast of various reds and greens. Van Gogh writes: "In my painting Night Café I have tried to express the idea that the café is a place where one can destroy oneself, go mad or commit a crime".

Color contrast examples



Vincent van Gogh – Night Café in Arles

Mixing colors on palette

Contrast causes several other optical phenomena:

Contrast of values – If you place a light and dark color close together, the values difference will make the dark color appear darker and the light color appear lighter. This effect can be used to highlight a particular spot in a painting by, for example, surrounding a white object with a dark background and vice versa.

Temperature Contrast – By placing warm and cool colors close together, the appearance and temperature of each color is affected. A warmer color looks even warmer when contrasted with a cool color. Conversely, a cold color appears cooler next to a warm hue.

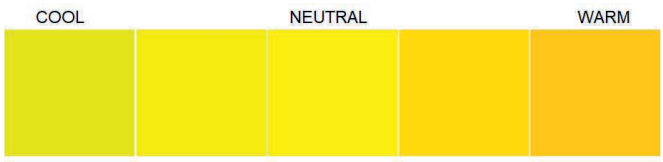
2.3 The importance of contrasts for artists

Most artists understand that color theory plays a very important role in their work. However, to be more expressive, it is necessary to go beyond the harmonious color wheel. This is where the theory of simultaneous contrast and contrasting temperatures and values comes in to play. Remember that colors and their appearance are influenced according to the above rules. For example, if you want a color to look lighter, apply a dark color next to it and vice versa. If you want to increase the saturation of a particular color, surround it with a complementary or less saturated hue and so on.

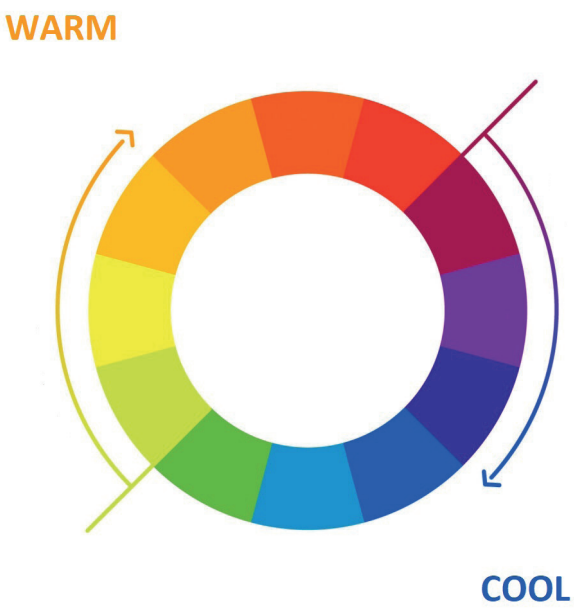
Next time when choosing a particular color palette, think about how neighboring colors interact. In general, by mixing colors on a palette, we are trying to achieve a certain hue that corresponds to our requirement. How the resulting color matches our idea is only apparent on the canvas, where it is surrounded by other colors. These determine its final appearance. One way to see if the color combinations work together before placing them on the canvas is to get small cards. You can apply colors to these and add them together at will. However, this method is impractical, and a better option is to create a small color study of your future work, where you test your idea of color against a small picture to see if it matches your intention. At the same time, you can avoid mistakes that would occur when you create the painting.

2.4 Warm and cool colors

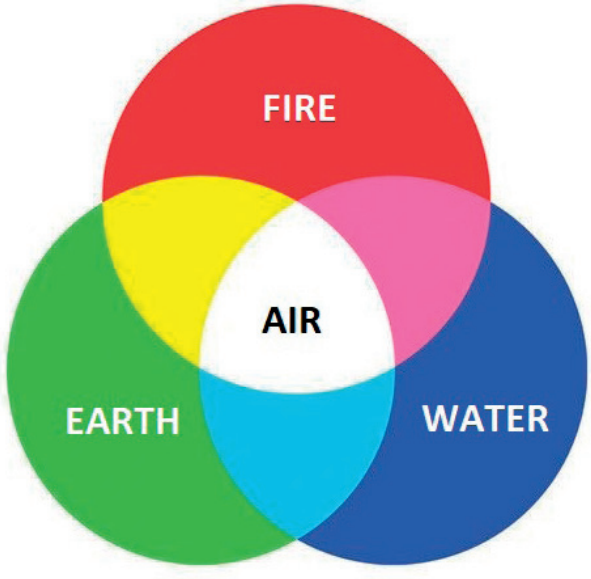
In traditional color theory, the labels "warm" and "cool" are very often used to distinguish between shades, for example "warm yellow" for reddish yellow and "cool



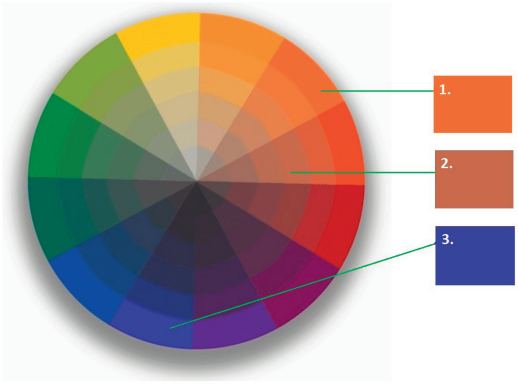
Temperature range of yellows



General division of colors



Colors of natural phenomena

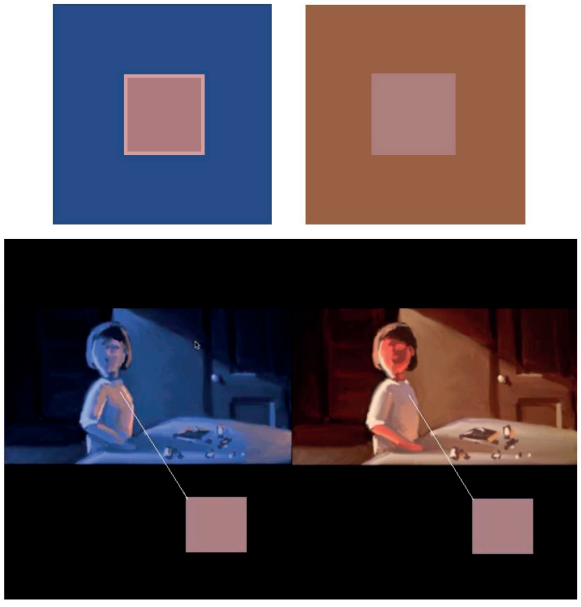


Temperature comparison

TEMPERATURE COMPARISON

If we look at the picture, the colors marked 1 and 2 can be described as warm because they are on the warm side of the color wheel. The blue-violet shade No. 3 is generally a cool color. If you compare all these hues with each other, you will see that hue No.2 is cooler than hue 1. However, compared to hue 3, color 2 is warm. So, it is always good to keep in mind that even within the warm colors, one hue can be considered cooler than the other one, even though they are all warm. Of course, this also applies to cool colors.

TEMPERATURE RELATIVITY



Temperature relativity

Another practical example is a picture of a child's figure. The local color of his T-shirt can be described as a low chromatic (low saturation) pink. If the local color is surrounded by a blue tint, it appears as warm. Conversely, if it is surrounded by a warm hue, it appears much cooler.

yellow" for greenish yellow, etc. The distinction between warm and cool colors is merely a visual concept that assigns a temperature attribute to colors based on subjective perception. Yet, this division is a crucial element in artistic creation that is often overlooked, especially by beginning artists.

The importance of this division of colors was demonstrated, for example, by Jeremy Lipking in one of his interviews, where he said that his teacher told him during his color theory studies, "There are warm and cool colors, and that's all you need to know about painting."

In general, we can divide the colors and thus the color wheel into two halves, in which the colors are grouped according to temperature. The essence of this division of colors is the association with natural phenomena. Therefore, the division into cool and warm is based on a psychological subjective feeling rather than on the physical properties of colors. We perceive orange, which is the color of fire, as warm and blue, which evokes water and ice, as cold.

The perception of the difference between warm and cool colors has historical roots in Renaissance times, where colors and temperatures can be traced back to the basic elements: water, fire, air, and earth. However, for a more specific ordering, it had to wait until Isaac Newton and the emergence of the color wheel. Of the four unique hues that are considered fundamental components of our perception in modern color theory, yellow and red are usually classified as warm and green and blue are usually classified as cool in traditional color theory.

However, a typical feature of color temperature is its relativity. An individual perceiving warm or cool hue associations may claim that his perception is objective and obvious, but another individual

may perceive a different or even exactly opposite association. The most striking case of discrepancy concerns bluish hues. Although there is a firm consensus that places bluish hues in the cool color category, one camp within traditional color theory considers reddish blue (ultramarine) to be a warm color. Another example is the view that green is a warm color because it contains some yellow.

Traditional color theory teaches that warm colors advance to the foreground and cool colors recede to the background. This effect is used a lot, for example in landscape painting, where the different planes of the image can be thoughtfully divided to enhance its overall depth. In the representation of space on a two-dimensional background, however, contrasts and values play a major role (contrasts are less pronounced in the background). For this reason, the rule of warm and cool colors is not a dogma.

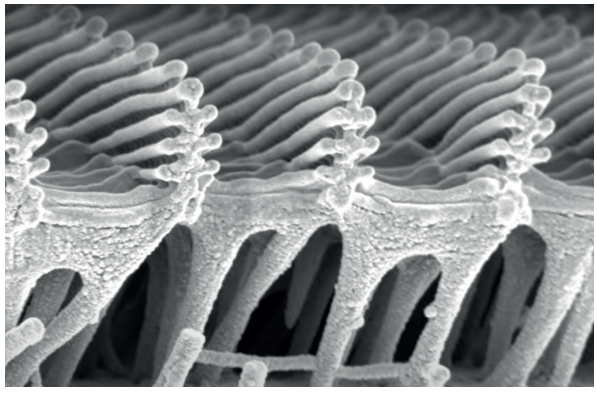
Carl Rungius – warm and cool planes

Morpho peleides

As already mentioned, a characteristic element that applies to both color and contrast is their relativity. Color appears to the observer as it is according to the shades which surround it. Thus, by analogy, temperature can also be determined solely by comparison with the surrounding hues.

The cold colors evoke a feeling of coolness, calm and tranquility. Conversely, warm colors are associated with the opposite feelings. Warms evoke restlessness, fire, sunshine, etc. The above perception is the result of the effect of the different focal points of long and short wavelength rays on our stereoscopic vision, which for most observers will cause a red object to be perceptually in a significantly closer plane than a blue object at the same distance. Areas that have relatively high saturation may appear more 'visually urgent'. The human eye generally recognizes more color nuances in the red-yellow spectrum than in cooler shades.

Another interesting fact is that the warm and cool colors in the color wheel are not equally distributed proportionally. The yellow-orange and red spectrum extends beyond half of the wheel to violet (a mixture of blue and red). The human eye is more sensitive to detecting color nuances in the warmer



Structure of the butterfly wing

Lapis Lazuli pigment

yellow-red spectrum. This fact is partly supported by the fact that throughout history it has always been easier to obtain more readily available pigments with warmer yellow-orange hues. In contrast, pure red or blue pigments (Lapis Lazuli) were rare and not commonly available – in historical times they were literally worth their weight in gold.

Why is blue so rare in nature? Most animals on our planet are colored with warm yellow-reds and browns. You really won't find many blue-colored animals. Interestingly, however, if such an animal does exist, its blue coloration tends to be incredibly rich and highly chromatic.

The blue butterfly (Morpho peleides) is a fascinating example of how the laws of nature work. The beauty of this butterfly is most apparent in flight, when it changes shades of blue according to the angle at which light strikes its wings. Yet, if you take its wing and look at it against the sun, the blue color disappears! The secret of its rich color is in the design of its wing. The wing's microscopic structure is composed of elements that are arranged to absorb certain wavelengths of light (the red and green parts of the spectrum) and reflect only blue light. Thus, the blue color is not made up of pigment, but only of the reflection of light. So, the blue color is again an illusion and, the butterfly wing has no color!

2.5 Color harmony

In the language of colors, the color harmony creates a pleasing image that pleases the eye. In the visual world, color has a wider psychological impact, which was briefly described in

TIP

In general, when using a harmonious color palette, it is advisable to complement the color scheme with a contrasting color. For example, if your painting will be painted entirely in warm colors, thoughtfully place areas of cool color somewhere. The cool color will then contrast with the dominant warm hues and accentuate the overall warm palette.

Color harmony

the introduction to this book. Understanding how colors work together, what impact they can have on mood and emotion, and how they change the look and feel of the final work will fundamentally affect the outcome of your efforts.

In music, deep tones contrast with high tones, they harmonize together, or vice versa – they create a discord. The same applies to color. Some colors also harmonize with each other and create a pleasant picture, while other colors create a contrast and are almost incompatible in color harmony. Either way, we can always use these principles to our own ends and combine colors as they suit our requirements.

There is no one right choice in choosing the right color harmony. Some theories of color harmony are even contradictory, as the color combinations that are most aesthetically appealing depend on a person's race, gender, age, culture, etc. Basically, what is harmonious and pleasing to the eye varies from person to person. However, the good news is that there are some basic rules for the combinations of colors that are most aesthetically pleasing and together create a pleasing visual perception.

The starting point of the choice is always the intention of the artist. Are you painting a yellow rose and want the background to be distinctly separate and the rose to stand out from the canvas? Use a blue or green-blue shade for the background, which will create the effect you need through color and tonal contrast. On the other hand, if you want a uniform look that will blend in with the whole, use a harmonious range of similar colors.

There is an endless variety of color combinations available to every artist. And a skilled artist does not choose colors randomly during his work but creates a plan before he starts working on his piece. The choice of certain colors greatly influences the mood or impression of the painting. Therefore, it is necessary to have a clear idea of the direction you want to take at the beginning of the painting.

@colorpalette.cinema – Examples of color schemes

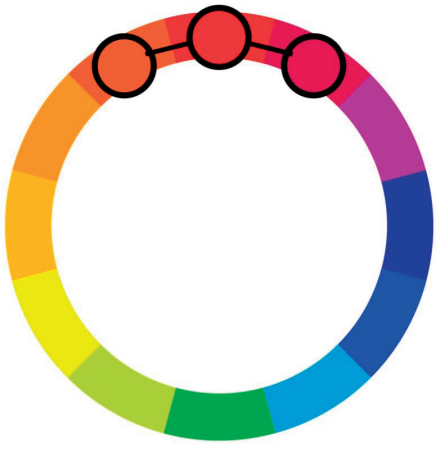
In general, then, it can be argued that extreme uniformity leads to insufficient stimulation of our perception. As a contrast, extreme complexity leads to over-stimulation and visual discomfort. In short, color harmony is a dynamic balance between these states.

Light has the greatest influence on the color harmony of any scene. The color and temperature of the light hitting the subjects determines how the resulting colors will look. We discussed this in more detail in Section 3.5. Light and color. If you need to refresh your memory, you can go back to that chapter and read it again.

How to work with color schemes? Don't be fooled by the limited selection of colors, which are always chosen for illustration in the most saturated form. By adjusting the saturations and values, you can obtain a color field containing an essentially infinite number of different hues and temperatures but belonging to the group of selected colors. This applies to all color schemes.

There are several basic color models you can choose for your purpose. Among the best known are:

Monochromatic – the simplest color scheme that uses a variation of tonal values and temperatures of one color. An example would be underpainting, which is usually done with a single color. You can create a painting or design with only one color, such as blue or red. If the execution of such a work is of good quality, it can produce a strong expressive work that stands out in a flood of other common works for its originality.



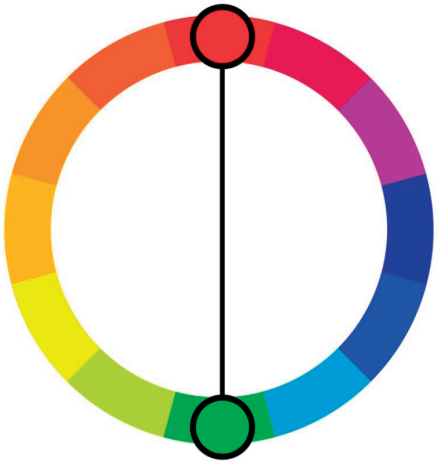
Analogical harmony

Monochromatic painting

Example of analogical harmony – Jan Matěják

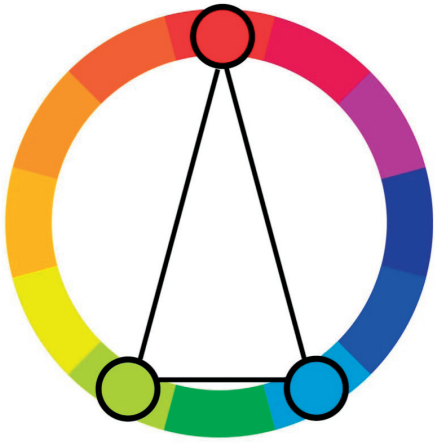
Analogous – uses a combination of usually three (can be more) adjacent colors in a color wheel. The middle color is referred to as the mother color because it is partially contained by the two neighboring colors. Analogous harmony creates a pleasant and calm visual perception without strong contrasts and is often seen in nature. Of course, the analogue palette can be warm or cool depending on which colors you choose.

Complementary – uses a combination of colors lying opposite each other in a color wheel. It is therefore a contrast of a selected warm and cold color. Each of the colors has only one complement, which is also called a direct complement. These colors together create the greatest possible color contrast, especially if you are working with full saturation colors. To take advantage of this scheme, it's a good idea to plan the amount in which the two chosen colors will be represented in the piece. You can choose a balance scheme in which both colors and their variations will be present in similar amounts. Or choose one to dominate and use the other as a complement to increase contrast and highlight the dominant hue.



Complementary harmony

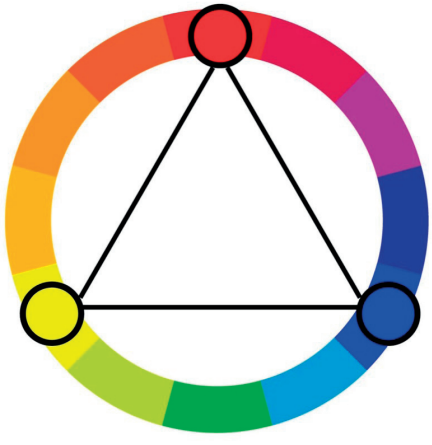
Split complementary – Extended combination of complementary colors, where the selected color is complemented by two analogous colors from the opposite side of the wheel. The primary color contrast is thus reduced, and the complementary contrast is visually more appealing.



Split complementary harmony

Triadic (triangular) harmony – a combination of three colors lying in a color wheel at an equal distance from each other. Basic examples of triads are primary or secondary colors. The space between them forms an equilateral triangle, so there is no clear predominance of one color. Because the colors in this system are relatively far apart, a fairly pronounced color contrast is created. This makes the scene more visually interesting. To use triadic harmony successfully in practice, the colors should be carefully balanced. Choose one color to dominate the scene. Use the others to accentuate it.

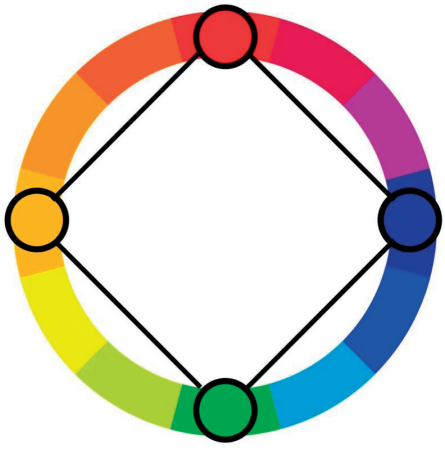
Example of triadic harmony – Jan Matěják



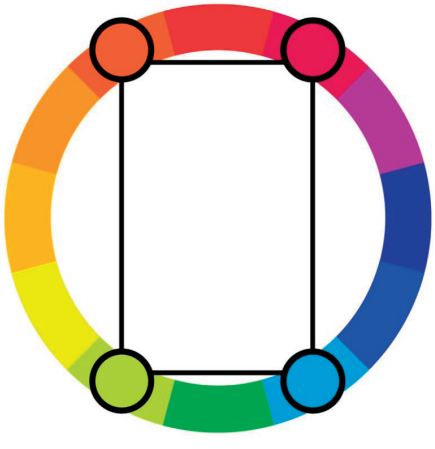
Triadic harmony

Tetradic or square harmony – a combination of four colors, the conjunction of which forms a square or rectangle in the space of a color wheel. Again, this scheme creates more visible contrast ratios, especially in the square scheme, as it involves pairs of complementary colors. To make the scheme work, again choose one dominant color and let the other shades play second fiddle.

This overview is only a basic list of color schemes. In practice, the principles can be intertwined and there is no limit to how they can be used and combined. If you are familiar with color harmony, you can let your imagination run wild and use the colors as you wish.



Square harmony



Tetradic harmony

SUMMARY

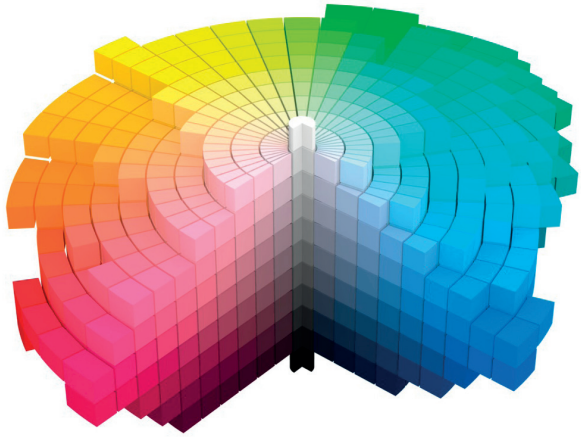
- Color wheels are an organized interpretation of colors and show the relationships between primary, secondary, and tertiary colors.
- The color wheels are mainly used for comparing existing colors and for basic orientation in the color space.
- Colors and hence the color wheel are divided into two halves – warm and cold colors
- The additive RGB system is used by monitors, televisions, etc.
- The CMYK subtractive system is used for reproduction devices such as inkjet printers.
- Complementary or complementary colors always lie opposite each other in each wheel and create maximum color contrast.
- If you place a light and a dark color close together, the value difference will make the dark color appear darker and the light color appear lighter.
- The properties of colors, their saturation, value, chroma and temperature are relative.
- In practice, nothing exists in isolation and all colors are in a relationship with each other that affects their final appearance!
- The color can be both warm and cool depending on the hue that surrounds the color and temperature being compared.
- In general, warm colors move to the foreground and cool colors recede into the background.
- Color harmony is a dynamic balance between excessive color unity and excessive color complexity.
- Color harmony and color selection must be planned in advance.
- If a harmonious color palette is used, it is advisable to complement the color scheme with a contrasting color. The contrast will then accentuate the dominant color scheme.


MUNSELL
BOOK OF
ATLAS
The
Munsell Color System
6 CHROMA

3

COLOR PROPERTIES

When other color properties enter the mixing, the situation becomes a bit more complicated. We are talking about brightness (value) and saturation (chroma). These attributes expand the field of visible color nuances (gamut). Some color wheels are shown with variable saturation towards their center. The change in saturation of colors can therefore be represented pictorially still in two-dimensional space. However, if we include the change of tonal values in the process of color mixing, it is necessary from a practical point of view to go into three-dimensional space and imagine a Munsell color atlas.



3D Munsell color space

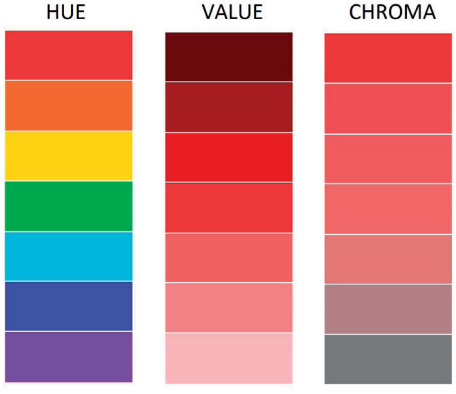
3.1 Basic color properties

Before we explain further details, let's stop with the definition of color and hue. Many people don't see any difference between color and hue, even though they are two different things. Yet color is just a general term used to describe every hue and tone we see. For example, let's focus on yellow and yellow ochre. In the color wheel we are in the yellow section, but yellow ochre is already a hue of yellow because its saturation and value is different from pure yellow.

The hue therefore only refers to the dominant color group. It can also be said that any hue is a color mixture of pure colors and another color. For example, adding white to yellow still produces yellow, but in a different hue than the original yellow.

In the previous chapters, we were introduced to the color wheel, in which the colors of the visible spectrum are clearly arranged. In general, the colors in the wheel are mostly displayed at their highest possible saturation, so they are highly chromatic. Each of the colors has three basic attributes, the ratio of which determines the final appearance of a particular hue.

Each of the colors has a certain:



Hue, value and chroma

Hue – By moving in the two-dimensional space of the color wheel we determine which color group it is (red, yellow, blue, green shades, etc.)

Saturation (chroma) – Each of the colors can take on a different saturation. Bright saturated colors are referred to as highly chromatic. Conversely, colors approaching a gray neutral hue are referred to as low chromatic.

Value (brightness, tone) – Each of the colors can take on a certain brightness or value. If you convert the individual colors and hues into a black and white spectrum, it will be obvious that some colors are light or dark.

These basic attributes are clearly recorded in our Munsell Color Atlas for easy orientation in three-dimensional color space. This atlas is an excellent tool for effective communication and therefore it is necessary to be perfectly oriented in the given space.

3.2 Munsell's color space

The three-dimensional color system was developed by Professor Albert H. Munsell in the first decade of the 20th century. During the development of Munsell's research, the traditional appearance of the color wheel was taken a step further. The two-dimensional wheel was sufficient to describe only one dimension of color, more precisely hue. Munsell turned to Euclidean geometry and architecture to describe the three-dimensional relationship more adequately between its three attributes: hue, value and chroma. He also believed that, as in music, where a particular sound is recorded in terms of tone, intensity, and duration, a particular color can be defined by analogy using the 3 attributes.

Before Munsell, there were several similar systems in which color was placed in different three-dimensional forms, but it was Munsell who first separated hue, value and chroma into uniform and independent dimensions. He was also the first to illustrate color systematically in three-dimensional space. This system was developed from careful measurements of the visual responses of human subjects to color and is thus based on a solid experimental scientific foundation. Although it is more than a century old, the system has survived to the present day and is still widely used. The Munsell Color Atlas is a very effective tool for color communication.

If you mix adjacent colors of the color wheel, you get a continuous variation from one hue to another. For example, red and yellow can be mixed in any proportion to get all shades of red, orange, and yellow. The same can be applied in the case of yellow and green, green, and blue, blue, and purple, and purple and red, etc. This brings the whole series back to the starting point so that it can be arranged in a circle (color wheel).

For perfect orientation in space, the individual hues are marked with a number. The wheel is composed of 10 basic colors. Each main color is preceded by the number 5 and each is further divided into 10, giving a total of 100 hues.

HUE

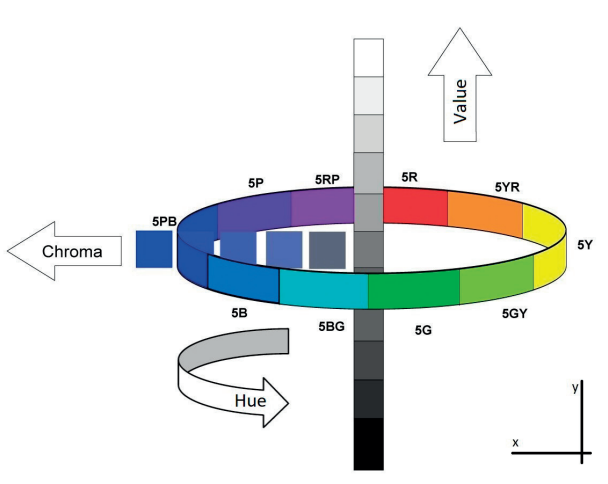
Munsell called red, yellow, green, blue, and purple the "main hues" and arranged them in a circle with equal ranges. He added five intermediate shades: yellow-red, green-yellow, blue-green, violet-blue and red-violet, making a total of ten hues. For simplicity, he used the initials as symbols to indicate the ten hue sectors:
R (Red),
YR (Yellow Red),
Y (Yellow),
GY (Green Yellow),
G (Green),
BG (Blue Green),
B (Blue),
PB (Purple Blue),
P (Purple)
and **RP** (Red Purple).

Different editions of the Munsell Atlas

Gradation of yellow-red hues

MOVEMENT IN MUNSELL'S COLOR ATLAS

Looking at the three-dimensional Munsell system from above (**y-axis**), you will see the classic two-dimensional color wheel. Moving along the hue in both directions changes the hue. For example, for a color with an index of 5PB (purple blue), you can move from the blue-violet spectrum to 5B (blue) of the blue spectrum, or in the other direction to 5P (purple) of the purple spectrum, etc. It follows, then, that the first step in color mixing is to change the basic starting hue. We'll talk more about specific hues later.

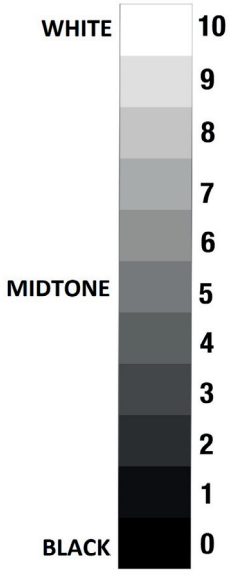


Orientation in the Munsell system

VALUE

Sometimes also brightness or tone. This attribute determines how dark or light the color is. Moving perpendicular to the color wheel along the axis of value (y-axis) in Munsell's atlas, changes the darkness or lightness of colors. Each artist has an essentially infinite number of values at his disposal, so in practice it is necessary to limit this range to a few basic tones. The scale of values ranges from 0 for pure black to 10 for pure white. The shades between black and white are called "neutral colors". They are neutral grey and have no tint. Each of the colors in the color space has a certain tonal value. So, when mixing, along with hue, you influence how light or dark your color will be.

Here I would like to explain for the sake of clarity that black and white are not part of the visual color spectrum. White is made up of the reflection of all wavelengths of light towards the observer, and conversely black absorbs all light. Therefore, white, and black are not colors as such. Obviously, no color has a higher value than white, and conversely, no color has a lower tonal value than black. The tonal values of all colors lie somewhere between the values of white and black.

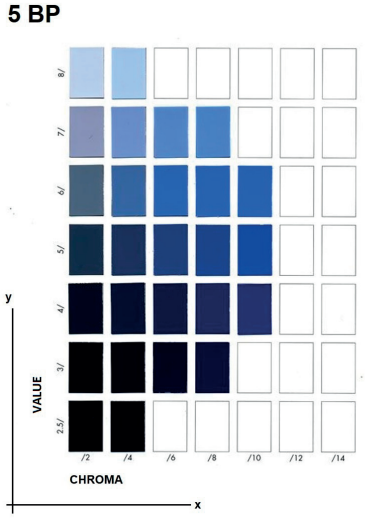


Value scale (brightness)

CHROMA

Or saturation is also a designation for the degree of color in a given value range. A horizontal movement in the chromatic axis of the Munsell Atlas (x-axis) changes the saturation of each color. Using the example of the color labeled 5PB, we see that a color can have a bright saturated hue (high chromaticity) or, conversely, a low chromaticity, nearly neutral hue approaching the gray in the center of Munsell space. So, when mixing, along with the previous two attributes (hue and valence), we also change the saturation of the color.

Based on the combination of all three of these attributes, a specific color in the color space can be accurately identified and described. It is hard to explain to someone in words what "dark red" or "cool green" looks like in your own imagination. Using the system that Munsell developed, you can find a specific color at any point in color space and easily define its exact hue.



Values and saturation of 5PB hue

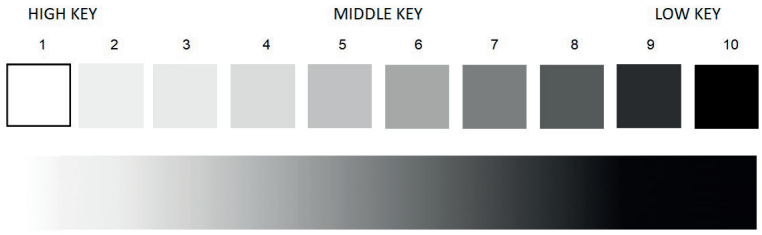
PRACTICAL THOUGHT PROCESS DURING MIXING

Mixing yellows

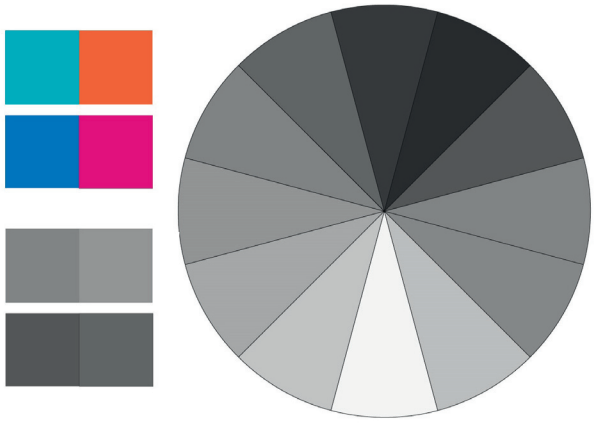
The starting point for mixing must always be a concrete idea of what you want to mix. This idea can be more precisely identified and then transformed into reality by means of the attributes mentioned – i.e., hue, value and chroma. Throughout the mixing process, the questions to ask yourself are: What hue must the color be? For example, is it a yellow with a warm red tinge, or a cooler yellow with a greenish tinge? Does the color have less, medium, or high saturation. What about the value? Is the color darker or lighter? If the result is a color that matches your idea, remember that the final appearance of the color is influenced by the adjacent surroundings. Therefore, how accurate you're mixing, and your estimation was will only be revealed in the final, when you apply the mixed color among the other colors in the painting.

Color sample 10R 7/6

For even a better understanding, we will illustrate everything with a practical example of the hue marked "10R 7/6". Looking at the color sample, it can be described in words as a red color with medium saturation and medium value, or if you want to put it more simply: it is a flesh color. However, this description is open to the subjective interpretation of the observer, and it is unlikely that two people would imagine the same hue from the above verbal description. 10R indicates that it is a red hue (Red), the value of 7 indicates the brightness (Value) and the value of 6 after the slash indicates the degree of saturation of the color (Hue). Such a marking therefore indicates exactly what hue it is, making the marking a perfect tool for color communication.



Value scale



Similar color values

3.3 Value

When we describe a color as "light" or "dark," we are talking about its tonal value, or brightness. This property tells us how light or dark a color is, based on how close it is to white or black. The lighter the color, the higher its tonal value, and vice versa.

Although inherent color is the most attractive quality of any image, believe it or not, tonal value is more important to the design and success of an image. Thus, value plays a key role in the composition of any image. Physically, it is represented by a gray neutral shade of a certain tonal value. The so-called value scale of grays, in which the individual tones are neatly arranged from lightest to darkest, is used to accurately classify each tone. Like color, value is closely related to light. The reflection of light off the surface of objects allows us to see colors and their values. For drawing and painting, the value is an essential element and a tool for creating the illusion of reality on a two-dimensional surface such as paper or canvas. Compared to the actual color, tonal value is a much stronger structural element of any work of art.

If you look at the black and white version of the color wheel, you can see that some colors have almost the same tonal value, even though they are different hues. When these colors lie next to each other, it is very difficult for the human eye to determine, due to the lack of significant contrast, which color is more distinctive. Therefore, the value scale is a great tool for any artist. By comparing any color or hue to a standardized gray scale, you can accurately determine its tonal value. Obviously, within the visible spectrum, there are no colors as dark as black or as light as white. All the colors we know fall somewhere on a scale of values between black and white.

Girl with a pearl

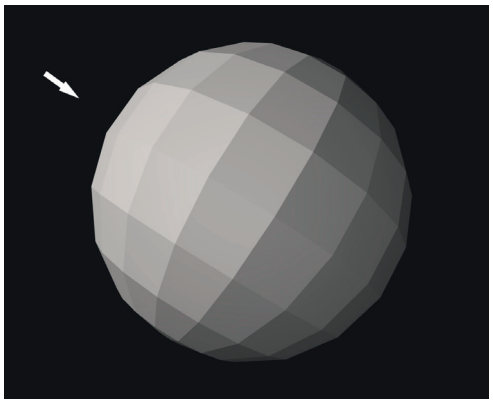
VALUE IS MORE IMPORTANT THAN COLOR

This statement is especially true in the initial design phase of any scene or design. As you can see in the example of Jan Vermeer's famous painting *Girl with a Pearl*, you don't really need color to tell the viewer what the painting is supposed to represent.

In the real world, there are essentially an infinite number of value nuances available. An illuminated curved surface reflects an amount of light according to how each of its planes is inclined to the light source. This creates an almost infinite gradation of grays with an indeterminate range that is difficult to work with. For this reason, it is easier to use a limited range of gradations, which are usually broken down into several gray levels. For artistic purposes, a scale divided into about 10

grades according to the Munsell Atlas is usually suitable. I personally use a scale divided into 20 parts for my work. However, the number of degrees is not as important as understanding how to work with the value correctly.

To fully understand how the value manifests itself as a function of the amount of light, let's imagine a picture of a polygon sphere. For illustrative purposes, this sphere is divided into several surfaces that are inclined at different angles to the light source. The plane perpendicular to the light source reflects the most light and therefore appears the brightest and has the brightest value. Other planes that are more or less inclined away from the light source have different tonal values. In this way, a three-dimensional illusion of reality is optically created using only different tonal values. The value is thus the key to creating the illusion of light.



Polygon sphere

Let's go back to our value scale now. The choice of values and their tonal range plays an important role in the final form of each painting. The first option is to use the full range of values from white to black. If you don't want to use the entire scale for your work, you have the option of using only part of the value scale and compressing the tonal range as needed.

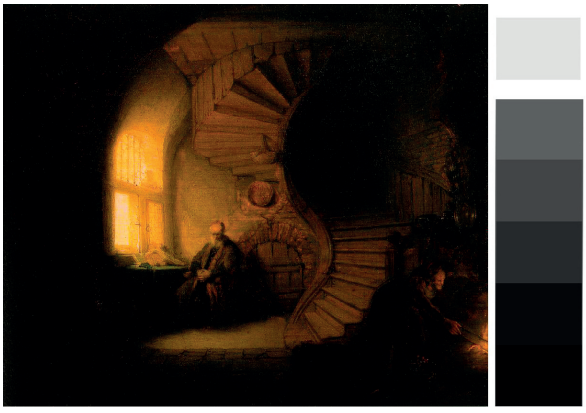
Claude Monet: Thames Under Westminster – *Example of a painting with high brightness*

HIGH VALUE SCALE – all the tonal values are shifted to the lighter part of the value scale. The lighter values of the scale are also used to shadow areas. Due to lack of significant contrast the overall painting appears fresh and airy.

Paintings with predominantly light values can be seen, for example, in the Impressionists. Their works are painted under a wide sky that provides sufficient lightning. Thus, local colors are generally lighter, and shadows are free of significantly darker values due to the presence of light. The warm yellow-orange hues reach their highest chromaticity in the lighter values, so the lighter paintings are full of light. In contrast to classical realism, the representation of the volume of the bodies in the painting is based on the alternation of temperatures and the saturation of colors.

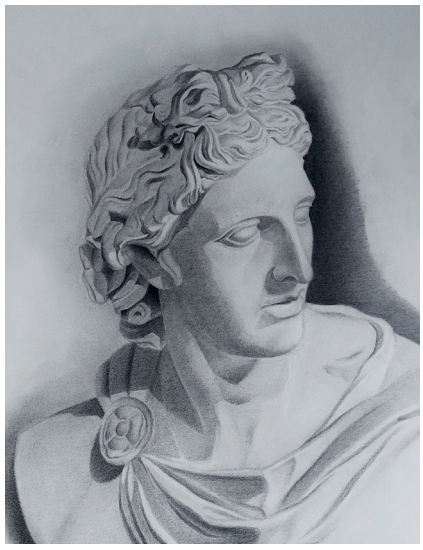
LOW VALUE SCALE – tonal values are shifted to the darker part of the scale. The mid-tones of the scale are used to show highlights and the areas in shadow are very dark. The result gives a dark and cramped impression.

MID VALUE SCALE – tonal values are in the middle part of the value scale. The image is free of strong highlights and deep shadows.



Rembrandt van Rijn: The Meditating Philosopher – *An Example of low value and expressive Contrast*

The well-thought-out shapes and compositions of the individual values, and especially the strong tonal contrasts of light and dark areas, can lead the viewer's eye in the desired direction. Strong tonal contrasts attract the eye, and the artist essentially predetermines where to look first. In general, a quality work of art should have at least one central point that is the focus of the composition and the viewer's attention is concentrated there. This is usually the point of greatest contrast. However, if any of the above compressed scales are used, it must be assumed that the image will not have any significant contrasts that contribute significantly to the structure and composition, as has been mentioned several times. If a scene is composed only of light or dark tones, there is a great risk of it becoming uninteresting. Of course, this is not always the case. However, a few very dark spots in the image will accentuate the light values and make the scene more interesting. Just as significantly



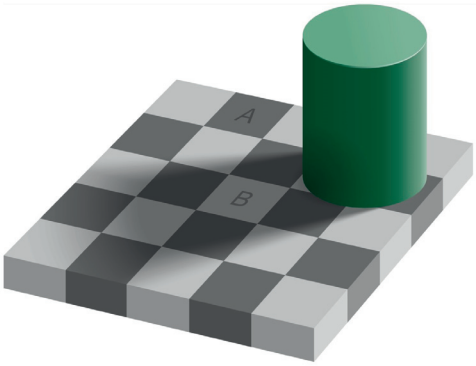
Drawing a plaster sculpture

bright values will enrich the low scale. In the above facts, one can see an analogy in coloration, where a warm color in a painting accentuates the surrounding cool tones and vice versa.

The value is such an important and essential element in the creation of a painting that at the most prestigious schools, students are forced to work only in pencil or charcoal before they move on to painting in color. It is not only for the sake of perfecting their drawing, but also precisely for the sake of mastering the use of values. This is usually done by practicing drawing plaster sculptures. This brings us to the ability of the brain and the human eye to estimate and determine values.

As you will soon see, our perception of values is not as simple a matter as it might at first appear and it requires some experience. How easily our perceptions can be deceived is illustrated by the following examples of optical illusions.

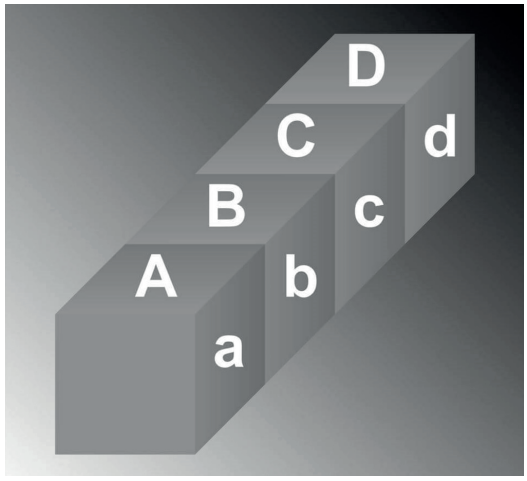
In these pictures you can see how the appearance of the values is significantly influenced by the surrounding environment. The same value appears light against a dark background, but the opposite is true against a dark background. This fact is beautifully illustrated by the shadow optical illusion, first published by Edward H. Adelson. Although it does not appear so at first sight, the two squares marked A and B have exactly the same value, or both are equally dark. If you still don't believe this, I recommend printing out the image and cutting out the corresponding squares. Once you put them together, you will find that they are both the same. So how is it possible that square B appears lighter than square A?



E. H. Adelson: Optical illusion

This is because our perception is constantly deceived by the contrasts and values that are adjacent to the observed place. Square A appears darker because it is surrounded by lighter squares. Square B is shaded, but it is surrounded by squares that are darker. It therefore appears to us that, in contrast to its surroundings, square B is much lighter.

Another optical illusion that demonstrates the relativity of values is shown in the following picture. The squares marked with capital letters A, B, C, D have the same value and gradation. Each of the squares shown is made up of a slight gradation of grey hue. The upper part is always slightly darker than the lower part. This allows us to perceive the edges of the transitions between the squares. Although they look different at first sight, they are all equally dark, or, if you prefer, equally light. The same is true for the squares marked with the lowercase letters a, b, c, d. If you still don't believe this, you can cut out the picture and cut it into the appropriate squares. When you superimpose it on the original whole, you will find that the squares are indeed identical and have the same tonal gradation. The above is due to the



Optical illusion of gradations

Eye squinting technique

HOW TO DETERMINE THE VALUES?

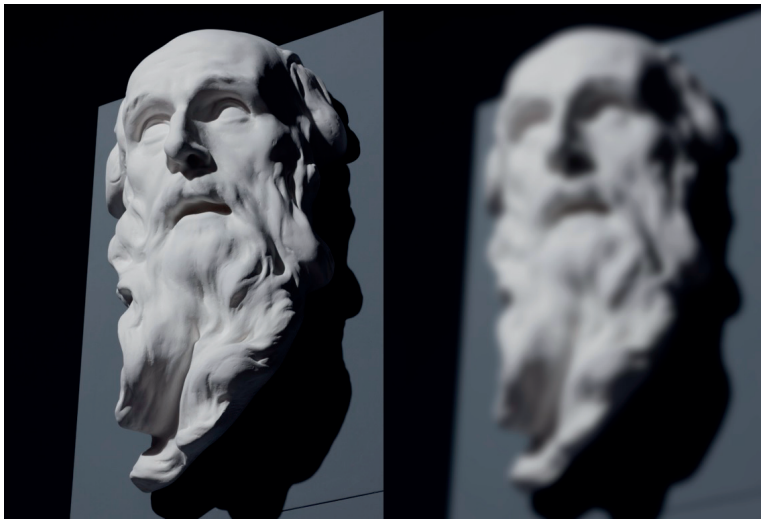
Another important part of this process is the ability to observe and estimate values. There is a simple trick that every experienced artist uses to do this. If you look at an object and squint your eyes, like Clint Eastwood in the picture, the tiny details will blend into a uniform mass. This way, the information about the details won't distract you from your observation and the correct estimation of the values of the selected spot will be much more objective and accurate.

tonal gradation of the background that surrounds the squares. Again, if you compare the square against a light background, the contrast will make it appear darker. Conversely, on a dark background, the square will appear much lighter than it actually is.

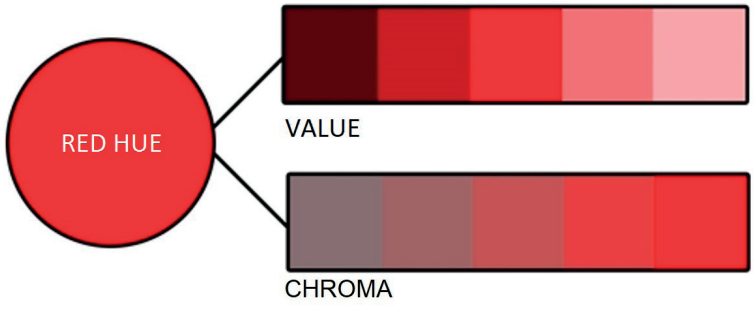
The same applies to the grey strip in the picture, which appears lighter on the left side and darker on the right side due to the gradation of the valleys, although its tonality is the same on both sides.

Even though our eyesight is a nearly perfect system, it can be deceived quite easily. What conclusions can be drawn from these facts? Value, like color, cannot be judged and determined in isolation. Its specific appearance only becomes apparent when it interacts with its surroundings. In practice, this means that it is advisable, in the case of a painting or charcoal drawing, to first apply different values in several places and only later to adjust their shapes and refine their contours. In general, it is preferable in this respect to start a painting or drawing with the darkest areas. If you have dark hues applied to the canvas or paper, such as the part of the head in shadow, your estimation of the specific values in the light will be much more accurate because you have something to compare them with.

This method of observation is particularly suitable for artists working from a live model. However, we live in the 21st century and we can make things easier for ourselves by using, for example, black and white photography. If you only have a color photograph, you can remove the color in a simple software. The advantage of doing this is that the photograph will not tie you down artistically in relation to color.

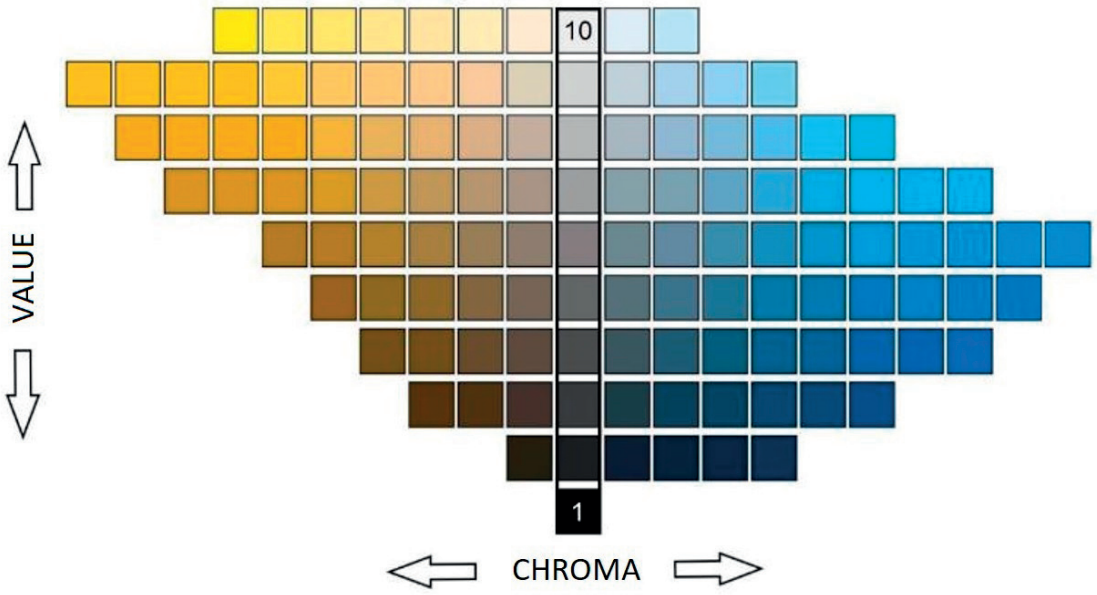


Normal VS simplified image



Hue variations of red color

Chroma



Chroma and value dependance

The squinting technique is primarily useful for determining the relationships between the valences of the subject being observed, not the valence of a particular location. At the same time, it is a tool for simplifying a form that is composed of several small shades. As said a complex form can be very often represented and simplified by a single value. If you close your eyes, the values darken to some extent. This technique is therefore not suitable for determining colors when, on the contrary, you need to keep your eyes wide open.

3.4 Value and chroma

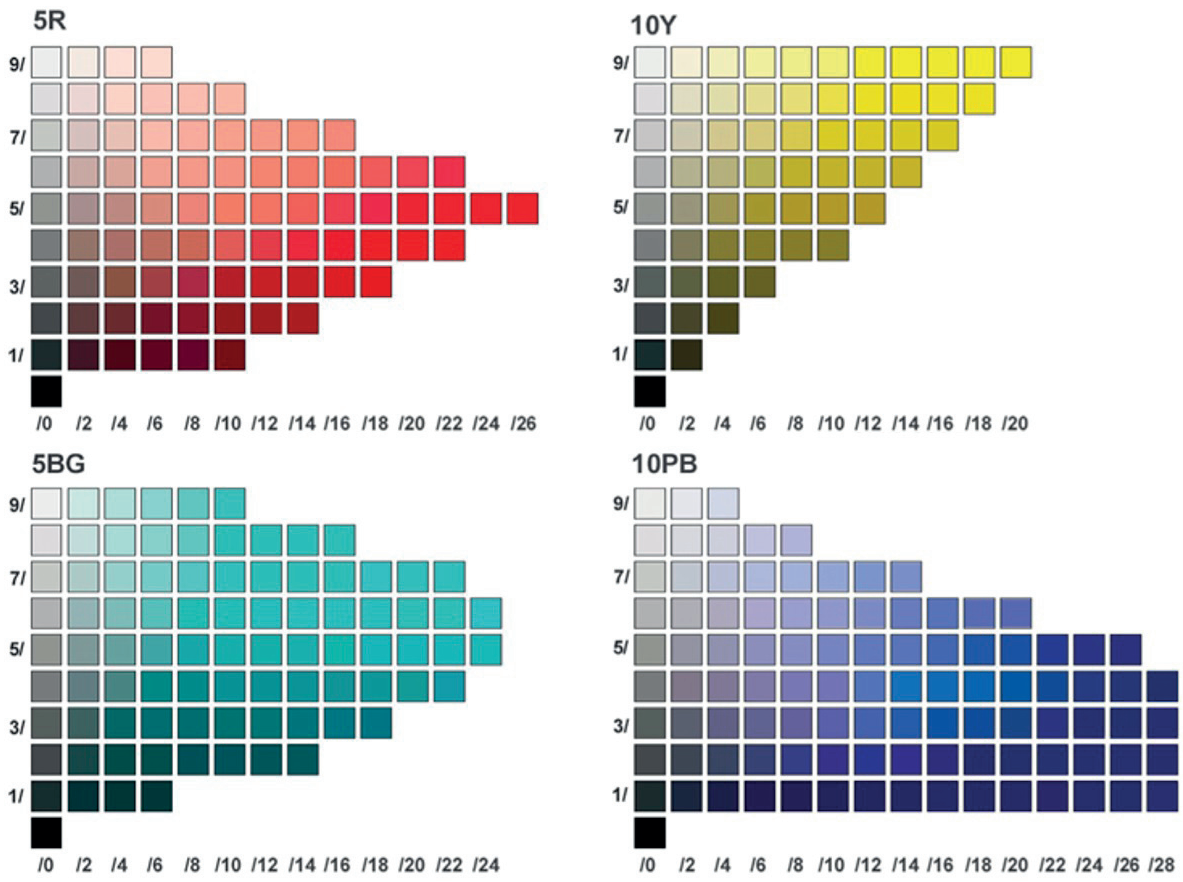
Saturation is another dimension that allows a color to be identified by the intensity of its hue. If you have two colors of the same hue, for example red, they can both have the same value and differ in saturation. By the saturation of a color, we mean its degree or intensity of color in relation to the grey. Thus, a color may be maximally saturated, and its saturation may decrease to a neutral grey hue.

Color saturation is sometimes referred to as chromaticity. Highly chromatic colors have high chroma. The opposite is true for low chromatic colors, which decrease in saturation to a neutral shade of gray.

There is essentially no upper limit to chroma for maximum color saturation. Different regions of color space have different maximum saturation coordinates. For example, light yellows have significantly more potential saturation than light purples. The ability to display saturated colors has been affected over time by technical advances and the availability of various pigments and dyes. Today's monitors and televisions can display colors that were, for example, 100 or 200 years ago completely outside the color gamut of the time.

In the context of value and chroma, you may notice another fundamental fact. The saturation of any color varies according to the darkness and lightness of the color. The middle column is a range of neutral greys with values from 1 to 10. Moving left or right from the center of the axis of Munsell space, the saturation of yellow and blue rises to its maximum saturation. This is true for any other color in the color spectrum.

Note that each color reaches its full saturation only in a particular tonality, i.e. in a particular value. Yellows reach their maximum saturation in the light values, reds reach their maximum saturation in the middle values, and blues reach their maximum chromaticity in the darker values. The addition of white, black, or grey to a particular hue does not theoretically change the actual color and only adjusts its value (lightness or darkness). However, when working with real pigments, such as oil paints, due to the additional additives, pigment and so on, lightening a particular hue cannot be so easily achieved without causing a color shift.



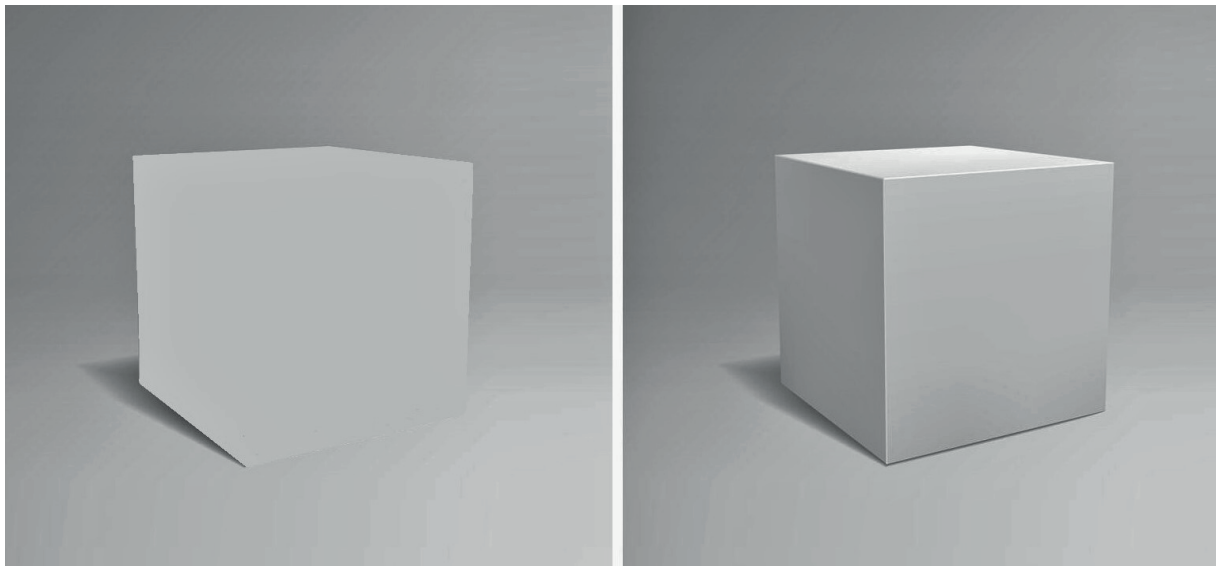
Comparison of saturation of different shades

For example, if you lighten the red color only with white, you will move towards pink. The result will be a less saturated and slightly different hue than the original red. We'll talk more about this in the practical section of the book.

These facts bring us as artists back to the role of underpaintings, the essence of which is not color, but value. If you look at a black and white image, you have enough visual information even without color to discern what it is meant to represent. In the image of the cube, you can see how the change in tonality fundamentally affects the appearance of the subject. Without tonal changes, the shape appears flat, but by changing the values the subject appears three-dimensional.

The difference in value changes the human perception of space, and changes in tonal values give us the ability to see objects as three-dimensional. Whenever you look at something, your mind automatically compares the values you see. Your brain recognizes these tonal patterns and

3D color wheel



Values

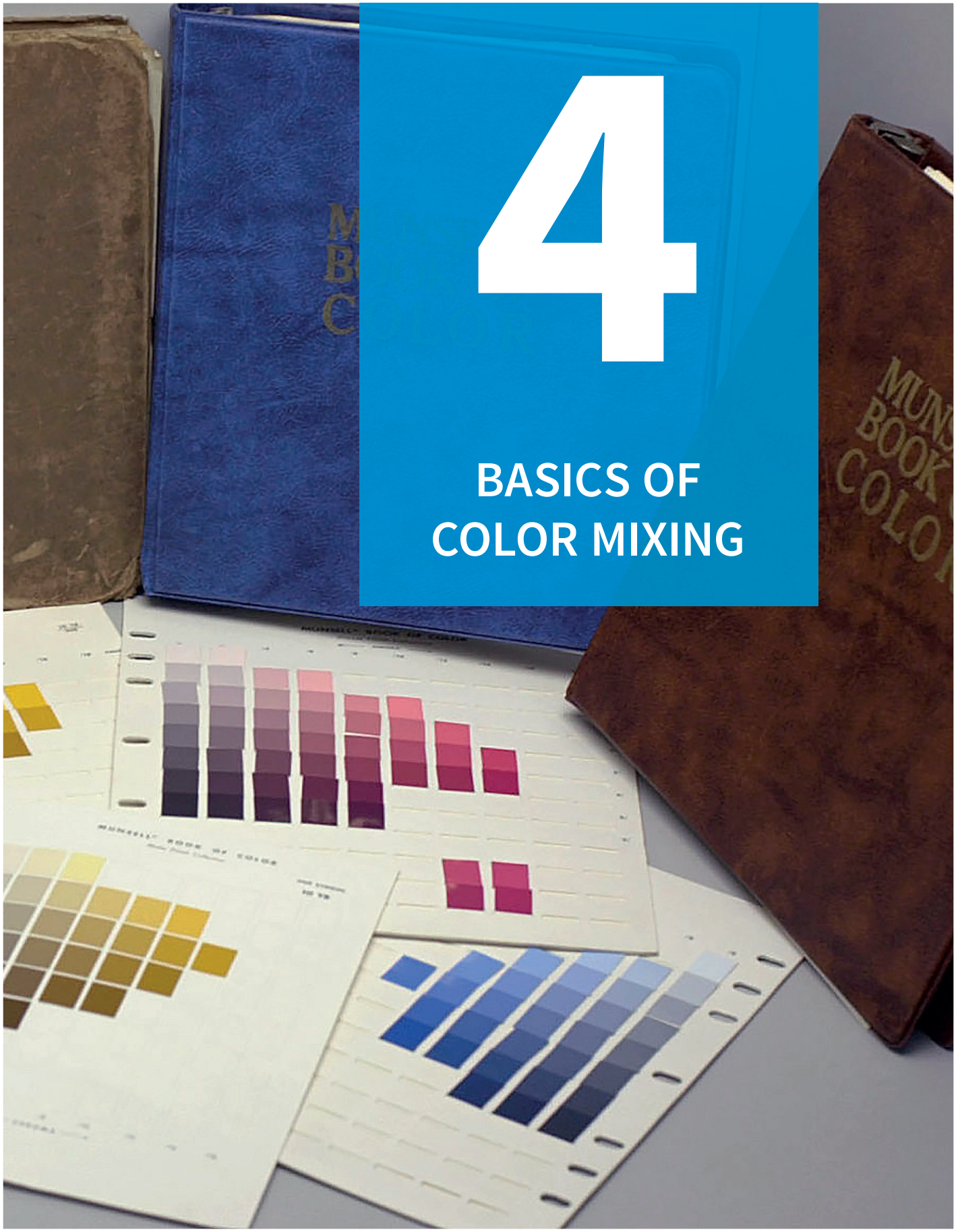
interprets what you see based on your prior knowledge of how light hits objects, creating areas of light and shadow. It is this information that creates the impression that a flat shape is three-dimensional.

From what we now know about colors, it follows that the essence of mixing is to change the optical properties of each color by adjusting its hue, saturation, and value. The way you mix on the palette depends on the technique you use, and above all on what the aim of your work is in terms of color and saturation. Nature and the world around us, with some exceptions, does not contain that much saturated colors. For example, if your aim is to paint realistically, you will be forced to tone down the saturation of the colors used, depending on the starting colors. On the other hand, if your goal is a modern work based on the principle of color contrasts, you can use colors straight from the tube without additional mixing. We'll talk more about the individual colors and their properties later.

SUMMARY

- The basic characteristic of each color is its hue, value and chroma.
- The classification of colors is clearly illustrated graphically in Munsell's Atlas of Colors.
- The value is more important than the color in the early stages of creation.
- Only with a value you do have enough visual information to discern what the image is supposed to represent, even without color.
- The value cannot be assessed and determined in isolation because its value is affected by adjacent values. Its specific appearance only becomes apparent when it interacts with its surroundings.
- In the real world, there are essentially an infinite number of value nuances available. An illuminated curved surface reflects an amount of light according to how each of its planes is inclined to the light source.
- The lightest value is always the plane that is inclined perpendicular to the light source.
- A squinting technique is used to assess the values. This way you will see the model without small details that will not disturb you when determining the tonality of the selected spot.
- The well-thought-out shapes and compositions of the individual values, and especially the distinctive tonal contrasts of light and dark areas attract the viewer's eye and can direct his gaze in the desired direction.
- The saturation of the color (chroma) depends on the value. Some colors reach their maximum saturation in darker values. Conversely, light colors reach maximum saturation in high values.


MUNSELL
BOOK OF
ATLAS
The
Munsell Color System
6 CHROMA



4

BASICS OF COLOR MIXING

efore we delve into the mysteries of color mixing and uncovering all these "secrets" together, it is useful to first explore and briefly categorize the expressive possibilities of colors and color schemes. This will give you an initial orientation as to which category you belong to as a painter. If we go back in history, we know that rich pigments, and therefore rich colors, were rare and hard to come by in the early days of oil painting. Later, with the development of painting and technological advances, natural materials were replaced by synthetic substitutes, which led to a significant expansion of the range of colors available. This went hand in hand with an increase in the colorfulness of artworks. From the point of view of color and the overall colorfulness of a work, artists can be divided into two basic categories, namely the colorists and artists working with values.

Side lighting is light that falls on a subject at roughly ninety or forty-five degrees to the subject. This means that one side of a subject will be lit, and the other side will be in shadow. This type of lighting emphasizes textures, dimensions, and shape of bodies.

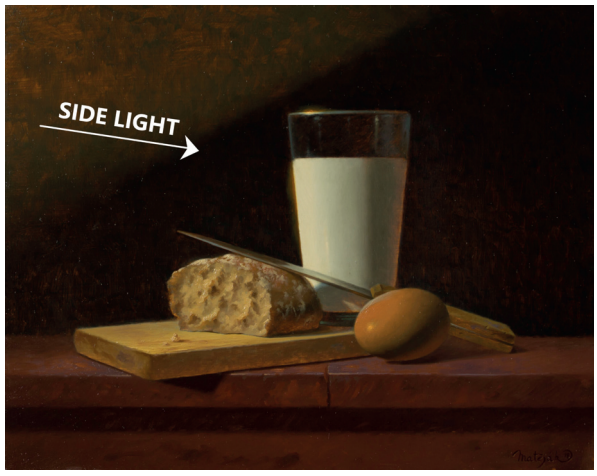
The value representation is based on the play of light and shadow. This concept is useful for representing the volume and depth of the bodies and subjects depicted, as the shapes and curves of the light and shadow boundaries provide visual information about the shape, texture, and volume of illuminated subject. From the perspective of color theory, however, local color, that is, the subject's own color, is affected by changes in values, or changes in light and shadow. How this happens we will discuss later. Typical for value representation is illumination from a semi-profile, where the light falls on the subject at an angle of approximately 45°.

Coloristic representation is based only on pure color, not on the change of lights and shadows. This type of painting is characterized by so-called frontal lighting or lighting from the front. This kind of lighting does not reveal the boundaries of shadows and hence the volume of individual bodies in the painting but emphasizes the subject's own color. Other, especially more modern, and expressive styles of painting can generally be placed in this category.

The division into these groups is for information only, as in practice there may be a combination of styles. It is just that your method of mixing colors will depend on the painting technique you use.

4.1 Mixing oil paints

To mix colors, you need to start by choosing the medium to work with. Since this is a book with a focus on fine art, and as you know, my own domain is oil painting, the next chapters will



Example of side light

André Derain – Example of a colorist painting

Rembrandt oil paints

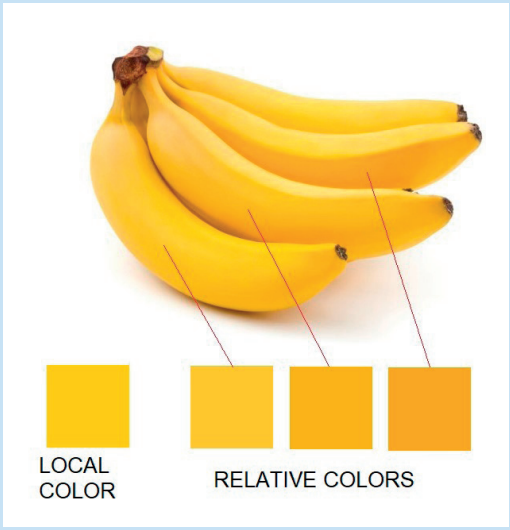
COLOR FROM THE TUBE

Olives

Green hues

Several different shades of green and yellow can be seen in the picture of the olives and leaves. You can mix the green you need from the yellow and blue. You may need to reduce the saturation of the green with a complementary shade of red. So, you can skip this whole process and reach for a tube of green, in this case earth green, which is closest to the desired shade. This will simplify the mixing process.

LOCAL COLOR

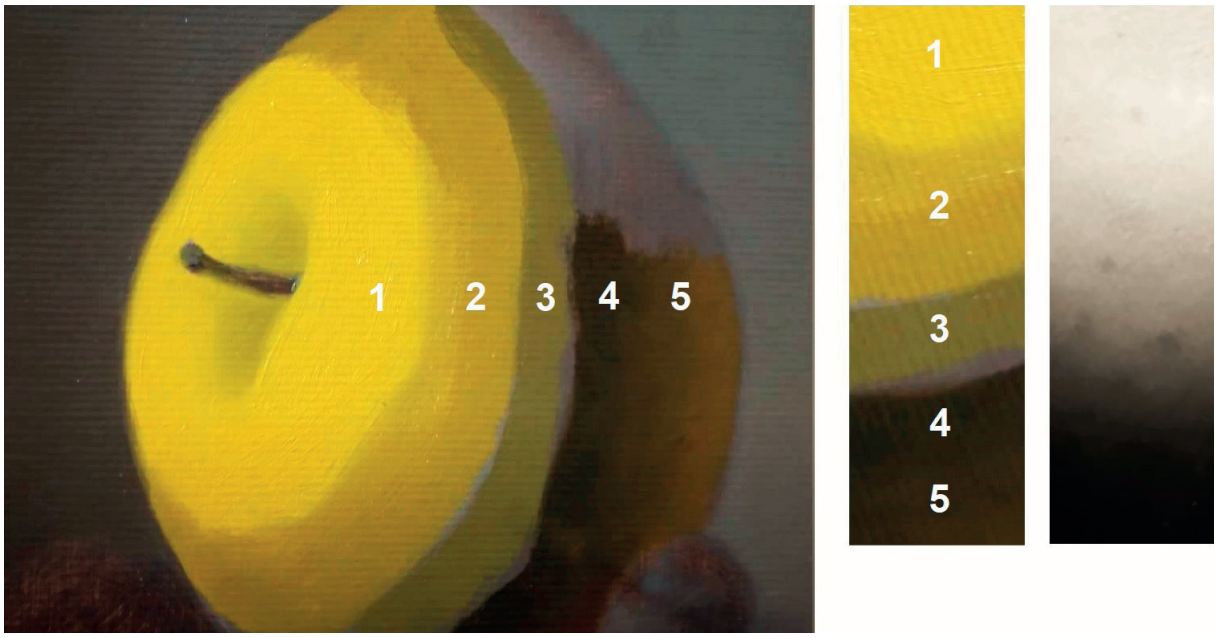


Local color

Now, dear readers, I will give you a simple task: imagine bananas. Your brain will immediately conjure up an image of beautiful yellow bananas. Yellow is therefore the actual color or local color of bananas. But if you look closely at a bunch of bananas, you will see many different hues that are relative to the local color. The color is therefore influenced by other factors, including the type of light, the distribution of light and shadows, and reflected light. So, in the real world, you will almost never see local color in its pure form, as it is always affected by the surrounding conditions.

focus primarily on oil paints. Oil painting has been described as the royal discipline of art, and a wide range of hues and nuances of color can be easily achieved on the palette through oil paint. Today's oil paint palette provides a plethora of hues and saturations that were previously difficult or not available to artists at all. Sometimes it can be confusing for the novice artist to know what color to choose.

he starting point for choosing the right color is usually the subject you are going to paint. It is generally easier to reach for the color from the tube that is closest to the subject's local color. However, I can still reassure you that you can't avoid mixing your chosen color anyway. The local color of any subject is always affected by light and shadow. Therefore, even if you have the "right" color in your hand, you need to adjust its saturation, value, and hue by mixing.



Value and color

In terms of mixing, it is sometimes stated that if you want to achieve a certain hue, the mixture should not be made up of more than three different colors. This increases the risk of falling into a grey trap during mixing and creating an unsuitable muddy mixture instead of the desired color. I can reassure you, however, because in practice you will certainly get over this limit several times with satisfactory results.

4.2 Light, shadow, and color

Light and shadow fundamentally affect the appearance of colors. We will therefore revisit this topic and explain it in more detail using a specific example. You can't start mixing colors without knowing what your goal is. In your mind you must always have a specific idea of whether the desired hue is to be high or low chroma, what temperature it should be, whether it should be dark or light, etc. You may wonder how you are supposed to know what shade to use right now. If you don't know, this chapter is for you, as it tells you how light and shadow colors all the objects around us.

Based on your knowledge of the theory, you can almost always logically deduce what hue do you need in a certain location. Therefore, it is essential

SCAN THE QR CODE

Scan the code to get a link to the YouTube video. There you will find a video workshop on oil painting for beginners, focusing mainly on shading objects to render them realistically. The video will give you more detailed information on the topic of this chapter.

YTB shading video

Warm and cool light

EXTENDED SHADOW TEMPERATURE

A good and simple way to paint a shadow to contain a certain proportion of warm and cool color is to use layering of colors of different temperatures. If you look at a close-up of a painting by J. Treck, you can see how the warm underpainting in the shadow part of the book or drapery is visible through the cooler hues of the top color. Transparent layers of warm and cool colors visually break the monotonous appearance of the shadow.

Jan Jansz Treck – detail of still life

to be well versed in the subject. Later, you will find that mixing of colors is essentially simple because the problem is not the mixing itself, but that you must know for sure what color you want to mix.

So, let's explain everything with a specific example. To do this, we will use a yellow-green apple, which has an ideal curved shape and a surface on which all the changes in tonality, temperature and color can be seen. I must warn you, however, that all the rules below are only valid if you want to render an object or portrait realistically. The light that I personally use is mostly natural. So, it primarily has a warm hue (the sun), which is complemented by a cool diffuse light (the blue sky surrounding the sun). Therefore, the temperature changes described are affected depending on the temperature of the light source. If you use a cool northern light for your subject, the coloration will be slightly different.

Point No.1: local color (subject's own color) – in the place where the subject plane is perpendicular to the direction of light, the local color chroma is the highest and the yellow-green color of the apple is the richest here. The plane receives the temperature of the light source (the sun). Therefore, at this point, the intrinsic color has a warm tinge of the primary light source.

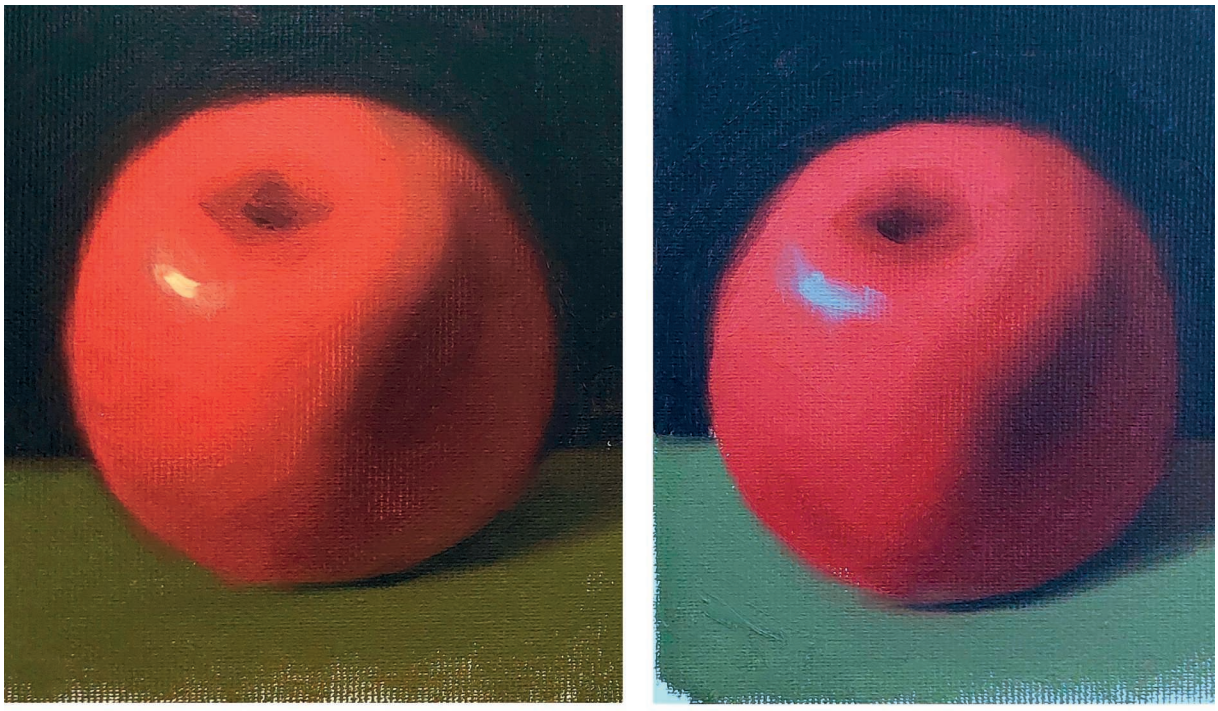
Points 2 and 3: halftone area – chroma decreases with value. The plane is deflected away from the sun and receives the cooler light of the blue sky, towards which it leans. The color of the apple is therefore less saturated, slightly darker and cooler in tone compared to the color in point 1.

Point #4: core shadow-chroma low due to absence of light. The area in shadow receives reflected light from the table and is relatively warmer compared to the point 3.

Point 5: reflected light – due to the presence of reflected light from surrounding objects or the table, the chroma and temperature increases compared to points 3 and 4.

For a classical realistic painting it is therefore necessary to constantly observe the direction of the light falling on the painted object and to analyze which planes are perpendicular to the light source, which planes are deflected and so on. In connection with this analysis, the chromaticity or saturation of colors must be adjusted according to the above rules, along with the tonality. A good way to start painting is to first establish a local color and then adjust its value and chroma by mixing.

Generally, warm light falling on a subject produces warm hues in the illuminated part of the subject and cooler shades in the



Temperature changes of local colors

shadow area. Of course, it's exactly the opposite with the cool kind of lighting. Thus, local, and relative colors are cool in the light and warmer in the shadow. However, do not take this rule as dogmatic. Rather, it serves to guide your thinking in the right direction when choosing hues and their temperatures.

As you know from the previous chapter, color temperature is a relative concept, and therefore the temperature relationships on a particular subject and their designation as warm and cool are based on their interaction with each other. To put it simply: we may label a color as cool because we are comparing it to a warmer hue, but if we compare the same color to another hue, its temperature may appear different. If this makes your head spin, I recommend going back to Section 4.4, Warm and Cool Colors, for a refresher on the rules for determining the temperatures of specific hues.

The truth is that the issue of temperature in practice is more complex. Particularly in shadow areas, when determining the color and temperature, it is important to consider that warm colors add depth to shadows and colder hues make shadows look flat. Thus, in the case of realistic shadow representation, it is necessary to find a balanced mixture of colors that not only fits the overall harmony of the scene being depicted, but also contains warm and cool colors at the same time.

Let us now return to the rule of alternating warm and cool hues. In the picture of the red apple, you can see the temperature changes depending on the type of lighting used. The left apple was painted with a spot of warm light, so its local red color has a warm tint. Because its surface is relatively glossy, the temperature of the primary light source is also reflected in the specular reflection. As in the painting of the previous subject of the yellow-green apple (Fig. 6.7), the halftone area is less saturated and cooler than the area in the light because the halftone is cooled down by the secondary cooler light of the blue sky.

However, if a cooler source is used, the situation is different. The cooler primary light source cools down the local color and its cool hue is also reflected in the specular reflection, which now has a much cooler hue. Conversely, in the halftone, the saturation and temperature of the local color increases slightly, as the apple plane is deflected here and is therefore not as affected by the cool light. As you can see, any changes in the color, saturation and temperature of a particular subject are dependent on the type of light used.

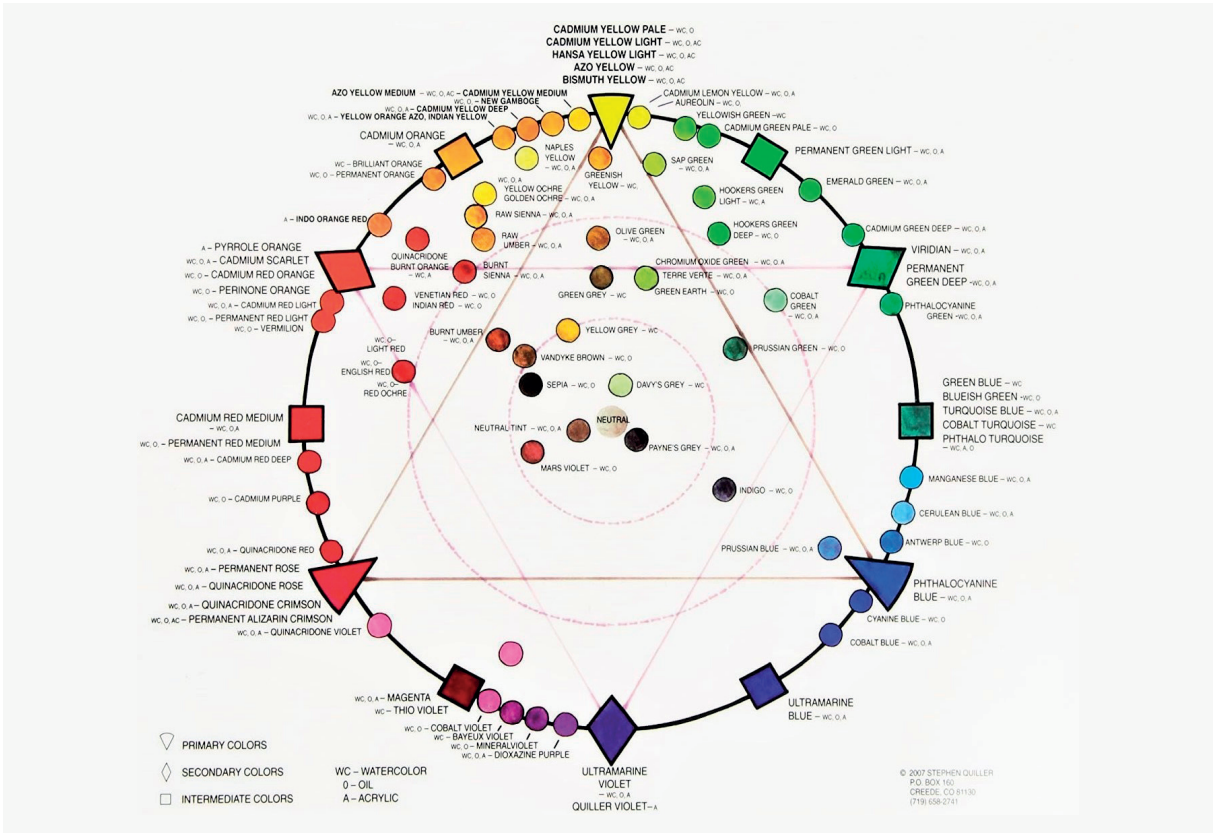
4.3 Choice of colors

So, the first step to mixing is to define the lighting conditions of our future work. The next step is logically the selection of colors, of which there is a plethora on the market today. The brand or manufacturer is now irrelevant for us, and we will focus only on the actual hues of the colors. It should be noted, however, that the colors are not always branded with the same names for each manufacturer, and even sometimes the same color differs in hue from one manufacturer to another. Some colors are opaquer, while others are more transparent. Therefore, we will talk about hues and names in general terms. Some artists use a wide palette of several hues of yellow or blue, for example, and some make do with just one hue of each color. Eventually, in the course of gaining personal experience, you will find for yourself that the choice of the particular range of colors on the palette is your personal choice, and over time you will certainly learn to select color in such a way that achieving particular hue becomes easy for you.

In the previous chapters it was explained how to navigate through the color space using Munsell's color atlas. However, if we start speaking the language of oil paint, navigating the atlas becomes a bit confusing. You will have a hard time guessing whether Ultramarine Blue belongs in classification 5B or 5BP or whether Cadmium Orange corresponds to 5Y or 5YR in the Munsell Atlas, etc. Now you may be wondering why you need to classify a particular hue in the color wheel and know where it is in space. But know that perfect orientation is a prerequisite for perfect knowledge of the mixing process. By looking at a color placed in a wheel, you can instantly and easily determine its relative temperature, its complementary color, and any other information you need.

In order to make the orientation depending on the names of the oil paints easy, we will now introduce a special color wheel created by the American watercolorist Stephen Quiller. This tool is useful not only for artists of all media (oil, acrylic and watercolor) but also for other crafts dealing with color relationships. The 70 hues are arranged in the wheel according to their

The Old Holland oil paint color range



Stephen Quiller's Color wheel

names so that their position corresponds to the given color space. According to this tool, you can easily find any hue and thus determine its characteristics.

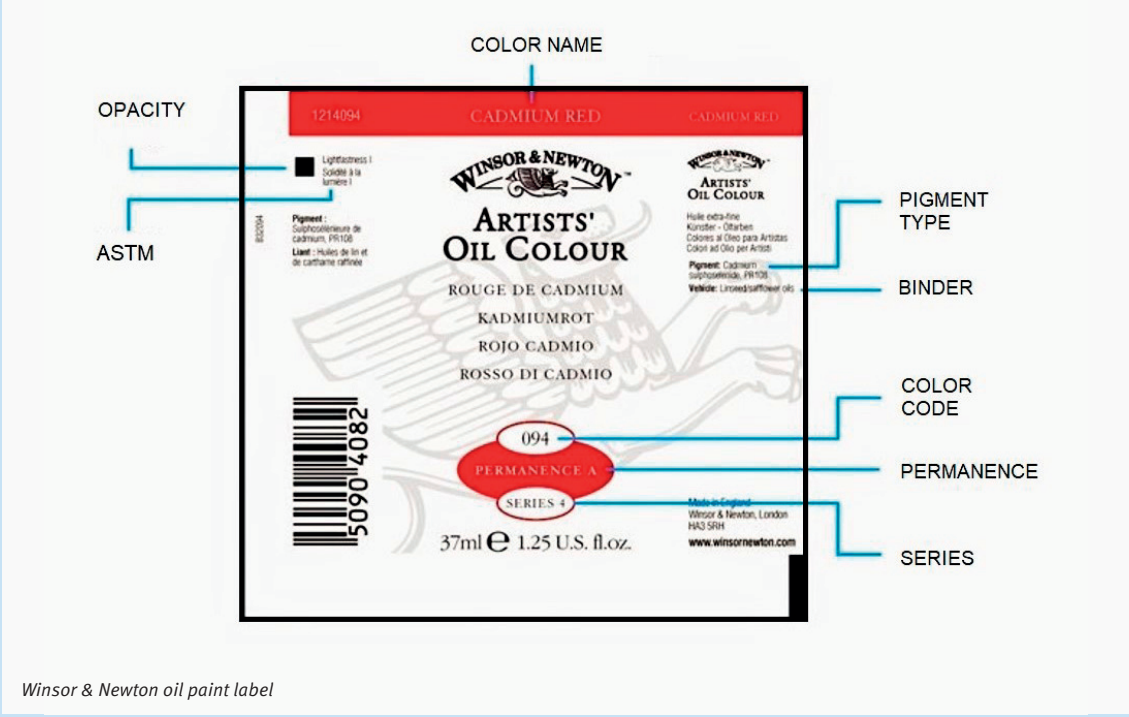
Now it's time to choose specific hues for your own work from the whole spectrum of colors. If you are just starting out with oil painting, I recommend keeping the range of colors to a minimum at first. This will make it somewhat easier to maintain overall color harmony on your palette. In the beginning it will be best to use, for example, one shade of blue, one shade of yellow, and so on. Later, as you learn how to expand your expressive possibilities, it is possible to add more shades.

From my own experience, I recommend you get a basic color palette that includes these shades: Titanium or lead white, Yellow ochre, Cadmium yellow medium, Cadmium red, Carmine, Burnt Siena, Burnt Umber, Ultramarine blue, Ivory black. In the practical part of the book, we will look at each shade in more detail.

Why these colors? The choice of colors is subject to the needs of display under natural light. As you can notice, most of the colors have a warm hue. Only black and blue serve as a cool complement

Basic color palette

HOW TO READ OIL PAINT LABELS



Winsor & Newton oil paint label

Each paint usually comes with a label that provides all the important information about the composition, properties, and stability of the selected brand. Thanks to the information on the label, you can see how the paint will look on your future work. The character and properties of paints depend on the type of pigment, binder, and other additives that some paints contain. The unique character of each color in the tube gives the artist options for texture, opacity, consistency, tone, and shade.

Color name: A name or color name that may not be unique to a particular range or medium. For example, a paint with the name Cadmium Red exists for both oil and acrylic or tempera paints.

Pigment type: this gives a chemical description of the pigments used in each color. The type of pigment determines the hue of the color, its lightness, and its opacity. Historically, natural pigments were used. Over time, in many cases, natural pigment powders have been replaced by synthetic variants.

The binder: The most common binder for oil paints is linseed oil. However, its properties are not always optimal, as linseed oil turns yellow over time. Sometimes, for example, safflower or walnut oil is used for white paints. These oils do not yellow, but their drying time is longer.

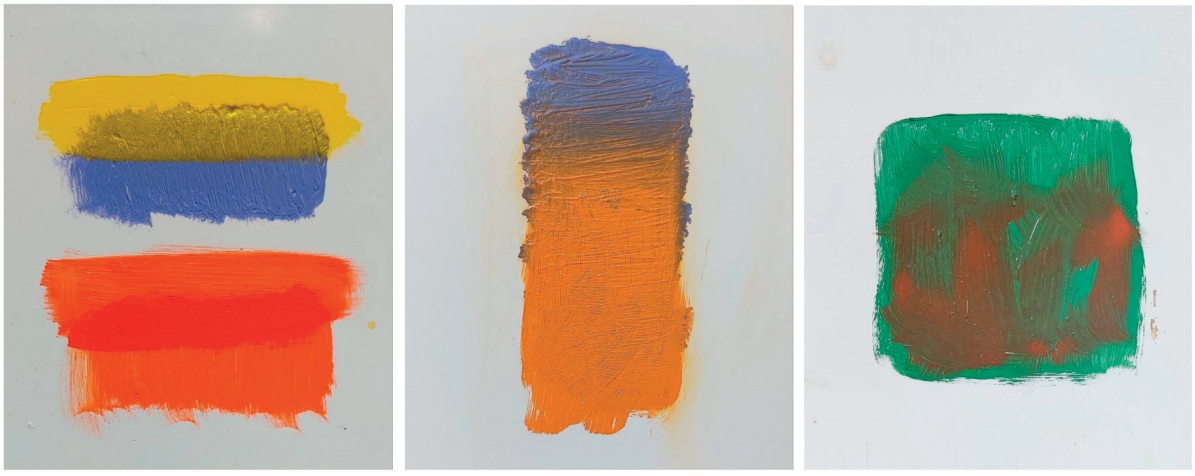
Color code: color identification number.

Permanence: basically, the durability of the paint after it has been applied to the surface. This gives us an indication of how durable the paint is when exposed to light and atmosphere.

Series: The numbering is given in relation to the relative price of the color, which is based on the price of the pigment.

Opacity: transparent colors are marked 'T' and semi-transparent 'ST'. Opaque colors are marked 'O' and semi opaque 'SO'. However, transparency is relative, and the rating is only a guide. In fact, any thin film of color will appear more transparent than a thicker layer of paint.

ASTM: Light Resistance. ASTM stands for American Society for Testing and Materials. This organization has set standards for the performance of art materials, including lightfastness of paint.



Methods of mixing colors

to balance the warm hues. Either way, you must start somewhere and the colors you choose are sufficient to effectively cover the full expressive range of the color spectrum. Green is not represented in the selection as it can easily be mixed from yellow and blue.

MOST USED METHODS OF COLOR MIXING

The mixing process can be divided into two main categories, namely mechanical mixing, and optical color mixing. The very simplest method, which is familiar to practically everyone, is of course the mechanical mixing of colors with a palette knife or directly with a brush on a palette. This method of mixing is used, for example, in the technique of direct painting or alla prima.

The dry brush method can be used to rub undiluted paint onto an already dry surface. The bottom paint is visible through the top layer to some extent, causing the paint to mixed together.

Another method, which is based on the optical principle, is glazing. By applying a translucent thin layer of transparent paint to a mostly dry base paint, the appearance of the base hue is influenced in the desired way. Light passing through the transparent top layer is reflected to the observer by the opaque bottom layer. Thus, there is no physical mixing of colors, and the glaze layer of paint adds depth to the resulting hue. This visually achieves an effect that cannot be created by a layer of opaque paint alone. Glazing can be used both to enhance the color or to reduce the value and saturation of the original color, for example in areas of shadow.

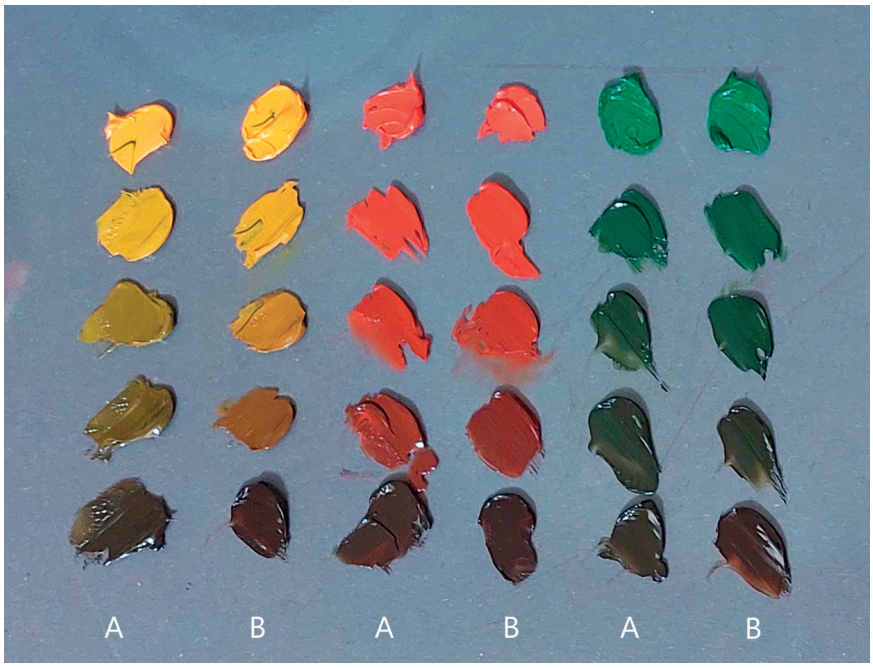
Winsor & Newton – Oil paint production

4.4 Mixing methods

The range of available colors is now much wider than in the past. Saturated colors, once rare, have been replaced by synthetic pigments and this has significantly widened the color field. The choice of colors and the way they are mixed is subject to your artistic style and purpose. For example, if you decide to paint a copy of a Rembrandt painting, it is not

advisable to reach for rich colors, which were not even available at the time. If you do, you will have your hands full mixing and reducing the saturation of the colors you choose. Conversely, if you want to paint a fauvist work, you will need high saturated colors, even straight from the tube. So, the whole mixing process depends on your intention and need.

For a realistic painter like me, the situation is clear. If you look carefully, you will find that nature around us, with a few exceptions of brightly colored animals, is not teeming with brightly colored objects. Therefore, the mixing process I'm using is largely based on reducing the saturation of chromatic colors.



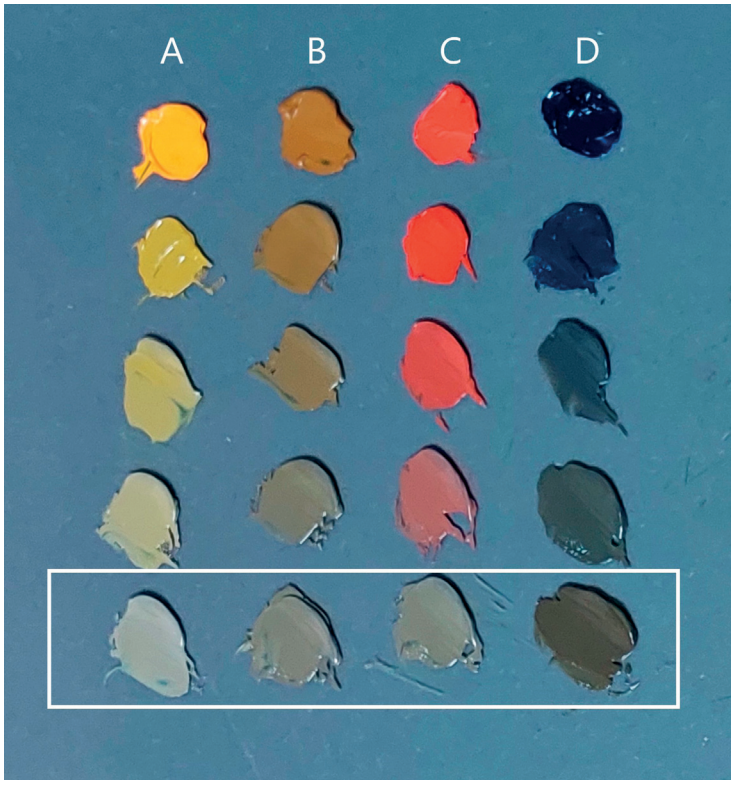
Mixing with umbers

Basically, I use three basic principles for modifying, or if you want to mix colors, from a tube. These include mixing with low chromatic earth colors, mixing with grey hues and mixing complementary colors. Each of these techniques has its own specifics and they usually intermingle while painting.

MIXING WITH LOW CHROMA PAINTS

Some of the most suitable and most used colors for reducing saturation are umbers. These include mainly raw umber and burn umber. Both colors have very dark values and relatively low saturation. The main difference between the two colors is that raw umber is closer to the yellow spectrum and burnt umber is essentially a dark red color. By being closer to the red spectrum, natural umber has a warmer hue. These differences are logically reflected in the result when mixed with other colors.

As you can see in the picture, umbers take away the saturation of the other colors to some extent. However, the reduction in saturation is not as strong as when mixed with greys or complementary colors. In the left-hand column A is always raw umber and in column B burnt umber. As these are dark colors, the result is a change not only in the saturation of the original color but also in its



Mixing colors with greys

original value. In the case of yellow, the darkening is most visible because the yellow has a light value. So, when we add umbers to other colors, we take away the saturation and darken them at the same time. This applies specially to saturated colors with a light value. You may also notice that the B columns always form warmer hues than the A columns. Remember these differences in the future. If you want to darken the color and get a warmer hue, you will need a burnt umber. Conversely, with raw umber you will achieve cooler, slightly greenish kind of acidic hues. Despite all this, both umbers are still quite rich and warm in color.

Preparation of grisaille

MIXING WITH GREY HUES

Another way to adjust the saturation of a color and perfectly control its chroma is to add a gray of a neutral hue to the selected color. The great advantage is that you can prepare greys of different values to cover the entire value range. Simply put, a color of a certain lightness can then be mixed with a gray that has the same lightness or darkness. This will only adjust the saturation of the starting color without changing its value. For this purpose, however, you need to mix a grey of a neutral hue so that the original color is not affected along with the saturation when mixed. The colors used in Figure 6.23 are A – cadmium yellow medium, B – yellow ochre, C – cadmium red deep, D – ultramarine blue.

Mixing complementary colors

For example, if you use grey, which you prepare from ivory black and white (**A**), you get a grey, but very cool bluish in hue. When added to yellow, the color will then shift slightly from yellow to green. Of course, you can make clever use of this if color shift is your goal. If you only want to change the saturation, a warmer neutral grey color, mixed

from, for example, natural umber and white (**B**), is preferable. If you do use a mixture of black and white, you need to "warm up" the color by adding yellow and maybe red ochre. You can also use grey paint straight from the tube, which is also commonly available on the market. I personally use a warm grey from time to time from Rembrandt.

MIXING OF COMPLEMENTARY COLORS

This method is another well-known and commonly used variant. While the addition of grey is a very effective method, there is a danger that its use in the mixture will cause some colors to be too desaturated. As we already know from previous theory, complementary colors always lie opposite each other in each wheel, creating maximum color contrast. By mixing the complementary colors with each other, a neutral color range is produced which is sufficiently colorful according to which hue predominates quantitatively in the mixture. Even here, color shift is sometimes unavoidable, but this is essentially seen as an advantage.

For the sake of interest, we will take this opportunity to return to the basic principle of color mixing. The result of mixing complementary colors is also influenced by whether it is an additive or subtractive mixing method. The complementary colors of your monitor are slightly different from the actual pigment colors. Therefore, the mixing result will also be different to some extent. Since we're mixing oil-based, i.e., pigment-based, paints, let's focus on them first. You can see in the picture that by mixing the blue-violet hues with their complements (columns **A** and **B**) you can get a greenish shade that is less saturated than the original colors, but still colorful enough. For several different reasons, it is therefore quite difficult to achieve a downright neutral mixture in this way. However, as has already been mentioned once, this fact is an advantage for us artists, because neutral colors prepared in this way are still rich enough in different hues to enrich the whole painting in the final result.

The resulting mixture of complementary colors always has a muted hue of the predominant color in the mixture. So, remember, depending on what muted color you want to create, use a little more of that color. For example, if you want to mix a muted orange, then mix a smaller amount of blue into a larger amount of orange. Of course, the reverse is also true. If you want to mix a muted blue, then mix a smaller amount of orange into a larger amount of blue, etc. It's a very simple, yet effective method to prepare a range of refracted hues that are neutral, yet colorful enough.

For mixing colors by any of the above methods, it is not so important whether there is a color shift to another place in the color wheel during the adjustment of the hue. What matters is that you are aware of it and know exactly how the appearance of the color changes and exactly what color you need when mixing.

SUMMARY

- In terms of color and the overall colorfulness of any work of art, artists can be divided into two basic categories, namely the colorists and the artists working with values.
- The essence of color mixing is to adjust the basic attributes of the colors, i.e., adjusting the value, chroma and hue.
- Begin mixing by selecting colors that are closest in hue to the subject being. This will speed up the mixing process.
- In the real world, the local color of any subject is always affected by light and shadow.
- The actual mixing of the paints is basically simple. The problem is not the mixing process itself, but rather knowing for sure which color to mix. That's why it's essential to know color theory well.
- The general rule tells us that warm light falling on a subject produces warm hues in the illuminated part of the subject and cooler hues in the shadow area. For cool light it is the other way round. That fact, however, is not an immutable dogma.
- The choice of colors on your palette is primarily dependent on the color and temperature of the light source illuminating your subject.
- The placement of colors on the palette should be subject to a specific system.
- In principle, mixing can be done in two ways. Either free mix right on your palette or mix the necessary hues in advance. In practice, the two methods are usually intertwined.
- In practice, three basic principles are used for mixing. These include mixing with low chromatic earth tones, mixing with grey hues and mixing with complementary colors.
- The complementary colors of your monitor (RGB principle) are slightly different from the actual pigment colors (RYB principle).
- The most powerful tool for neutralizing colors is mixing with gray hues.


REMBRANDT
ARTISTS' QUALITY
701
1899
NOIR D'IVOIRE
ELFENBEINSCHWARZ
NEGRO MARFIL
REMBRANDT
ARTISTS' QUALITY
EXTRA FINE
311
VERMILLON
ZINNOBER
BERMELLON
SERIES 3
OIL COLOUR
REMBRANDT
ARTISTS' QUALITY
EXTRA FINE
NEAPELGELB HELL
AMARILLO NÁPOLES CLARO
SERIES
OIL COLOUR

5

INDIVIDUAL COLORS IN PRACTICE

Successful color mixing relies on knowledge of theory. For example, if you buy the best and most expensive brush and you don't know how to paint, it's useless. Similarly, the most expensive paint will not guarantee that you will be more successful at mixing. There are many paints and manufacturers nowadays and it is up to you to choose the paints that suit you best in terms of quality, consistency, and other qualities. Above all, it is important to know how different colors differ from others. When you look at a color, you need to be able to answer the question of what hue you are looking at, what saturation it has, whether it is a dark color or more of a light color and whether it is a cool or warm etc. If you can easily find the answers to these questions, you are ready to start mixing. In the following practical section, we will take a closer look at the most common hues of oil paint. We'll look at the differences between them and use practical examples to show you how to mix and use these colors.

OIL PAINT BRANDS

Although it has been pointed out several times in the book that the manufacturer and the type of paint do not play such an important role regarding mixing, it is still a good idea to get the best materials available on the market for your work. I'm sure, like me, you love visiting art supply stores where dozens of different colors and hues of paint are on display, stored on easels or lined up on shelves. Quality paint manufacturers that I can personally recommend include Rembrandt, Old Holland, Rublev, Vasari, Winsor & Newton, and Michael Harding.

5.1 Whites

White is just white and there's no need to dwell on it further, right? However, when shopping for white paint, you may come across several different hues of white that differ from each other in some way, even though they may appear the same at first sight. Their composition, the type of binder and pigment, will all affect the different characteristics and appearance of each hue. However, these differences in the chemical and physical properties of the different whites are most apparent in mixtures with other colors

The initial choice of the right white may depend on the art medium. Watercolorists, for example, may rely solely on the white of the paper surface. The essence of the watercolor technique is painting with translucent pigments. Although white watercolor paint is available on the market, it has a certain opacity and is therefore technically not watercolor paint but gouache.

Those who work with acrylic paints have an easier choice because the selection of acrylic whites is limited to only a few types. The greatest choice of whites is therefore in the field of oil painting. The right white is the foundation of any artist's palette and accounts for much of the paint that ends up on your canvas.

Reducing saturation with white

WHITE IS A COOL COLOR

The opaquer the white is, the more it reduces the color of the mixtures in which it is present. In general, any white is classified as a cool color. Remember, therefore, that the addition of white to other colors, and especially to warm hues, causes the original color to cool down and reduce its saturation. If your goal is to lighten a red, for example, adding white will indeed lighten the color, but it will also cause a color shift. The original red hue will change to pink.

In general, titanium and zinc white are most used for oil painting nowadays. Over time, these whites have replaced lead white, which was the only white used for centuries. Although lead white has lost its importance due to the development of oil painting and direct painting techniques, it is still the best material from a technical point of view for the construction of a painting, especially for classical layered painting.

In the next image, you can see more examples of how white takes away the saturation of warm hues and lowers their temperature. Column A and B (raw and burnt sienna) are saturated and warm colors. When white is added, it changes them to cooler cream hues. Colors C, D and E (raw natural, umber burnt and Vandyke brown) are also warm colors, but with a darker value than colors A and B. White again takes away saturation, and hues D and E in particular turn to a warm grey. In case you want to lighten and cool a warm shade, adding whites is one way to achieve this. However, if your goal is to lighten the color and keep it rich, you need to look for other colors in the color spectrum.

Each of these whites has different properties, both optically and in terms of its composition. Let's take a closer look at each hue. The kind of white you need can be defined through the properties that are unique to each of the whites. These are mainly drying speed, coloring power, temperature, and opacity strength.

Warm colors with white

Properties of whites.

TITANIUM WHITE

A non-toxic white made from titanium dioxide that is found on the palette of almost every contemporary artist. It is usually bound with linseed oil, mixes easily with other paints, and dries at a medium rate. Whites rubbed in walnut or safflower oil do not yellow as much but take longer to dry. Titanium white has a neutral temperature and is the brightest white on the market. It also has the highest tinting power, making it a great helper for mixing with other colors. Its covering strength surpasses lead white. It is not so suitable for underpainting and other underlayers. In terms of consistency, titanium white has a buttery "short" texture.

ZINC WHITE

A non-toxic, cool-toned white made from zinc oxide, it is less opaque than titanium white, making it more suitable for glazing. It has lower tinting power, takes longer to dry, and forms a brittle film over time that is prone to cracking. It is therefore not suitable for underpainting and for application in thick layers. On the other hand, the longer drying time makes it more suitable for direct painting techniques, where it is possible to develop the painting over a longer period of time.

LEAD WHITE

Lead white is an absolute classic among whites. Painters have used this white for hundreds of years and its role in oil painting is irreplaceable. Lead white is an extremely pliable and malleable material. It can be applied in thin layers and in thick pasty layers. The most outstanding properties of lead white are its high coloring and covering power and its reactivity with oil. The paint must be handled quite briskly, as it dries the fastest of all the whites. This property is also suitable for underpainting, which is why lead white is the most suitable for classic layered painting techniques. The drying time can be extended if the white is bound in walnut oil. At the same time, yellowing of the paint later on is prevented.

Alexander Koester – Ducks on the pond

WHY ISN'T WHITE COLOR "WHITE"?

Technically, white cannot be described as a color. Light falling on an object (such as "white" paper) is reflected off it, and all the reflected components of the color spectrum combine to create white light. Thus, for our visual system, the color white is created. Recall the decomposition of light through a glass prism from previous chapters.

Speaking in general terms, you can certainly use pure white paint straight from the tube for your work, especially if you want a more expressive creation or if your goal is to achieve high contrast, for example. In the real world, however, white paint is never pure white. Its appearance, color, temperature, value is influenced by the ambient conditions created by the light.

The hue of white is always determined by the light source. The color of the light is best shown on white objects. Because a white object has no inherent bravura, it must literally have the color of light when rendered. Sunlight has a warm yellow hue and at sunset a warm reddish hue. A blue sky produces light with a cool bluish tinge. Logically, all this must be reflected in the appearance of white colors.

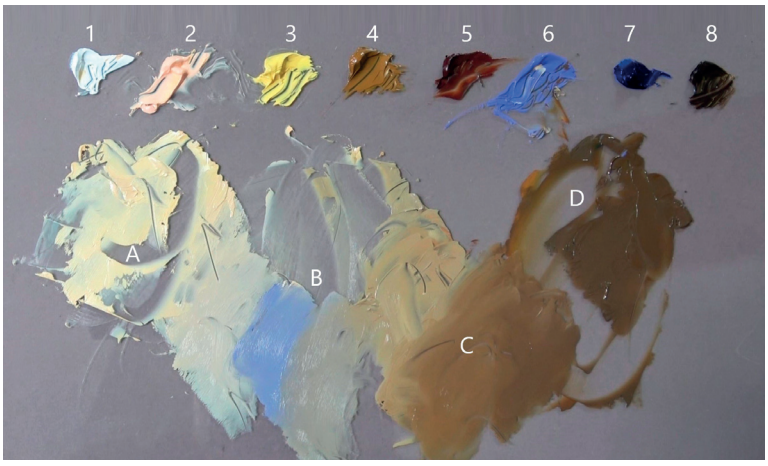
The best way to explain everything is with a practical example. The key to mixing and displaying "white" colors is to consider the color and temperature of the light illuminating the subject or selected motif. In A. Koester's painting of white ducks, you can see a wide variation of hues that change depending on the light and its direction. The ducks cast a short shadow from which it is easy to infer that the primary light source (the sun) is high in the sky. That it is a bright sunny day can be identified by the fact that at point **A**, the point of light incidence, there is a hue of white with a warm yellow tinge from the sun. The blue sky that usually surrounds the sun on a clear day must also show up in the subject, in the form of bluish hues at points **B** and **C**. Here the planes are deflected towards the blue sky. The reflected light then causes a warming of the hues, as seen in **D**. The fact that the ducks are surrounded by a dark value creates a strong tonal contrast that reinforces the illusion of white. The color, temperature, and tonal contrast of the surrounding colors make white appear truly white in sunlight, even though the local color has a certain hue and value.

I used the same approach to the variation of white colors and their temperatures when painting the white rose in the picture. Natural light fell on the flower, just as it did on the ducks in the previous example. So, I used almost the same principle for the painting. The only difference here may be the colors used and the mixing procedure. For example, if you want to mix the hue marked with the index A, you can use white with the addition of yellow and red, or you can reach straight for a similar color from the tube. This will both speed up and simplify the whole mixing process.

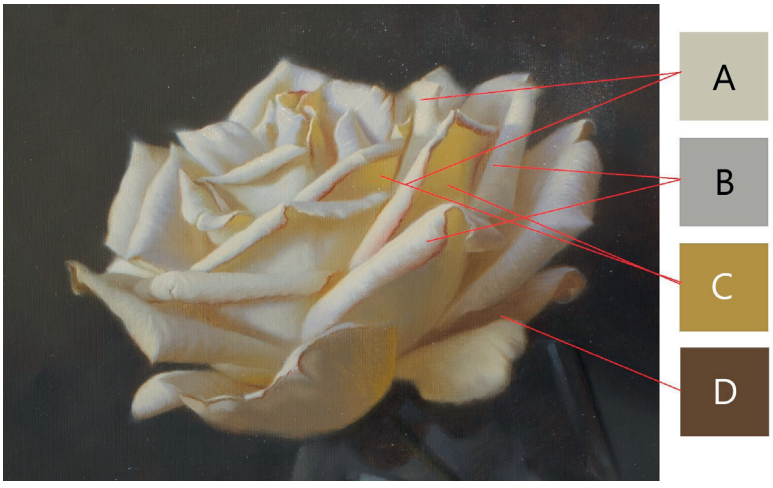
I used the following colors for the rose: 1. titanium white, 2. Naples yellow light, 3. Naples yellow, red, 4. yellow ochre, 5. transparent red oxide, 6. cobalt violet + white, 7. ultramarine blue, 8. Burnt umber.

During the mixing process I proceeded from left to right, i.e., from the light at point **A** to the shadow at point **D**. On the palette, you can again trace the alternation of warm hues (Points **A**, **C**, **D**) and cool halftones (Point **B**). The mixture at point **A** is intended to be used in place of the white rose in the light and has a warm tint from the sun according to the principles described above. The resulting color is mainly Naples yellow and a small amount of titanium white. At point **B** there is a cool halftone, the temperature of which can be varied as required. By adding burnt umber to the mixture at point A, I obtained a darker color suitable for the halftone. I further cooled this color by adding a light blue. The advantage of light blue is that its hue cools the other colors but does not significantly change their values. To cool down mixtures intended for shadow areas, ultramarine blue, which has a darker value, is preferable. Points **C** and **D** are essentially a variation of the warm mixtures, made up of earthy hues of colors 4, 5, 8 and 'cooled' by the addition of blue 6 or 7 if necessary.

In this chapter, I would like to mention the other two colors I used to mix the colors on the rose. Although Naples yellows are classified not as whites but as yellows, they are suitable for mixing white hues. The difference between Naples yellows is clear immediately. One color has a yellow tinge and the other a warmer red hue. However, both have the advantage that if you add them to other colors, they do not reduce their saturation and temperature as much as pure white. That's why I use them from time to time instead of pure white.



Mixing whites



White rose detail

They are also a great tool for mixing light hues of a certain temperature and value. For example, if you want to get a warm yellow hue, you need to take Titanium White, add Cadmium Yellow and maybe a small amount of Cadmium Red. You can basically skip these steps by using Naples yellows. However, as you already know, you will need to continue to adjust and mix each color as needed during the painting process. However, the whole process will be shorter and easier.

Naples yellows

Video – mixing whites

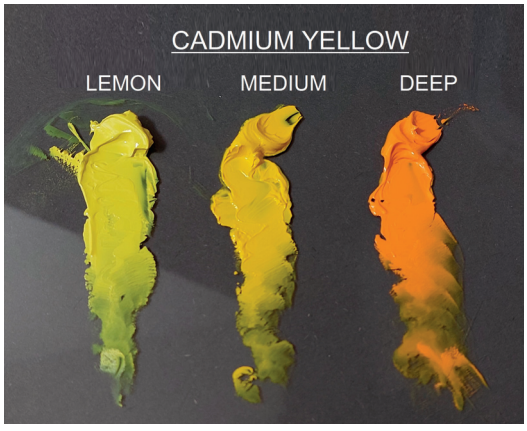
White Rose

5.2 Yellow colors

Jan Vermeer – detail of the painting

Yellow is a primary color that cannot be mixed from any other color. The range of yellow hues available from different oil paint manufacturers is quite wide, from bright cool yellows to warm reddish shades. Therefore, we will focus on the most commonly used yellows, which in oil painting include cadmium yellow lemon, cadmium yellow medium and cadmium yellow deep. Cadmium yellow, discovered by the German chemist Friedrich Stromeyer in 1817, became popular in the United Kingdom in the second half of the 19th century. This pigment replaced the classic lead yellow used in European painting before the 18th century. Lead yellow can be found, for example, in the paintings of J. Vermeer.

Looking at the position of the yellows in the color wheel, lemon yellow is a cool color and is closer in hue to the green part of the color spectrum. On the other hand, cadmium yellow deep lies closer to the warmer red part of the wheel. Medium yellow lies somewhere in between in temperature. These differences in temperature and hue will also show up in mixtures with other colors.



Cadmium yellows

CADMIUM YELLOW LEMON

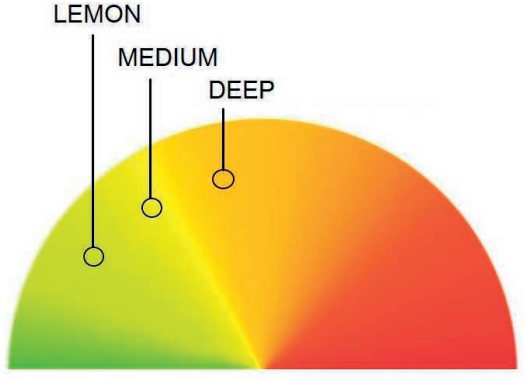
Medium opaque bright yellow with a cool greenish tint. This cool yellow is one of the richest yellows on the market. It is a great color for mixing bright yellow-green cool shades. Especially when mixed with Prussian blue, lemon yellow produces highly chromatic acidic shades of green.

CADMIUM YELLOW MEDIUM

In terms of temperature, this yellow is somewhere between lemon and deep yellow. The color has an intense warm hue and good opacity. Unlike other yellows, when mixed with titanium white, the resulting mixture still retains a relatively rich yellow hue. Compared to lemon yellow, cadmium medium has a slightly more orange tinge. It can be used to create bright and rich greens, especially in mixtures with cobalt and Prussian blue. Medium yellow should not be missing from any landscaper's palette, as it is suitable for painting brightly lit green hues on grass and trees.

CADMIUM YELLOW DEEP

Yellow with an almost orange warm tinge is great for mixing warm green hues. Greens mixed with blue hues produce warmer greens than with lemon or medium yellows.

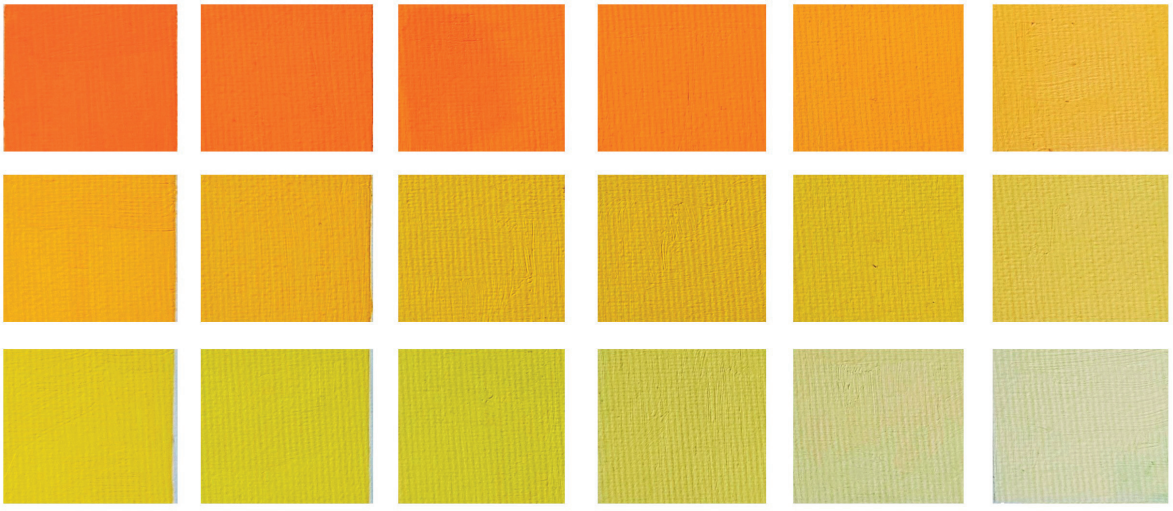


Yellow colors in the color wheel

However, these greens are slightly less saturated, especially with ultramarine blue. This is because both colors lie closer to the red spectrum in the color wheel, and the red is complementary to the green.

Because this dark yellow has a warm hue and a light value (but is the darkest of the yellows listed), it is a great color for painting bright light reflections, especially of a natural light source (the sun), which also has a warm hue. On a highly reflective surface, such as silver, the specular reflection of light appears almost undistorted. Thus, the mirror light reflection shown can be easily mixed from cadmium dark, a small amount of cadmium red, and white. The mixture can be further attenuated according to need – one possibility is burnt umber.

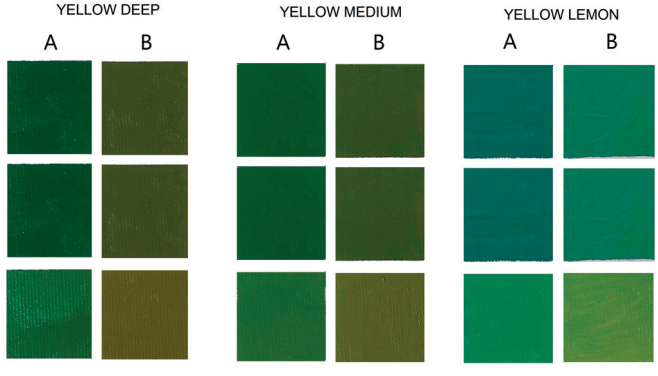
Gold reflection painted with yellow deep and white



Mixtures of yellow and white

This paint is also suitable for painting gold and brass objects. When mixed with white, the mixture can be used, for example, to paint a light reflection on a gold object.

All three yellows are rich colors with strong coloring strength. Cadmium lemon yellow and cadmium medium yellow in particular retain their saturation even when mixed with white. Only cadmium yellow deep, which contains a proportion of red, changes its hue slightly to a creamy warm color when mixed with white. The differences in the yellows are most visible in the shades of green.



Mixtures of yellows and blues

In the picture of the green colors, you can observe the different temperatures and hues that are created by using yellows and blues. Prussian blue (**A**) and ultramarine blue (**B**) were used for mixing in all columns. If you compare the columns with each other in relation to the yellows, lemon yellow produces the coolest bright color, especially with Prussian blue in column A. Medium yellow and deep yellow produce warmer hues, especially with ultramarine blue, which has a proportion of red in it. The warmer hues of green, however, do not have the saturation of the lemon yellow. These differences are good to remember so you know what colors to reach for. Keep in mind that with ultramarine blue, green hues are warm but less saturated, and conversely, with Prussian blue, green hues are brighter but cooler.

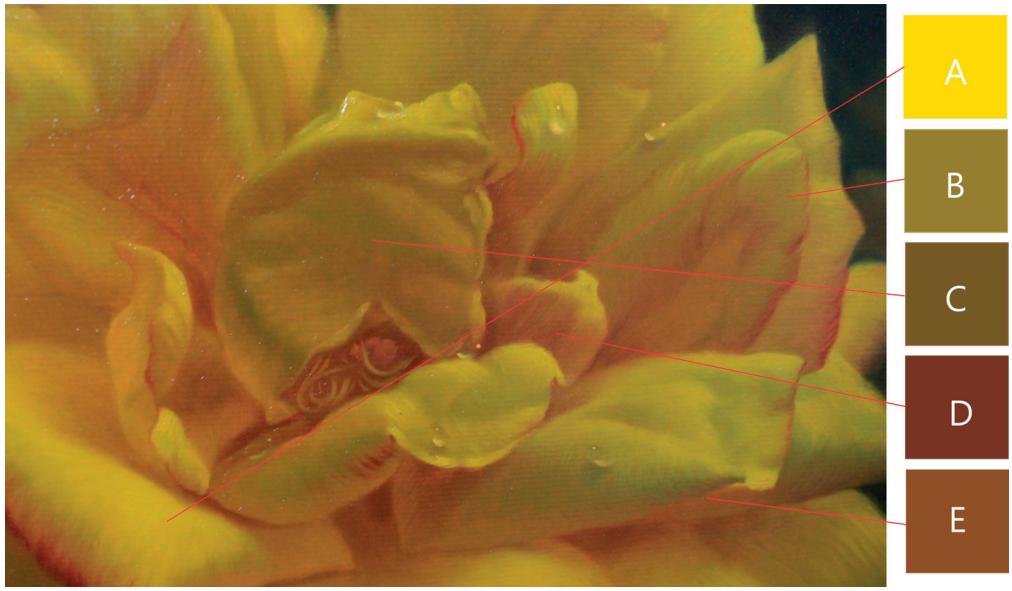
Darkening of yellow

HOW TO DARKEN YELLOW?

First, you must ask yourself if you want to darken the yellow without changing the color. During the darkening process, it is possible to change the saturation or even the hue of the original yellow.

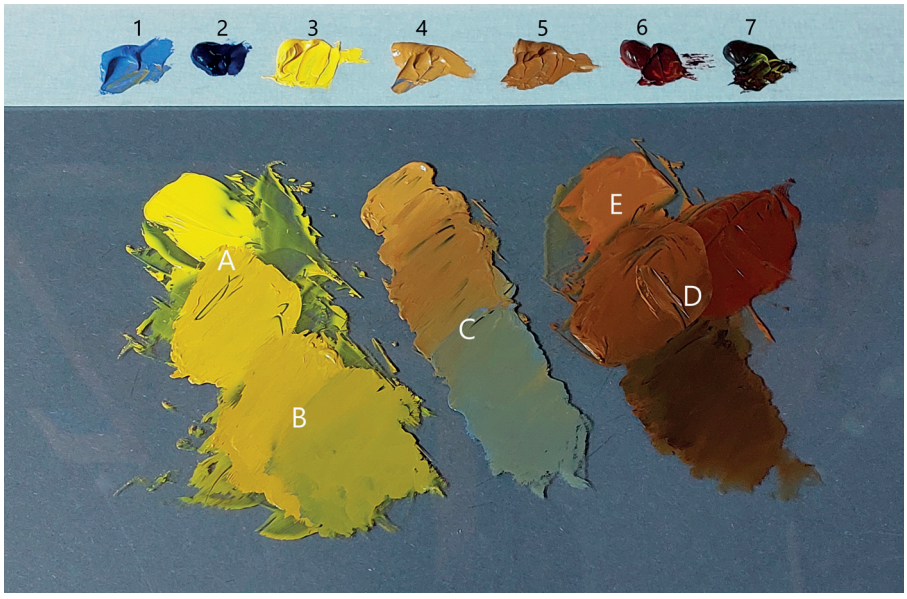
The easiest way to darken yellow is to use the appropriate hues straight from the tube. So, to darken the yellow while maintaining saturation in the darker value, we can move to yellow ochre and then to raw umber. These yellow-brown hues can in principle also be mixed from the primary colors, but there is a risk of losing the saturation of the resulting hues by mixing.

In the picture on the right, the scale of yellows in columns **A** and **B** were created by the other colors (yellow ochre, raw



Detail of yellow rose

sienna and burnt umber (**A**) and raw umber (**B**). The colors here do not lose saturation even in the darker values. Since burnt umber is essentially a red color with a lower chroma and a darker value, there is a small color shift towards red in the darker area in column **A**. The ideal scale is therefore found in the middle in column **B**, where raw umber is used in the darker area, which is essentially classified as a yellow color with a lower chroma and a dark value.



Mixing yellow hues

As you can see in column **C** below, darkening with black does not produce the desired result. As we already know, ivory black is essentially a dark blue color with low chroma and a very cool hue. Therefore, when mixed with yellow, it produces greenish tints that are not consistent with the preservation of the yellow hue.

If you want a realistic representation of a yellow subject, you can't avoid changes in the saturation of the original hue during yellow darkening. Using the example of a yellow rose, you can see how the yellow changes its hue towards the green spectrum in areas of halftone, and at the same time its saturation decreases. Conversely, in areas of shadow, the yellow shifts towards warmer hues of umber, while its saturation increases. Again, therefore, a change in temperature and saturation is reflected here.

For the painting of the yellow rose, I used the following colors: 1. light blue, 2. ultramarine blue, 3. cadmium yellow medium, 4. yellow ochre, 5. raw sienna, 6. transparent red oxide, 7. burnt umber.

During the mixing I proceeded from left to right as always, i.e., from the light at point **A** to the shadows at points **E** and D. Again, the palette can be traced alternating between warm hues (points **A**, **C**, **E**) and cool halftones (points **B** and **C** below). The mixture at point A has a warm hue from the sun according to the principles described above. The cadmium yellow medium was too rich to use straight from the tube. I therefore reduced its saturation slightly with the burnt umber. This color also slightly warmed up the yellow hue, which corresponded exactly to my intention to shift the hue of yellow slightly towards red, while not losing the saturation of the local color by darkening it. At point **B**, the mixture is cooled down by the light blue hue, making it suitable for the darker and colder halftone. The advantage of light blue is that its hue cools the other colors but does not significantly alter their values. If I were to use Ultramarine to cool down yellow, you know what would happen. It would darken too much and at the same time turn the yellow into a green hue.

Rose petals are somewhat translucent. The penetration of light through the petals causes an increase in the saturation of the shadow color. At point **C**, the mixture is made up mainly of raw sienna and a small amount of burnt umber. A cooler version of this color for the cooler halftone has been created by again adding light blue. For cooler mixes intended for shadow areas, it is preferable to use ultramarine blue, which has a darker value. Points **E** and **D** are essentially variations of differently warm mixtures, made up of earthy hues 5, 6, 7 and cooled by the addition of blue 2 or 1 if necessary.

Video – mixing of yellows

Yellow Rose

5.3 Ochre and Sienna

Ochres (1) and siennas (2, 3) are among the oldest pigments and colors used by mankind throughout its history. These are earthy hues that are essential for landscapers or for mixing flesh tones, for example. In the color wheel, we classify ochres and siennas into yellow and red hues. The colors have nowhere near the saturation of cadmium yellow and red. Their mixtures produce more subdued hues because they are lower chromaticity colors. However, if you compare these hues in isolation, they are still fairly saturated colors and their use in painting is wide. In the days when synthetic pigment substitutes were not yet available, saturated colors were very rare. Earthy yellow-brown hues were on the palette of all the major artists. They are currently available on the market in several different hues that balance between the yellow and red color spectrum. The choice is vast, so we will only take a closer look at the most used hues.

Comparison of ochre and siennas

YELLOW OCHRE

Yellow ochre is a warm yellow, medium opaque color with an almost golden hue. The paint was originally made from natural iron oxides found in the ground. The natural pigment was replaced by a synthetic version in the 1920s. Many painters use this paint as a base hue for mixing flesh tones. Among the world-famous artists who used yellow ochre in portrait painting was Anders Zorn. Other hue variations of this color are available on the market, such as orange ochre, gold ochre, etc.

RAW SIENNA

This is a darker version of yellow ochre, as both variants belong to the yellow spectrum. The pigment contains iron oxide and manganese oxide. In its natural state, the pigment has a yellowish-brown hue, which is characteristic of natural mien. An essential color for every landscaper to represent dry soil and grass.

BURNT SIENNA

If you heat the pigment of raw sienna, you will get burnt sienna. The heat dehydrates the iron oxide and partially turns it into hematite, giving the sienna a rich reddish-brown color. Its hue thus shifts from yellow to red. Although it is a semitransparent color, it has a higher coloring strength than other earthy hues. This color, in combination with other hues, is suitable for portrait painting as one of the base colors for the shadow area of the model being portrayed.

Yellow ochre together with black was and is used as a base layer, which is called imprimatura. Basically, it is not an underpainting as such, but only a preparatory base layer of paint. Before you start painting in the classical style, you need to cover the white of the canvas to avoid excessive tonal contrast. The imprimatura should have an olive hue, which can easily be mixed from yellow ochre with the addition of a small amount of ivory black paint. If you want an imprimatura with a warmer hue, a small amount of burnt umber can be added to the mix. Umbra is a fast-drying color and will therefore speed up the drying of the whole mixture, which is essential for underpainting stage.

Most ochres, especially yellow ochre, are suitable as a basic skin tone for painting both illuminated and shaded parts of human skin. The different temperature and hue variations of

Mixture for imprimatura

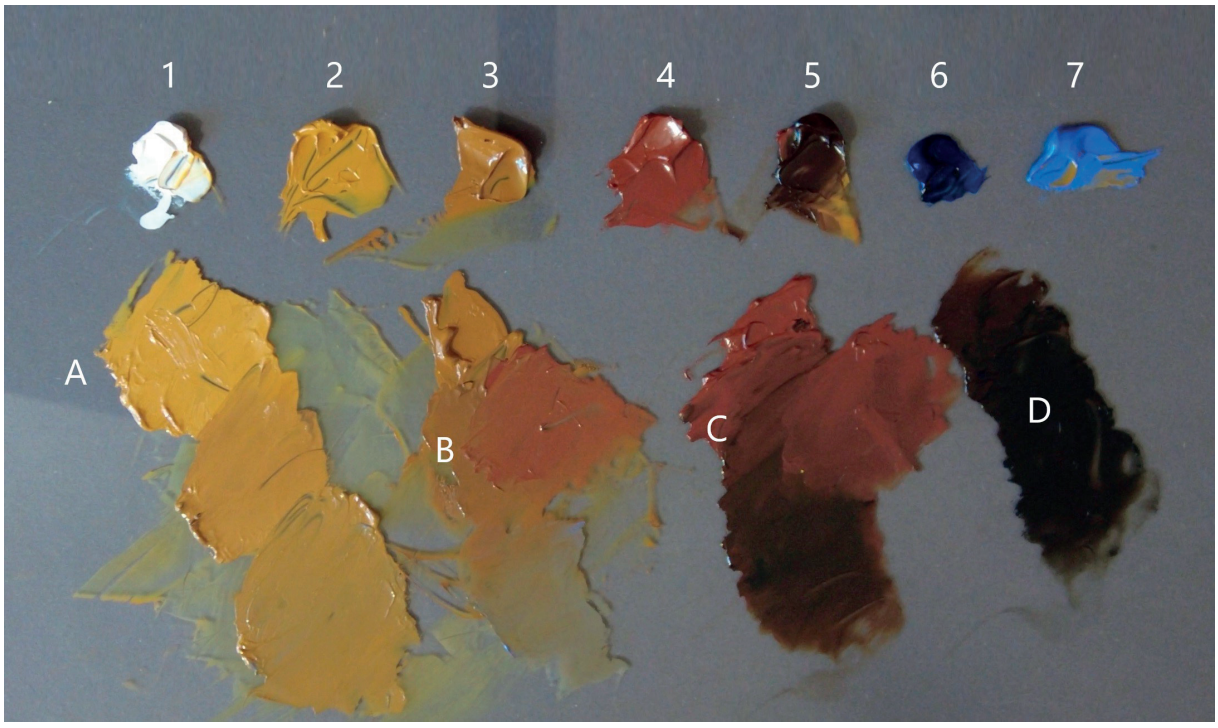
Basic flesh tones

this color are perfect for portrait and figure painting. Together with other hues (cadmium red, ivory black and white), yellow ochre creates a variety of flesh colors that should not be missing from your palette. If you lighten the black with white, a bluish mixture is created, which serves to reduce the saturation of the ochre-red mixture. This creates what is known as the Zorn palette, which can cover a range of different flesh colors. However, the color theory of portrait and figure painting is far more complex and would lend itself to several more books. In the case of determining a subject's local color, it is imperative to remember that a single skin tone cannot be used to paint an entire face or figure.

The still life with garlic was painted with a warm palette of ochres and sienna along with other colors. This is a classic example of a warm color analogue scheme with a limited color range. The painting was essentially painted with only yellow hues that vary only in temperature and value. As you can see from the image, you won't find a single prominent cool color.

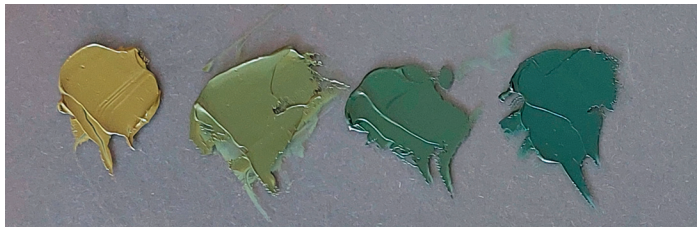
Only in the areas of light to shadow transition there are some cooler, low chroma colors that have been created by the addition of blues.

Zorn's color palette



Mixing of ocher and sienna

For this painting I used: 1. titanium white, 2. yellow ochre, 3. raw umber, 4. burnt sienna, 5. burnt umber, 6. Ultramarine blue, 7. light blue. Yellow ochre and raw sienna are basically the same colors, the only difference is that raw sienna is slightly darker than yellow ochre. Since these are yellow hues, the mixing procedure is essentially the same as for yellow rose. Local color **A**, composed of only yellow ochre and white, was applied to the illuminated part of the wall in the background. With the addition of white, I created local color of the garlic.



Low chroma greens

In column **B**, which is darker due to the raw sienna, I prepared a variation of warm and cool halftones. By adding the burnt sienna, I warmed up the mixture and expanded the color scheme with redder hues, conversely by adding light blue I cooled down the mixture as needed. In fact, it was possible to use a color mix of yellow ochre and burnt umber as a starting color for the halftone, instead of raw sienna. However, this requires an extra step during mixing and for this reason it is easier to reach for the color directly from the tube. This saves you time and space on your palette. Columns **C** and **D** are just different temperature variations created from colors 4,5, and 6 that I used to paint the shaded parts of the painting.

Because yellow ochre is essentially a yellow color of lower saturation, it can be used to mix various muted hues of green. In the picture you can see an example of mixing yellow ochre with ultramarine blue. The greens have a greyish tinge to them and thus lend themselves to more muted color schemes.

Video – mixing of ochres

Garlic

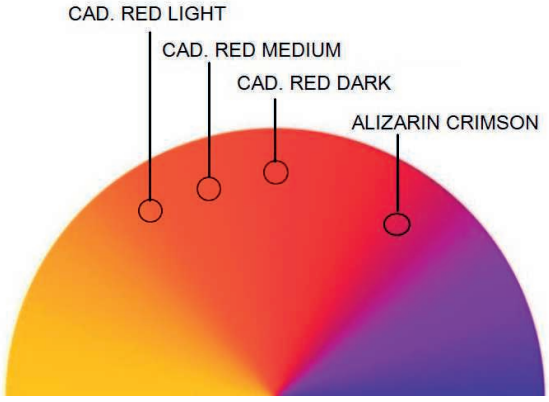
5.4 Red colors

Traces of red hues can be seen already in the work of the first cave artists. The oldest red pigment is probably red ochre. Like other earthy hues, this color was relatively easy to find. However, red ochre is far from the deep red hues of today. The Renaissance had already brought vibrant reds to Europe from China. Other organic crimson pigments, originating in Spain, were made from small insects. However, these early colors were not very lightfast and over time the original hues were degraded by exposure to light. This was the case until the early 19th century, when synthetic versions of red pigments were developed. Today, the range of red colors available ranges from bright shades of yellow, red to deep crimson reds. The colors also vary in tonal values. The range is therefore large, and in the description, we will again focus more specifically on representatives of frequently used hues, which include mainly cadmium reds and carmines.

Looking at the position of the reds in the color wheel, the cadmium red light has an orange hue as it contains a proportion of yellow. In contrast, cadmium red dark lies closer to the warmer red part of the wheel. The medium red is somewhere in between in terms of temperature. These differences in temperature and hue are essential for mixing, and the different color and temperature tendencies of the individual reds will logically show up in mixtures with other colors.

Cadmium reds are therefore different in temperature compared to each other and each of the hues is suitable for something different. In general, however, all three cadmium reds can be classified as warm colors. It is therefore advisable to have a representative of the cool reds as a counterpart on the palette. One of my favorites is alizarin crimson.

Red hues



Red colors in the color wheel

CADMIUM RED LIGHT

A very rich, lightfast, and opaque color that contains some yellow. Light cadmium has a warm, deep orange tint and is suitable for skin tone mixtures. Adding yellow gives, you a very rich orange that creates literally fiery hues in your palette. In general, lighter cadmiums have a strong coloring ability and still retain their saturation to some degree with the addition of white. Cadmium light is part of Zorn's palette and when muted with a complementary color, creates the base hues for pinkish flesh tones.

CADMIUM RED MEDIUM

Like all cadmiums, medium reds have good light fastness and strong opacity. It is slightly darker than light cadmium and its hue and temperature lie somewhere between light and dark red. On the traditional color wheel, this red is considered the 'true red'. It is essentially a modern and richer replacement for the classic vermilion used in earlier times.

CADMIUM RED DEEP

As the name implies, this red has the deepest warm hue and darkest value of the cadmiums listed. The color has excellent coverage and I personally use the most due to its warm hue. Since I use warm light most often for my models, I usually reach for this red to warm up other blends.

ALIZARIN CRIMSON

Is relatively dark and very transparent, and therefore suitable for glazing. Its rich hue is most apparent in the more subtle layers. It has a distinct bluish tint, which logically shows up in mixtures with other colors. This cool red is almost never absent on my own color palette.

HOW TO DARKEN RED?

If you want to darken the red, again, you need to ask yourself before you start mixing if your goal is to darken the red without losing saturation. Or if, on the other hand, you want to change the saturation during the darkening process and possibly move the color to another part of the color wheel. In the picture above you can see an example of darkening cadmium medium with burnt umber A and ivory black B. Burnt umber lies in the red part of the spectrum in the color wheel. However, it has a very dark value and can therefore be described as essentially a dark red color. So, if you want to darken the red and not lose saturation significantly, burnt umber is a good choice. If you use black, the resulting color will be slightly muddier and cooler. As you already know, ivory black has a very cool bluish hue and if you add it to another color, it will cause a loss of saturation and shift the resulting mixture to a cooler shade. So again, it cannot be said that one color or another is best for darkening. An impressionist painter, for example, may desire deep red hues, and in the case of darkening and preserving color, burnt umber will be more suitable for him. A realist, on the other hand, may need to darken the red and cool it at the same time – so in his case, black will be more appropriate.

HOW TO LIGHTEN RED?

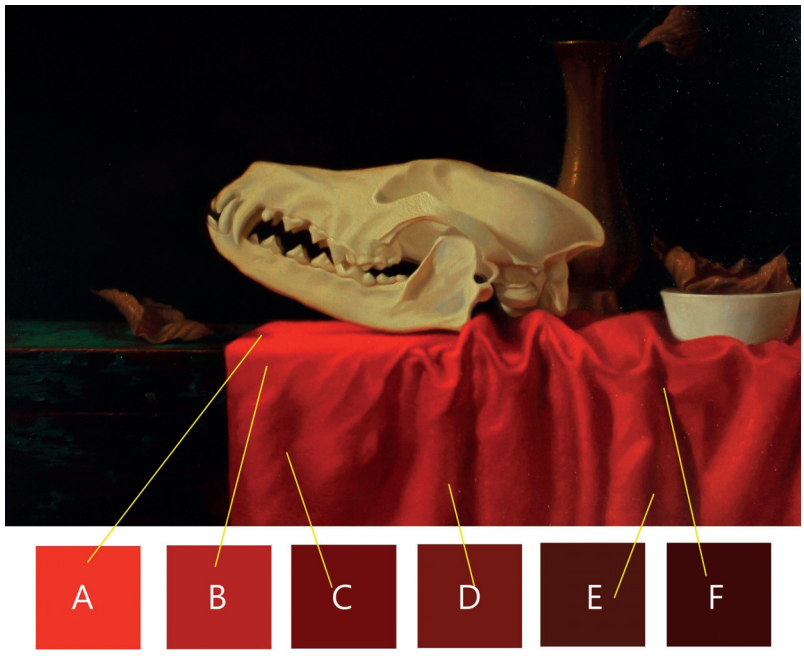
From the picture you can see that the addition of pure white A will of course lighten the color, but the original red color will turn pink with a cooler hue. So, if you're trying to get a cooler pinker hue, lightening with whites is the way to go. However, if you want to keep the original red hue during the lightening process, you must use another color from the appropriate part of the color spectrum. From the color wheel, we can see that in the lighter part, the red hues are adjacent to the yellow. Therefore, adding yellow, as you can see in column **B**, along with white, will lighten it while maintaining the original saturation to some extent.

Since repetition is the mother of wisdom, I will remind you again of the thought process that goes on in my mind every time I mix colors. The commonly held notion that an artist, intoxicated by a few bottles of wine or some other kind of opiate, will create their work in a geyser of emergent creativity is a lovely one indeed. On the contrary, you must be at full attention and process all the theoretical knowledge you have while mixing.

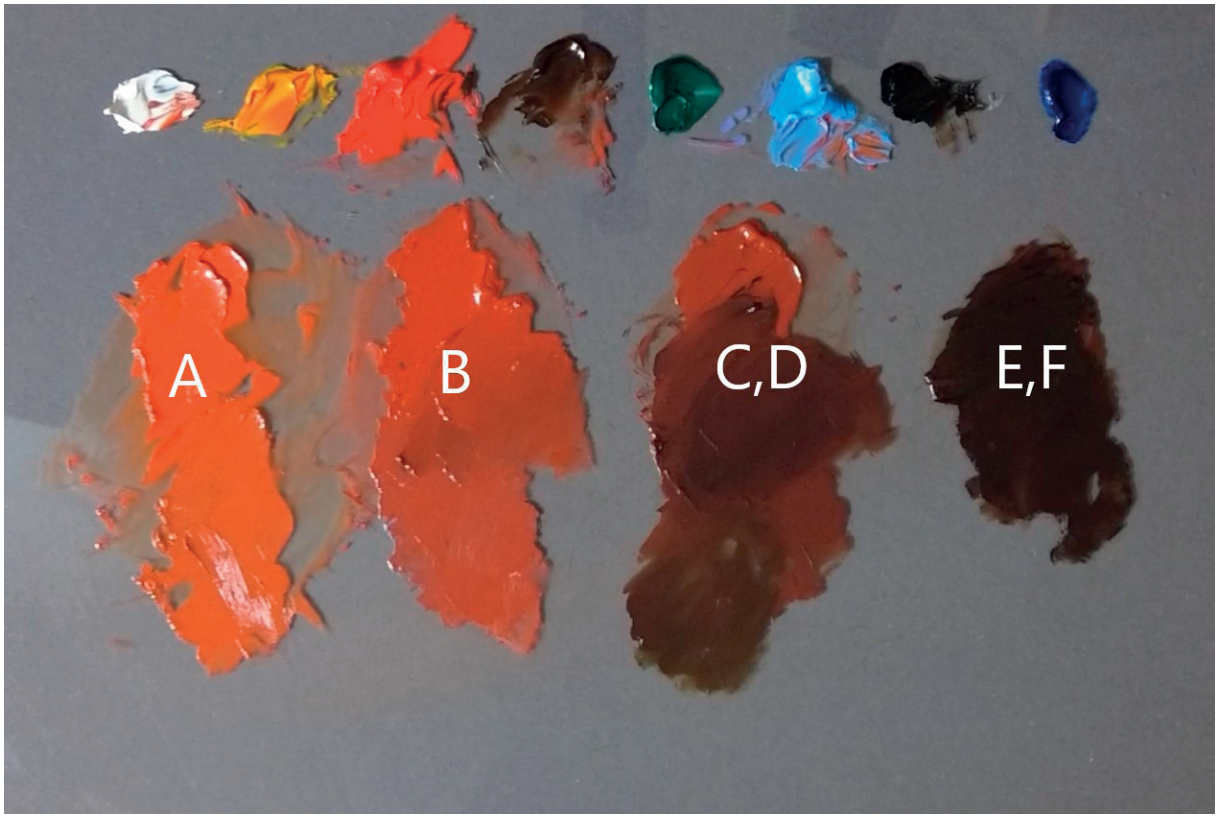
Darkening of the red color

Red color lightening

So, I always start with light and ask myself what color and temperature the light is. The primary light source for the red drapery in the picture is the sun surrounded by a blue sky, which has a warm yellow-orange tint due to its natural character. Direct light falling on the drapery affects the appearance of the local color and the directly illuminated part must logically also have a warm tinge. I used cadmium red medium as the starting color for mixing the hues in point **A**. The color is quite light and does not have enough temperature. So first I added burnt umber to the red. This not only warmed up the red, but also slightly reduced the saturation and value. This leaves room for further possible increases in saturation in other layers that may or may not be applied. I then add cadmium yellow medium and lighten the red, shifting its hue to the more orange part of the spectrum. This brings us back to

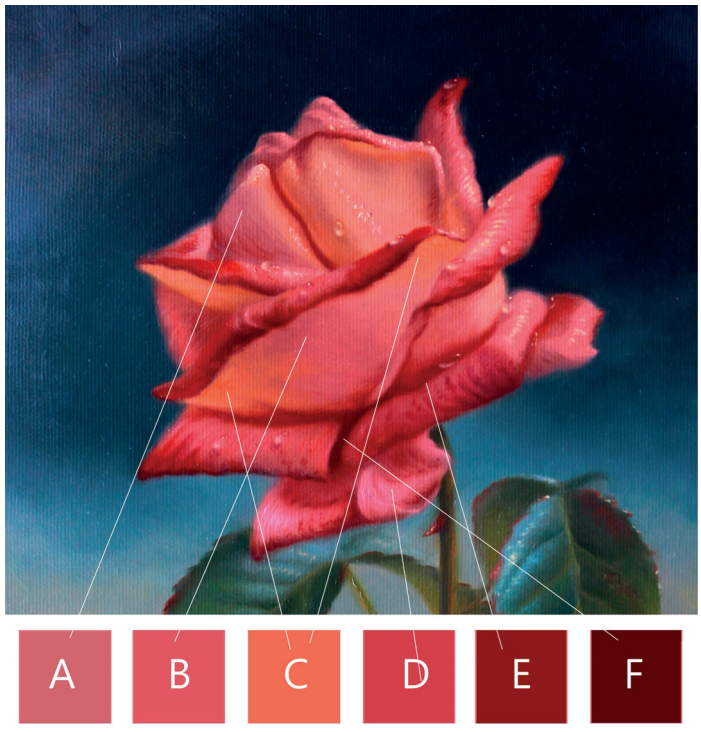


Red drapery



the beginning to one of the rules that the light color plus the local color correspond to what needs to be mixed. At point **B**, the situation changes somewhat. Here the plane of the drapery is already shifted away from the main light source. The area in the halftone tends to be cooler than the shadow or light in classical painting because the planes in the halftone are cooled down by the secondary light source. And while it is not always apparent in a live model or photograph, it is always good to keep this variation of warm and cool colors in mind. When I speak of cool color or hue, we know from previous chapters that it is a relative judgment to local color. Indeed, in isolation, a "cool" hue may appear to be warm. If you're just lost in the explanation, I recommend going back to Section 2.4, where everything is explained in detail. Anyway, at point **B** the hue is cooler and darker than at point **A**. This can be achieved by adding more burnt umber and the addition of blue, which cools the mixture down. Here it is suggested to reach for ultramarine blue, but this is very dark and would also darken the value of the resulting mixture, which is not needed at this point. It is therefore better to add a lighter blue, which will cool the mixture but leave the value unchanged. Although halftones are generally cooler, it is good to have variations in temperature to break up the monotone appearance of the drapery. The areas of fabric in shade **C**, **D**, **E** and **F** are again mixed from red, umber, and blue. Shades **C** and **D** are essentially identical. The drapery is not translucent, and no light is present in the tightest folds of the fabric. Therefore, the deepest shadows are less saturated and very dark. This can be achieved by the addition of a complementary color to the red, which removes saturation more than umber. In the darkest parts, black can also be used to darken the color.

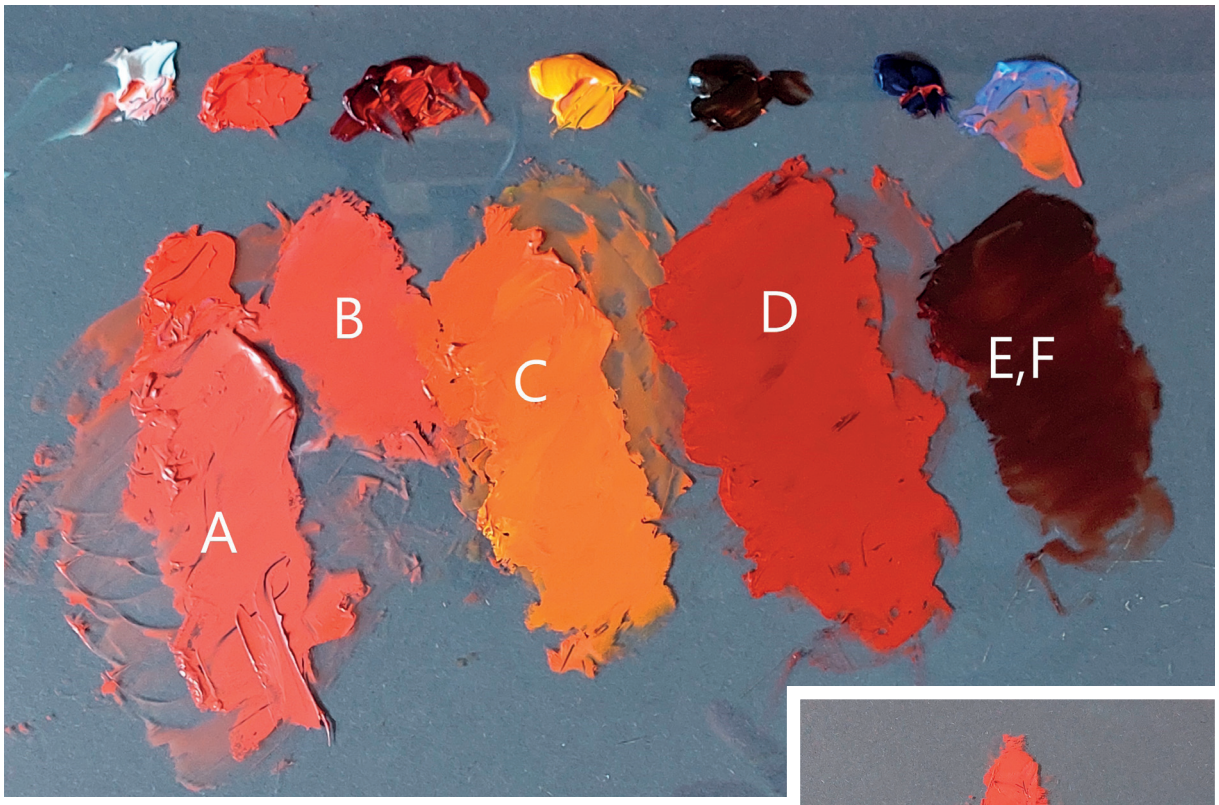
In the next picture the situation is different. Although the rules given for the painting of the red drapery also apply here, you may notice that this time the local colors are variations of cool pink hues **A**. Not only does the actual local color of the rose have a cool pink tint, but at the same time all the colors are mixed to achieve an overall color harmony within the cool palette of the whole painting. This also applies to the main light source. The subject is surrounded by blue hues and so the primary lighting has a much cooler feel this time than in the previous case. Unlike the usual system (warm light, cool halftone, warm shadow) you can follow the rule during mixing: cool light warm shadow.



Pink Rose

As always, I start by mixing the local color of the painted subject. The rose itself is a cool pink hue of A. Its temperature is enhanced by the cool light, which in this case is basically coming from all sides. I mix the color from cadmium red deep, which is however too chromatic and warm for the purpose. By adding white, I lighten the value while cooling down the original red hue. So, the color has a suitable value but is still too warm. Adding light blue cools the resulting mixture A even further and gives the desired local color. Again, it is preferable to use light blue here rather than ultramarine, which would cool the mixture but make it too dark. Color **B** is mixed in much the same way as hue **A**. It is slightly darker and warmer, which can be controlled by the addition of red, umber or alizarin. For hue **C** there is little change. The rose petals are transparent and let in a certain amount of light. This is especially true for areas that are tilted perpendicular to the light source. Light penetrating through the petals causes an increase in color saturation and temperature. The hue is therefore warmer in this area compared to other colors. Color **C** can therefore be mixed from the original local hue, which is warmed up by cadmium red, and especially by cadmium yellow medium, which shifts the resulting mixture towards the richer yellow-orange part of the color spectrum.

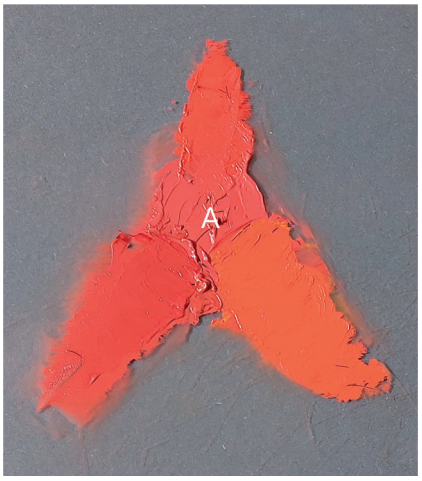
Here I would still pause on the actual mixing procedure. As you can see, shade **C** was essentially mixed from the previous hues of local colors **A** and **B**, rather than from the base colors on the palette. I pretty much always use this procedure. Of course, all the hues you need can be mixed from the default colors available. However, this is sometimes an



Mixing of cool reds

unnecessarily lengthy process, and you are then essentially forced to repeat procedures already done. Basically, the idea is that if I mix any local color, I can still build on it and modify it as needed. So, in this case, I can re-warm the cool pink by adding red or yellow. I can make it a little darker by adding umber or alizarin, cool it down with blue, etc. However, if you need a much darker hue than a local color or a halftone, it's better to start mixing again from the base colors on the palette. hues **D**, **E**, **F** are again made up of a mixture of red, umber, alizarin and blue.

Once again and for the last time, I will return to the role of the value, who directs the entire color orchestra in each painting. Although color is obviously a key



Color modifications of the local color

element, it is second only to the value in terms of importance. If your tonal values are well laid out and the areas of the painting are all dark or light as they should be, minor errors in color will not be as distracting as a dysfunctional value composition. After all, this fact is reflected in the way painting is taught in art schools, where in the early years, before proceeding to the teaching of color theory, students are taught how to shade and set values correctly.

Video – Mixing warm reds

Video – Mixing of cool reds

Pink Rose

5.5 Umbers

Umbers are other classic pigments that have accompanied mankind since ancient times. These natural pigments of earthy hues have been used in the history of art since prehistoric times. The very name of the pigment "umbra" comes from the Italian word terra d'ombra. Translated, it means "land of Umbria", the region located in Italy where the pigment was first mined. It is sometimes stated that the name is derived from the Latin word 'umbra', which translates as 'shadow'.

Before the creation of modern color theory where the color for the shadow is a mixture of the local color in a darker version, blue and a complementary color to the local color – umbers were the basic hue for painting shadows. Translucent underpaintings, made up of a mixture of ochre, black or umber, were visible through the layers of color to form the base hue for the shadow areas. These effects can be seen in many classical paintings, and visible umber was used by Caravaggio, for example.

Under the name umbra one cannot imagine one particular color. These are pigments that can have different colorations. From yellow hues to dark red to greyish colors. The actual color of the pigments depends on the amount of iron oxide and manganese in the clay.

BURNT UMBER

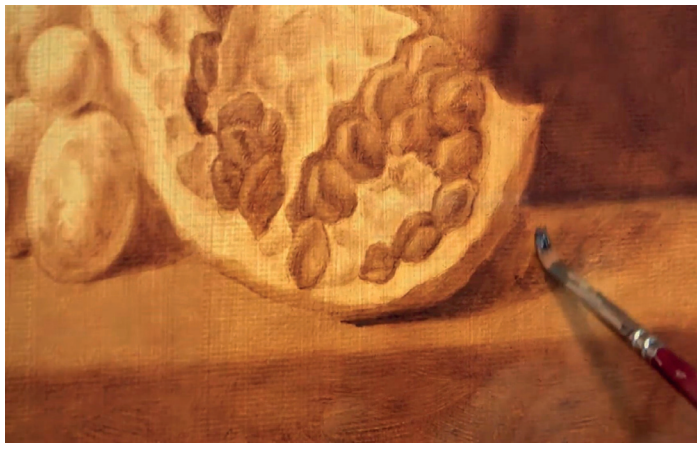
Medium translucent and lightfast color with a dark reddish tint. This is a fast-drying paint, adding it to a mixture with another paint speeds up drying. It is essentially a dark red, however some artists consider it a darker version of yellow. Compared to raw umber, however, it lies closer to the red part of the color wheel. Because it dries very quickly, it is often used in underpaintings and preparatory layers. Umber can be used directly from the tube as an imprimatura color, i.e., a base color layer. It is also suitable for painting warm dark shadows.

RAW UMBER

This color has almost greenish hue compared to burnt umber. Raw umber is transparent and when mixed with white produces warm grey hues. In thin layers it has a neutral greyish tint and was very often used as a color for imprimatura. For example, traces of raw umber can be found in the paintings of Johannes Vermeer. Modern painters, whose style was based on rich colors, did not use hues of umber much.

Umbers

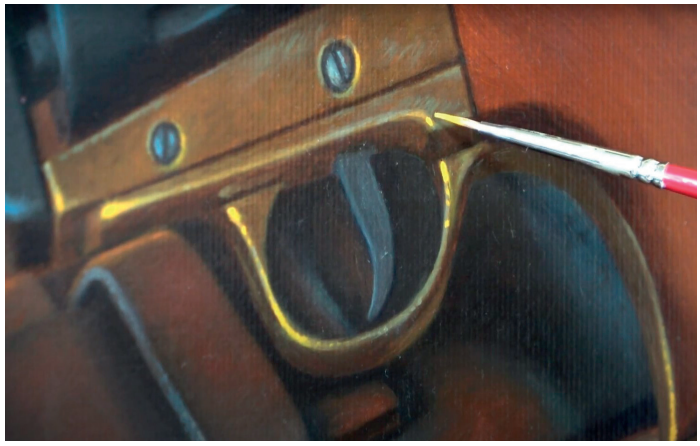
Underpainting with burnt umber



Underpainting with burnt umber

Since umber is quick drying, it is often used to create underpaintings. Applying a thin layer of umber is called glazing. The underpainting made in this way serves as a guide for further work on the painting, and its warm red hue can at the same time be visible through thoughtfully in various places or directly represent local color or shadow, as seen in the classical paintings of the Old Masters.

As umbers have a very dark value, this color is offered as a basic hue for painting shadows. If you mix burnt umber **B** with ultramarine blue **A**, which is on the opposite side of the color wheel, you get a very dark hue with the temperature of the predominant color in the mixture. This color can serve as a substitute for black. Although it is dark enough, it has a certain color and temperature which enriches the appearance of its hue. The advantage is that by controlling the amount of umber or blue, you can adjust the temperature of the resulting mixture as needed. Therefore, whenever you want to use black for painting, remember the possibility of mixing these complementary colors as a substitute for pure black.



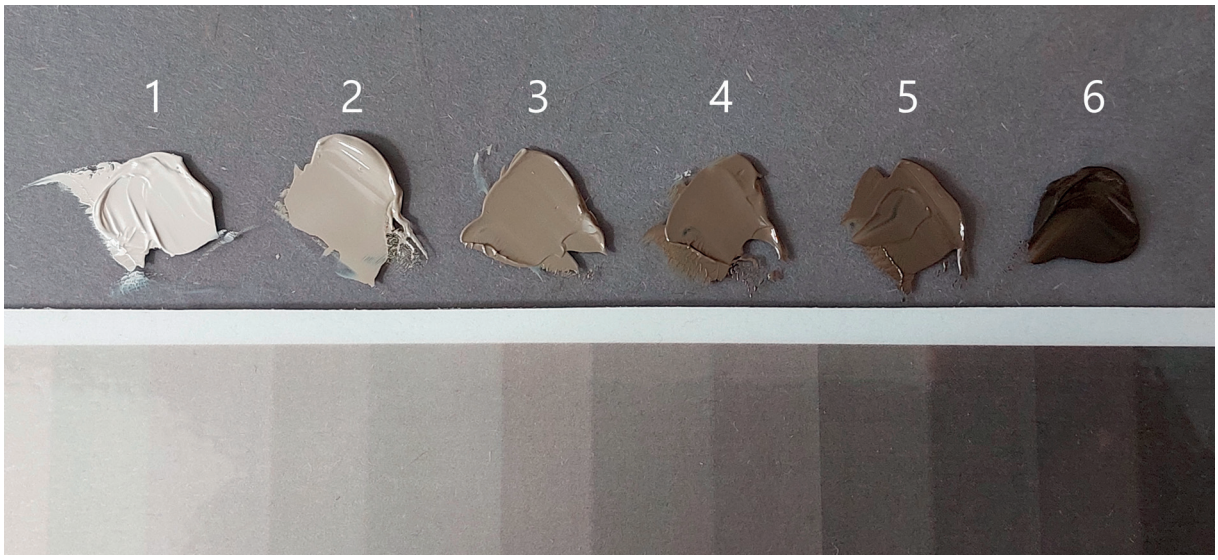
Light reflections

Black color

Burnt umber is a suitable color for reducing the chroma of other colors. The reduction in saturation is not as intensive as when using grey or complementary colors. For example, if you add raw umber to cadmium yellow deep, the saturation of the yellow is reduced, but the original hue, and especially the temperature of the resulting mixture, is maintained. When painting and mixing colors for light reflections from warm light sources, it is therefore advisable to reduce the saturation only with umber.

For the creation of a monochromatic underpainting, raw umber is more suitable. Monochromatic underpainting has several functions. This grey underpainting forms a preparatory layer for the subsequent application of color layers and glazes. For more detailed information about underpainting, see my previous book, *Realistic Oil Painting*.

Generally, the grey underpainting is mixed from several different colors. This is so that the required temperature and hue of the resulting grey can be adjusted and controlled by adding more or less warm or cool paint. But I have good news for you there is also a much easier procedure for mixing grays for gray underpainting. Just with raw umber and white you create shades of grey that are suitable as a universal underpainting for almost all



Raw umber grayscale

subjects. Mixing such hues is very easy and anyone can do it. By adding white, you control the value of raw umber and create a range of greys that cover the entire available value scale. The lightest hue should be darker than white, and conversely the darkest hue should be lighter than black.

Raw umber was and still is used as the color for the first base color layer, which is known as imprimatura. If you apply a more heavily diluted umber to a white canvas, the white color of the canvas lightens up the umber application visually. This creates a warm grey hue that is easy to paint on. In the picture of the child's portrait in progress, you can see the painting on the imprimatura created using only pure raw umber.

Sometimes a monochrome painting in pure umber or grey is so perfectly executed that it can be considered a finished work and does not need to be repainted. Such a painting is more expressive and sometimes even more interesting than a colored work. Examples of paintings that are essentially underpaintings, made mainly with burnt umber, can be seen in the following pictures.

Sometimes there may be a combination of several processes and the use of colors. For example, an imprimatura may be made using only burnt umber, on which a monochromatic painting is then created using the greys of raw umber. There are no limits to the imagination and each artist learns over time to master all the expressive means of color available to him. The use of pure umber as a base layer is mainly done when you want to use the lightening technique. This technique is based on laying down values from darkest to lightest.

Underpainting with raw and burnt umber

Portrait in progress

The Crow

Detail of the painting Death

HOW TO LIGHTEN UMBER WITHOUT LOSING SATURATION

If you are using umbers for prep bases and first color layers, working with these colors is a bit different in terms of dilution and lightening. Both umbers are transparent and suitable for thin glaze paint layers. Of course, they are worked with like any other paint when mixing, but for the purpose of first underpaintings, it is necessary to thin the colors to a translucent liquid state rather than lighten them with white. See what happens to the paint if I use these two different methods to thin or mix. Adding white to color **A** lightens the color, of course, but the color loses saturation and turns to a creamy warm gray. Just like when you pour milk into dark coffee. However, if I dilute the color with medium **B**, the saturation is retained, and the lightening of the umber is due to the optical mixing of the base color of the surface and the umber paint. Simply put, the color is lightened and retains saturation. This method of application is more akin to watercolor than oil painting, however, this is the principle on which glazing techniques are based.

Video – Glazing

Lightening of umber

5.6 Blue colors

Blue is one of the primary colors of both RYB and RGB color models. As with other rich hues, deep blue was a very rare pigment in the early days of oil painting. In Renaissance times blue colors were used selectively, for example for painting the Mary's clothing. The rarity of this pigment was also reflected in the price, and high chroma blue was literally worth its weight in gold.

One of the most famous blues in painting is certainly Ultramarine, sometimes referred to as " true blue", It was originally created from the precious gemstone Lapis lazuli, which was and still is mined in Afghanistan. This is where the name ultramarine comes from, which almost literally means "beyond the sea". One legend has it that Michelangelo left his painting The Entombment unfinished because he could not find the funds to buy ultramarine.

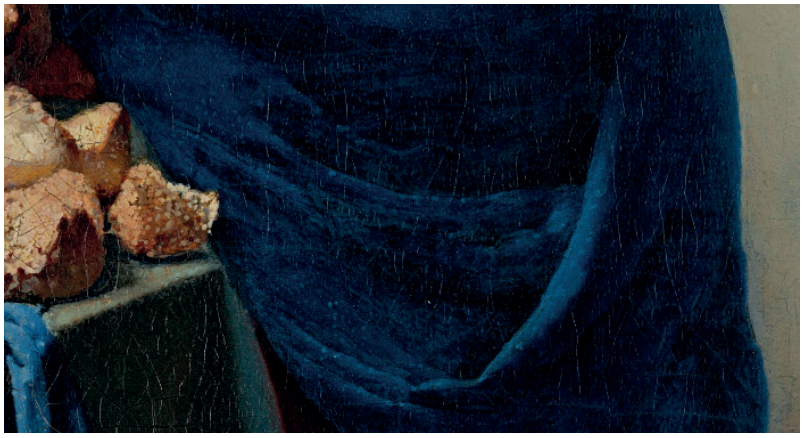
The famous Baroque master Johannes Vermeer often used the pigment and traces of Ultramarine can be found in almost all his paintings. In any case, due to its price and rarity, most painters of the time used blue in thin glazes more than in the form of classical pastes. In the 19th century, synthetic blue dyes and pigments finally gradually replaced organic dyes and mineral pigments.

In a survey of all the blues available at the present time, we are, of course, back to a list of a plethora of blue hues that Renaissance or Baroque painters could only dream of. Depending on the color spectrum, blue can have a warmer hue containing red, or a pure blue hue of sky-blue color.

Michelangelo – The Entombment, *The National Gallery, London*

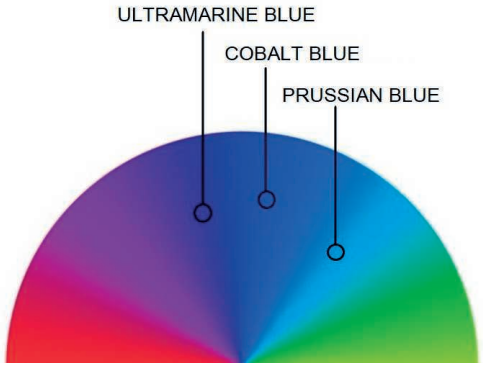
Due to today's range available, we will again limit the description to the blue ones that I personally use the most and explain how and why. Among these hues are of course ultramarine blue, then cobalt blue and we will be interested in Prussian blue, although it is mostly absent from my palette. Other blues that I almost always have on my palette are King's Blue and light blue, which I usually prepare myself from other colors.

Raw Lapis lazuli



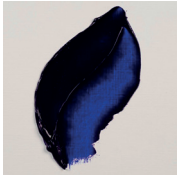
Johannes. Vermeer – Milkmaid, *Rijksmuseum*

If we look at the individual blues, we see that ultramarine blue lies in a wheel closer to the red spectrum. It therefore contains a proportion of red, making it the warmest blue of the others listed. Prussian blue, on the other hand, is closer to the green part of the spectrum and thus has a chromatic cool greenish hue. Cobalt blue is somewhere in between.



Blue's position in the wheel

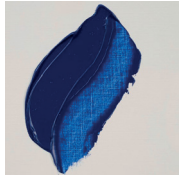
Just for clarification, the placement of the blues and other colors in this book in the color wheel in the pictures is for illustrative purposes only. Each of the colors not only has a different hue, but also a value. As we already know, blues reach their highest saturation in the darker values, so all the saturated hues produced are very dark. However, the value is not reflected on the basic two-dimensional color wheel. If you are still confused about any of this, refer to the previous chapters where the principle of the Munsell Atlas is explained. Thus, the aim of the figures is not to locate the exact hues in a given color space, but only to show what the differences between the colors are. It is important to know the individual color tendencies of the different colors. This is the only way to be successful in mixing colors.



ULTRAMARINE BLUE

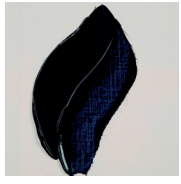
The most famous representative of blue colors. It is a lightfast transparent color that has a high coloring ability. Its deep hue is most evident in transparent glazes or with the addition of white. The synthetic version of ultramarine is slightly chromatic than the original mineral pigment. The paint dries for quite a long time, so it is not so suitable for the preparation of basic underpaintings. Some painters, including myself, use this paint as a primary blue. However, due to the warmer color tendency already mentioned, mixtures with this blue, especially the green ones, are not as saturated as when using cobalt or Prussian blue.

Blue colors



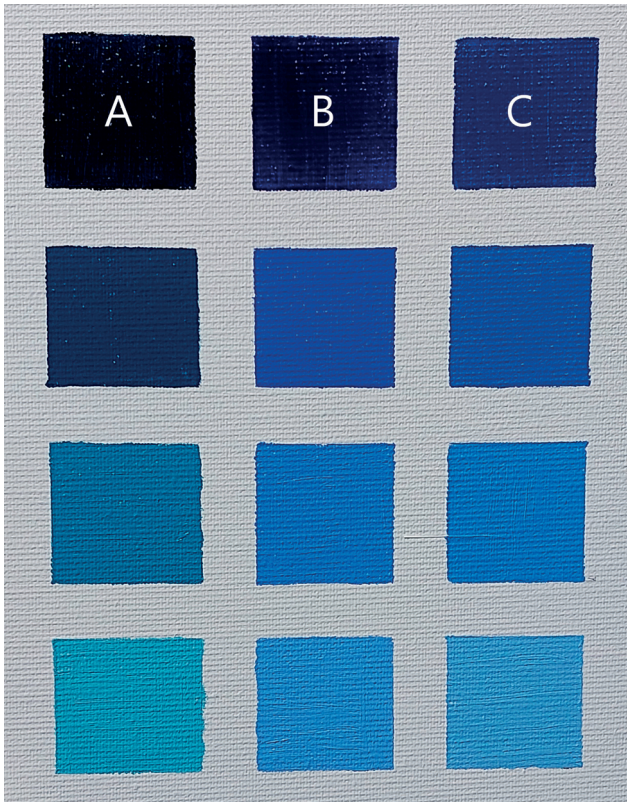
COBALT BLUE

A representative of the "true blue" was first produced in 1804. Cobalt paints are somewhat more expensive, but their unique properties and unique hue, which cannot be mixed from other paints, make them worth having on your palette – especially if you focus on landscape painting. The paint is medium opacity and has good lightfastness. Compared to Ultramarine and Prussian Blue, Cobalt Blue is the lightest and when mixed with other colors produces more muted hues than Prussian Blue. If you want to paint a clear blue sky, this is the right color for you.

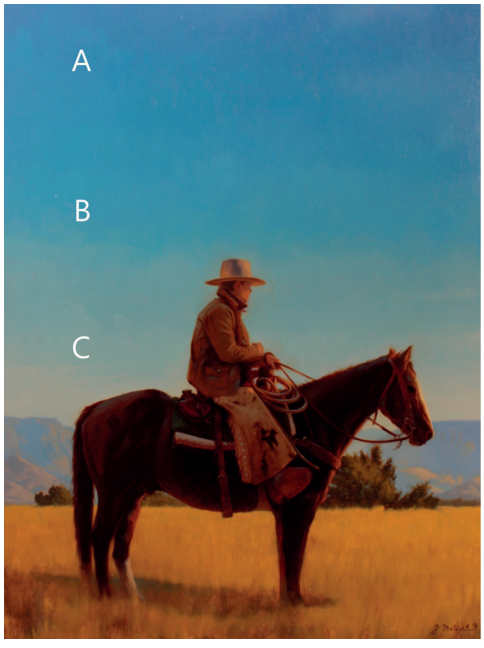


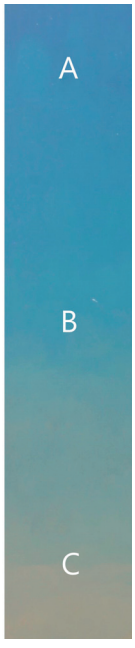
PRUSSIAN BLUE

A beautiful cool blue, which is very dark almost black in pasty layers. Its color intensity is either in thin layers or mixed with light colors. The color is fast drying and accelerates the drying of other colors present in the mixture. For this reason, it is sometimes added to additional underpaintings such as imprimatura and grisaille. Due to its high chroma and staining power, Prussian blue should be handled with care. In mixtures with yellow, especially medium and lemon, it produces saturated green hues. Again, a useful color for any landscaper.



Blue colors comparison





Ben

When comparing the blues with the addition of white – **A** Prussian, **B** Ultramarine, **C** Cobalt – you can better see the differences in hues described above. All 3 colors have a high coloring strength (Prussian blue the most) and the blue retains its saturation even in lighter values. Prussian blue has a cool, slightly greenish tint. Cobalt and ultramarine have a purer hue with a warmer tinge.

Let us now return to the practical example of using blue paints for painting and mixing the sky and water surface. But first, let's get a little philosophical! The fact that the sky is blue most of the time is due to the decomposition of light and the filtering out of certain wavelengths. Blue is essentially an illusion due to our way of perceiving it, and one of the best examples is the color of water. Try asking someone what color water is. Most people, of course, will say blue. After all, children in kindergarten automatically reach for a blue crayon when they are asked to draw water or the sky. The blue color of water is simply a dogma that should be taken with a grain of salt. Let's look at some practical examples.

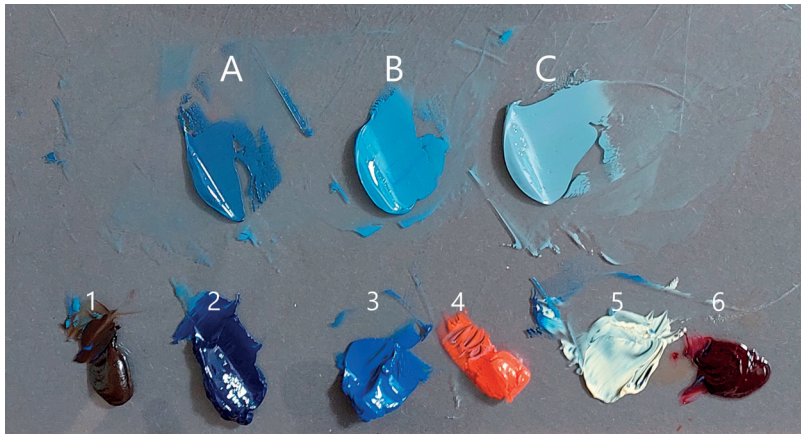
The sky is of course blue on a clear sunny day. However, it does have a certain value and temperature gradation. What I mean by that is that the sky on the horizon has a different value and temperature than the space directly above the observer. The appearance and color of the sky also changes depending on the direction of the light. If you are looking toward the sun, the sky is obviously a different color than if you are looking in the opposite direction. However, let's not complicate the situation now and focus on the basic general model shown in the painting of the sky. Here you can see that the upper part of **A** contains the deepest blue, approaching a hue of ultramarine. The middle part of the sky, **B**, has a clearer cobalt tint. The sky near horizon **C** generally has a lighter value, and the blue shifts towards the warmer part of the color spectrum.

Why is that? These changes are influenced by observer distance and atmospheric perspective rules. Note that the horizon in the next image is farther away from the observer than the sky directly above. Because more atmosphere lies between the observer and the observed location when looking further away, shorter wavelengths are filtered out. This then results in a change in color and temperature according to the previous gradation example. In the atmospheric perspective picture, the horizon is warmed even more by the rising sun, which lies beyond the horizon.

The example shows a detail of a sky that has been painted according to the rules mentioned above. The sun illuminates the scene from the left side and is not part of the composition. The individual layers, indexed **A**, **B** and **C**, are deliberately not blended for clarity, and the boundaries of the individual shades can be seen.

Atmospheric perspective

Landscape above Osek – sky detail



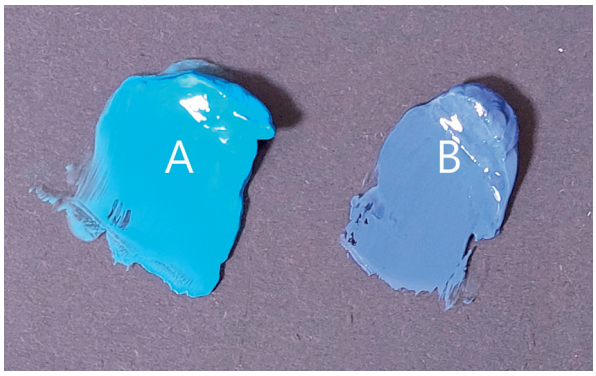
Mixing blue shades

I used the following hues to mix the sky colors: 1. burnt umber, 2. ultramarine, 3. cobalt blue, 4. Cadmium red light, 5. Naples yellow and 6. alizarin

As usual, I'm starting to mix so I'll prepare the local color first. In this case, it's basically hue **B**. This base color is mixed from cobalt blue and Naples yellow. I deliberately didn't use pure white for the lightening to maintain a certain temperature in the final mixture.

However, the resulting hue is too chromatic, so I add a small amount of burnt umber to the blue. The umber is placed on the opposite side of the color wheel from the cobalt blue, and therefore takes away the saturation of the blue exactly according to the rules of complementary colors. From hue **B**, it is easy to get a hue for the warmer and deeper sky color at the zenith at point **A**. The addition of ultramarine blue will darken the hue while shifting the blue slightly towards the warmer part of the spectrum. The addition of alizarin can deepen the **A** hue even further. For the part of the sky on the horizon at point **C**, I again used a B mixture, which I lightened with Naples yellow. The addition of cadmium red can warm up the mixture slightly if needed.

All three blues described should be sufficient in saturation to cover your requirements. By adding other colors, you can mix other hues of blue. However, all the blues shown are quite dark and if you need to, you will need to lighten them with white or Naples yellow, as in the previous example. If you don't do this and add ultramarine, for example, to the flesh color, you will lose the saturation you get from adding the blue, but you will also darken the value, which is not always desirable. Lightening up is an extra step that unnecessarily complicates the mixing process. That's why it's a good idea to have a representative of lighter hues in your palette.



Light blues

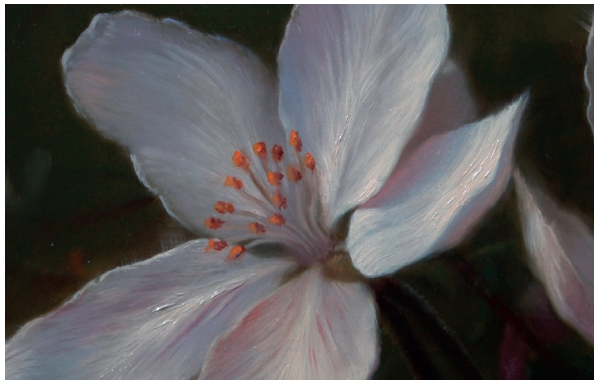
The light blues that I use include King's blue A and a lighter warmer blue, **B**, which I mix in the tube ahead of time. My second blue is made up of a mixture of white and ultramarine purple. The difference between these two colors is apparent from a glance. My own blue is slightly reddish than King's blue. The different temperatures make it logically suited to different things.

In a practical demonstration we will return to the whites. Remember the cooling "white" colors for the area in the halftone? The word white is deliberately placed in quotation marks because we know from that chapter that for realistic work, white always has some color, depending on the light source.

The white pale of Pomegranate **A** is painted basically just with Naples yellow. In places of halftone, you may notice how much of the "white" contains pale blue hues of **B**. Adding King's blue or a lighter warmer blue shifts the warm yellow towards a cooler bluish hue. At the same time, this keeps the light value and makes everything easy to mix from just two colors. Adding cobalt blue would both cool and darken the color, which of course you don't need. You would have to lighten the selected blue again with white first.

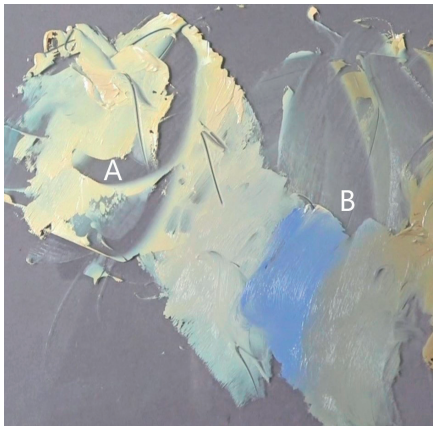
Looking at the detail of the white flower, the same principle as in the pomegranate can be seen. The areas in the penumbra are always cooler and the color contains strong traces of light blues. The hues in the light contain a warm Naples yellow.

Portrait painting is another important area of art where shades of light blues are used. Blues and cool greens are used to reduce the intensity of flesh tones. Light blues are suitable for the illuminated parts of human skin. The reason is the same pure ultramarine is too dark color. On some parts of the body, the skin tends to be quite reflective and therefore reflects the light source. If the figure is under a blue sky, you need blue hues to complement the skin color and to paint light reflections. You can see these rules in practice using the human ear as an example. Flesh colors can take on many different hues: from yellow ochre colors to reddish hues, from chromatic colors to low chromatic hues. There is no universal flesh color. In any case, without cool bluish and green hues, human skin does not look natural.

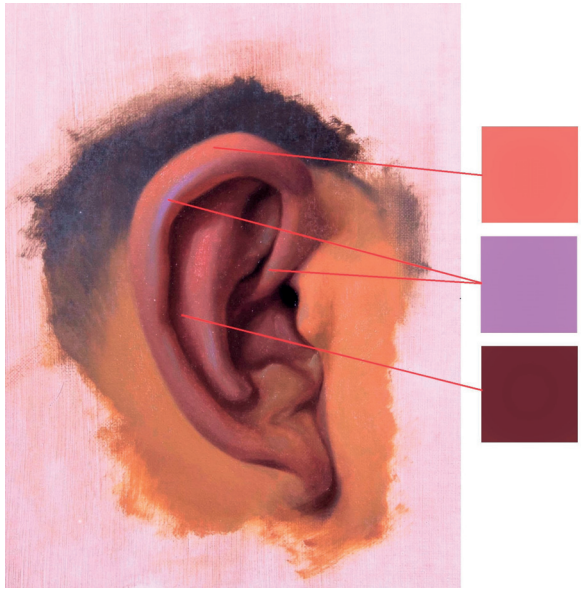


Spring – *detail*

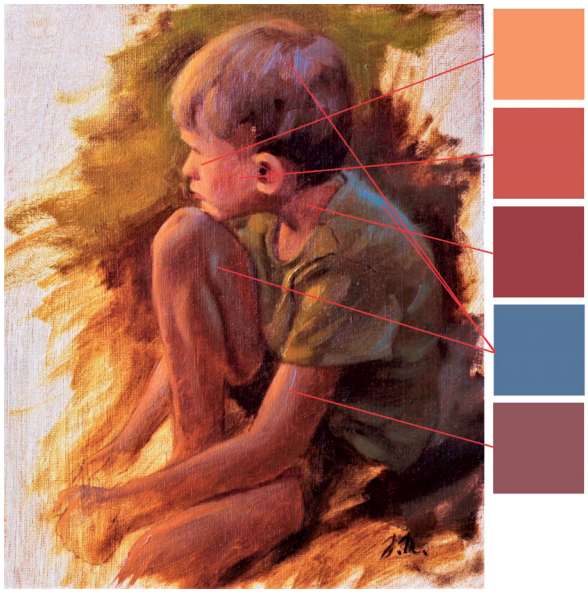
Detail of pomegranate



White colors



Study of my own ear



Sunset

Thanks to the classic color model, you can see the temperature changes already described. It is related to light, its color and temperature. In the light and in the shadow, there is a relatively warm color. In the halftone and, in this case, the light reflections, there is a cool color made up of a mixture of local flesh tone and light blue.

The same principles are applied to the portrait of the boy. The warm light of the setting sun warms up the local flesh colors on the illuminated parts of the model. From the other side, the cool light from the blue sky falls on the model. So again, the alternation of warm and cool colors is involved, which is the basis of the principles of realism.

Mixing the cooler colors for this portrait was basically easy. I mixed local colors in the highlights and shadows and then modified these with cooler hues of blue where needed. There is a clear trace of cobalt blue on the shoulder as it faces up towards the blue sky. It follows from the above, then, that light is the source of the color harmony in any painting.

Flesh tones with blue

The local flesh colors for the illuminated parts of the model you see in the picture can range from light ochers to redder hues. Basically, the color doesn't matter, and the correct value is more important than the color. However, it's always good to consider the temperature changes shown, which take place on the model due to the light, but which are often (for example in a photo) not so noticeable. Adding light blue cools the original flesh tones reduces saturation without changing the original values.

Video – Mixing blues

Examples of different colored skies

TIP

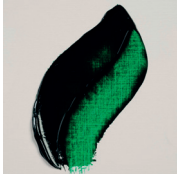
For the sake of interest, we will return to the "blue" sky in the examples. Now that we know what is behind the color of the sky and the color of the water, we must abandon this dogma. Under different light conditions, the color changes as light decays in the atmosphere, depending on how far the light travels through the air and water molecules. The color of the sky may take on yellow-red hues at sunrise or sunset, yellowish hues on a cool morning, or pinkish hues at a romantic sunset, etc. If you want to go even further, you can adjust the color of the sky to the intended color harmony. Water, of course, has a color according to the color of the sky it reflects. So, forget about the sky and water being blue! You can basically use whatever color you want.

5.7 Green colors

Green is all around us and it is, of course, together with blue, the most common and widespread color in nature and in the world. It is the color we associate with money, the nature, and aliens. Green is the color of life, prosperity, and rebirth. As one Spanish poet said, "Green is the main color of the world, from which its beauty springs. "The human eye is most sensitive to hues of green, and this is surely no accident. Green is not a basic pigment color, as it can be mixed from blue and yellow.

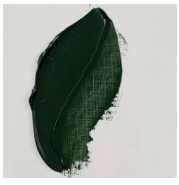
We probably can't imagine it today, but as with other chromatic colors, people have been searching for a truly green and durable pigment for centuries. Despite the wide variety of this color in nature, the green plant dye quickly turned brown and could not be used without significant restriction.

Green pigments have been used since ancient times, both in the form of natural minerals and malachite, used mainly by the Egyptians. Malachite, however, tended to turn black and was also quite expensive. The Romans later introduced so-called verdigris, which gave rise to one of the first artificial pigments. Pigments made of verdigris reached art easels sometime in the 15th century. Much later, the original pigments were again replaced by modern colors such as earth green, emerald green and Viridian. The modern artist today has a wide variety of greens to choose from. Let's jump right into introducing the basic green oil paints!



PHTHALO GREEN

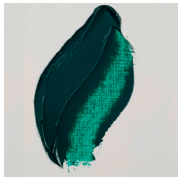
Rich dark green color with a deep hue. It has good lightfastness, high coloring ability and is transparent. Its fresh hue stands out especially in thinner layers. Because it is very chromatic, it can be used as a starting green for other hues. By adding blues or yellows, its hue can easily be adjusted towards a warmer or cooler hue. It is therefore a versatile green that can replace other greens. However, its disadvantage may be its poor covering strength.



GREEN EARTH

Dark value green with earthy hue. It is a medium transparent color that has lower saturation with a warm tinge. In various modifications, for example with burnt umber and black, it is suitable for painting shadows, green leaves, trees, etc. The color was popular during the Renaissance and was used for the grey-green underpaintings known as Verdaccio. Leonardo da Vinci used it for the underpainting for his masterpiece Mona Lisa.

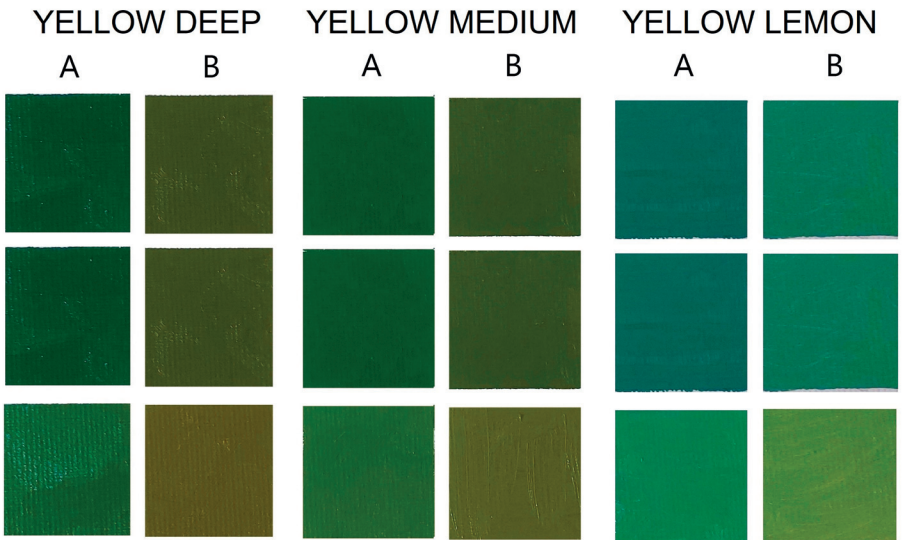
Green colors



VIRIDIAN

Medium transparent fast drying green with a cool bluish tinge. In combination with red hues, it forms interesting blue-grey colors according to the rules of complementary colors. For the record, the name Viridian comes from the Latin viridis, meaning "green, flowering, vigorous". Viridian appeared in the first half of the nineteenth century. The color has excellent lightfastness and as a transparent pigment it is suitable for the glazing technique.

Green pigment



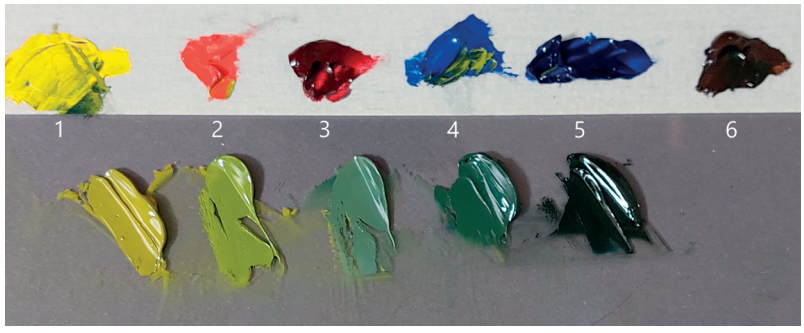
Mixtures of yellow and blues

HOW TO MIX YOUR OWN GREENS

If, like me, you want to mix your own hues of green, of course it's not enough to use just yellow and blue. Green colors can take on different hues, from warm yellow-red greens to cool bluish hues. In the picture you can see how light affects the appearance of green colors. The scene on the left is illuminated by warm sunlight. Thus, the green colors are generally lighter, especially in areas of light. Bright light penetrates through the leaves, and this is reflected by an increase in the saturation of the green and a shift in its hue towards a warmer yellow.

The image on the right side is illuminated only by the diffuse light of the blue sky. You can see that the hues of green are logically much cooler and the green shifts towards the blue part of the color spectrum. This brings us back to the crucial role of the type of lighting, which always determines the overall color harmony in a scene.

So, if you want to mix warm and cool greens, you need to reach for other colors that will shift the initial green to the desired hue. Pictured here are examples of greens mixed from: 1. cadmium yellow medium, 2. cadmium red medium, 3. alizarin, 4. cobalt blue, 5. ultramarine, and 6. burnt umber. We already know how the choice of a particular yellow and blue affects the appearance of green colors. For this demonstration, I have deliberately used cadmium medium and cobalt blue, which are classified as more or less neutral colors due to their temperature. If I wanted to mix a warmer light green, for example, I would use a cadmium yellow deep instead of cadmium medium, etc.



Pre-mixed greens

THE GREEN PROBLEM

Most green hues are chromatic enough to use directly from the tube, especially if your goal is, for example, a realistic landscape painting. The human eye is most sensitive to the yellow-green spectrum, so sometimes green can be too "deafening" in a painting. For an explanation of how to handle green, let's go back to 1855, when the art magazine The Crayon was published in New York, to which many important artists of the time contributed articles. Among them was the great landscape painter Asher Brown Durand, who addressed several articles to

TIP

Although there are many different green hues on the market that vary in opacity and temperature, I personally prefer to mix green colors with yellows and blues. However, if your goal is to make a more expressive work of art and you need a chromatic hue that can't be mixed, you can definitely reach for green straight from the tube. The picture shows green hues mixed from yellow and blue colors. For a more detailed description of the mixing process, please refer to the chapter on yellow colors.

Effect of light on the green colors

his students on the problem of green color. Especially in letter number VI, practical painting advice can be found.

To quote freely: *Nature generally struggles with every saturated color and never admits large unchanging areas of the same color. The foliage of leaves, plants and grasses is constantly changing according to their species, location, and light conditions. If you paint a vast forest or vast plains in one unchanging hue of green, it will be truly repulsive, because nature never does it that way. On the contrary, nature paints with endless variations of green hues. Even trees of the same species vary in hue and break the monotonous coloring of the whole forest. Trees, shrubs, and plants as bearers of green hues are a labyrinth of irregularities of infinite variety of shapes that struggle with a uniform appearance. If you look at a leaf in the sunlight, you will find that the top illuminated side is a cool green, while the underside is a warm green with an overlap into orange. This is due to the passage of light through the leaf, which then warms and shifts to the warm red spectrum. The light thus progresses lower through the leaves, producing increasingly warmer and redder shades to complement the green. The actual shadows of trees are therefore almost always more neutral than those of solids of the same green color.*

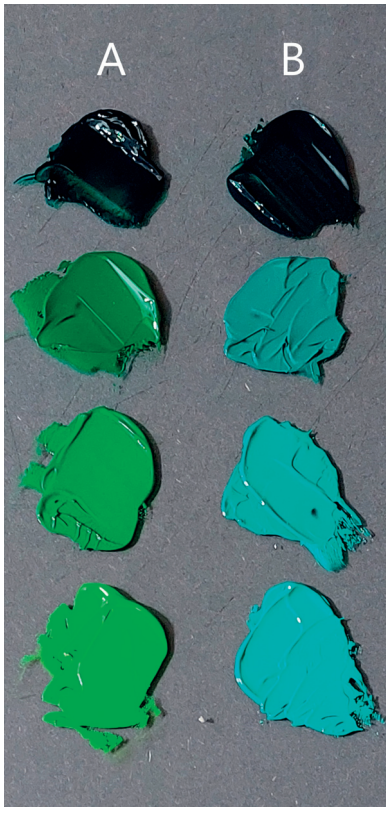
HOW TO DARKEN THE GREEN COLOR?

All three greens I'm listing here are very dark colors. If you need to darken the green even more, you can reach for a complementary color. Ivory black is also good for darkening the green. Adding black will reduce the value without a significant loss of saturation.

HOW TO LIGHTEN THE GREEN COLOR?

The lightening procedure is basically simple. By adding white (**A**) you lighten the green but cool it down at the same time.

Forest by the river *(detail) – Asher Brown Durand*



Lighten the green

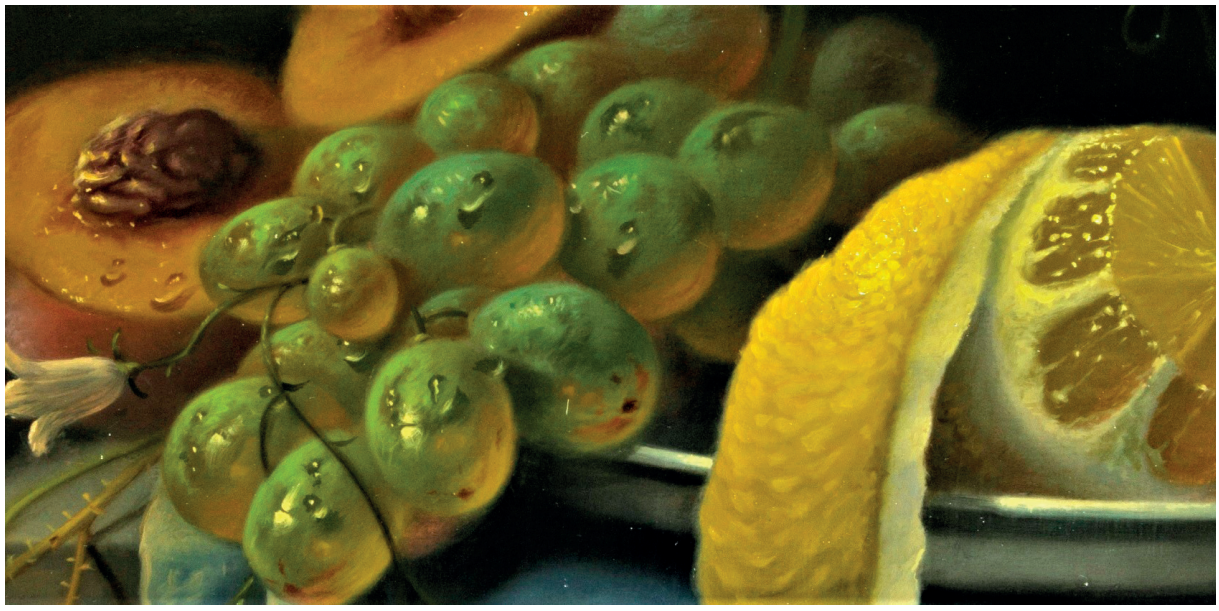
So, if you need to maintain the saturation of the green, you need to use other colors. In the color wheel, the green lies in the lighter part next to the yellow. So, adding yellow (**B**) will lighten the green and give you a saturated hue with a lighter value. More has been said about this in connection with yellow colors.

Green leaves

HOW TO WORK WITH GREEN?

Don't use the green colors from the tube but mix different greens from the blues and yellows. This will give you different temperature variations of the green colors and you will avoid monotonous coloring of the green areas. You can also complement the green areas with red accents or choose a warm reddish underpainting that you let visible through the cool greens.

In the example of the leaves, you can observe all these temperature changes of green colors. Sunlight warms up the hue at point (**A**). The blue sky cools down the green color (**B**) and the hue shifts towards blue. In the shadows (**D, E**) the green becomes warmer again. The translucent reddish underpainting then breaks the monotone appearance of the green.



Grapes

Leaves

Winter walk

5.8 Black colors

Our talk about specific colors began with a description of whites. Therefore, we will conclude our explanation at " the other side" and talk about black hues. Black was one of the first colors used in art. Prehistoric artists used a mixture of black coal and iron minerals to create the first black pigment. We have the evidence of cave paintings that still survive today.

The color black also has a rich history of ups and downs. In Renaissance times it was used for underpaintings and shadows, while in modern times it has become rather undesirable. Working with black has its pitfalls and should be used judiciously and only where appropriate. Even so, black paints are irreplaceable, for example as part of complementary color mixtures. They should therefore not be missing from your palette from time to time.

Different hues, differences in transparency, opacity, and above all differences in temperature predispose different black oil paints to different uses. Even the manufacturer plays a role, as slight differences in hues can be noted, even though paints from different manufacturers are usually labelled the same. So, let's look at the black paints that are most used in painting. These include ivory black, lamp black and mars black.

IVORY BLACK

(A) Probably the best known and currently most used is a medium transparent black paint, which is produced by charring animal bones. This black is slow-drying and therefore not very suitable for underpainting. It is probably the darkest of all the available blacks and was used by Rembrandt, for example, for his work. Mixed with white, it produces cool bluish hues. It is therefore sometimes referred to as low chromatic blue.

MARS BLACK

(B) Quick-drying and very well covering paint, suitable for underpaintings. It has a warmer undertone in a thin layer application and dries to a very matt film. The paint is made of synthetic iron oxide. If you want to use a thick coat of black, for example as an underpainting, this is the best candidate because it dries the fastest of all the blacks mentioned. The matt film that forms after the paint dries may be undesirable to some, however its sheen can be restored with a final varnish.

LAMP BLACK

Lamp black is also a slow drying, lightfast and permanent color. It has a stronger bluish tint than ivory black. Compared to this color, it also has greater opacity and stronger staining power. For the record, the name was originally derived from the soot of oil lamps, which is made up of pure carbon.

Comparison of blacks

Colt barrel *(detail)*

The choice of a particular black depends on what purpose you need the color for. Although ivory and lamp blacks are less suitable for underpainting than mars black, adding another fast-drying color (usually burnt umber or Prussian blue) will speed up the drying of the other colors. So, if you don't like the matte look of mars black, you can use other blacks with the addition of a fast drying paint in the underpainting.

If you use one of the black colors directly, it's a good idea to mix in other colors to enrich the hue. As with the complementary blacks, for example, adding ultramarine will move black to the blue part of the spectrum, or adding umber or sienna will move black to the warm part of the color spectrum.

In the picture of the gun with the black barrel you can trace the indicated temperature changes of the black color. Ivory black was used to paint the barrel. The barrel receives three types of light: warm light from the primary light source and from the candle, and cool light from the blue sky. These temperature changes must naturally affect the black color as well. In the illuminated part of the barrel, the black had to be lightened and warmed to neutralize its cool bluish tint. Adding umber to the

Coat detail

HOW TO REPLACE BLACK?

Mixing black colors

An alternative to black can be a mixture of primary or complementary colors. These mixtures are sufficiently dark while retaining some of the color tendency of the predominant color in the mixture. The simplest "black", that I use most often is a mixture of Ultramarine and burnt umber. This mixture is dark enough, plus you can easily correct its temperature towards a warm or cool hue. Another workable mixture might be of phthalo green and alizarin, for example.

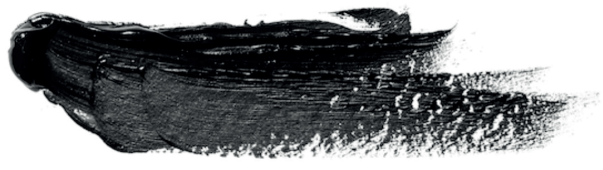
black and lightening it with Naples yellow produced a lighter and warmer black. In the case of the candle reflection painting, cadmium orange was used with burnt umber. Due to the reflective surface of the metal, the local black loses its original hue and shifts to a warm red orange at the point of light reflection. On the contrary, the cool blue hue of black with white was suitable for painting the reflections of the secondary blue light.

In another example of painting a black coat, a similar procedure was used. As you can see, the warm underpainting visible through the coat complements its local color and breaks up the monotone appearance of the black. As with the previous example of the gun, the black has several different hues. From the combination of warmer and cooler light hues on the illuminated side of the coat to warm dark hues whose temperature is amplified by the very warm underpainting that is visible through the top color layer.

Black paint, especially ivory black, can sometimes come in handy for landscapers, as its bluish hue makes it easy to mix various muted shades of green that can be used, for example, to paint foliage or shade trees, etc. In the picture, ivory black has been mixed with **A** cadmium lemon yellow, **B** medium yellow and **C** deep yellow. Although black generally "dirties"

Greens from black

colors and takes away their saturation, when combined with yellow it still forms a sufficiently chromatic and usable green for landscape painting. The warmest greens are black with cadmium yellow deep. Conversely, the addition of lemon yellow produces cool bluish greens.



Conclusion

Dear reader, we have just arrived together at the end of our adventurous journey through the fascinating world of colors. After reading this book, you already know that all the colors we know are not objective reality but the subjective creation of each of us. Yes, once again, color is just a perfect illusion that is created by light and interpreted by our brains into the familiar form we call COLOR.

I therefore do not hesitate to use the word fascinating in connection with color without exaggeration. I can't think of a better term for something that humanity has been exploring for centuries with the knowledge that color doesn't actually exist in the physical world.

In our world, color is an irreplaceable element of communication. Right from birth, we automatically distinguish according to the sex of the child what color his clothes will be. Blue for boys and pink for girls is an absolute classic. We all know that green at traffic lights represents safety, while red means stop, a warning. The different colors of products influence the consumer's decision on what to buy. Even the installation of blue lights in Japanese train stations has been shown to reduce the frequency of suicide incidents where people jump in front of trains.

It is no coincidence that color plays a vital role in the world we live in. Color directly influences the way each of us thinks and behaves, without us even realizing it. The psychology of color suggests that different colors can have a wide range of effects, from enhancing and influencing our moods to causing anxiety or, perhaps in extreme cases, stress. Color can affect a person's mental or physical state. Studies have shown, for example, that long-term observation of red, led to an increased heart rate, which in turn led to further pumping of adrenaline into the bloodstream.

Colors have similar effects on each of us, but our subjective perception of color can be influenced by our experiences and the cultural environment in which we live. For example, in Western countries, the color white signifies innocence and purity, while in Eastern countries it is a symbol of grief, etc. Although the effect of color on our emotions varies from person to person based on gender, cultural

context, personal experience and other factors, there are several general and valid patterns that have been confirmed by countless studies of color psychology. Because color is one of the fundamental visual cues of human cognition, general knowledge is a tool for all who use color to convey a specific message. Whether they are artists, marketers, or fashion designers, they all work with color according to the valid laws that have been presented in this book.

Let's briefly summarize the most important insights contained in this book that will be of the greatest practical benefit to your own work.

Light is essential

How things look and how color appears to the observer is determined by the type of light. If you decide to create a work of art that is meant to reflect reality light is the first thing you need to define exactly. Always determine whether the light has a warm, cool, or neutral feel before you start painting. It is also important to know exactly what intensity the light source has and in what direction it is hitting the objects. If you are clear on the above, always keep all these factors in mind during the creation of your work and subordinate your own creative process to them.

Paint light not objects

The world around us is represented to us on the principles of additive and subtractive synthesis. What we see is directly created either by light,

such as the color of the sky, or by reflected light, such as trees or rocks in the landscape. In case you want to mix and paint the colors you see in front of you, you cannot approach it with the idea that you are merely copying what you see. Your task is not to copy but to imitate with paints the effects created by light. If you don't know how to do this, all the important answers can be found in the theoretical science of color.

Color theory will help

The study of color is a fundamental building block to understanding how colors work.
From color wheels, used to systematically navigate color space, to the individual attributes of each color, knowing color theory gives you the tools to help you decide what color to use at any given moment. And not only that. Above all, color theory reveals the "secret " of why this is so! Surely, you've had the experience of mixing a color and not knowing for sure what shade you need. Thanks to a perfect knowledge of colors, their properties and above all the relationships between them, you can logically determine the hue you are looking for. There is no coincidence in the world of color, and everything is based on the laws that mankind has been creating for hundreds of years.

Mixing colors is fun

Know your colors. Learn the differences between them. Learn to distinguish between warm or cool colors. Learn the other characteristics of colors, their saturation and value. Once you are familiar with the theoretical side of colors, or their characteristics, you will have no problem mixing any hue. In fact, with time and practice you will find that the actual mixing process is the easier part of the equation. The essential part is knowing how the resulting color should look in context with the others. And that brings us back to the beginning of color theory.

Compare, compare... and compare

Relativity is a characteristic feature of our reality. A house can be described as big compared to a smaller house. At the same time, it can be described as small compared to a much larger house. This simple principle is also true in the world of color. A color can be less saturated or more saturated, it can be dark and light at the same time, depending on what you are comparing

a particular shade to. Colors and their characteristics cannot be described in isolation. The final appearance of colors, their saturation, hue, value is influenced by the surrounding colors that are constantly interacting with the hue being described. Therefore, constantly compare the individual hues with each other. Apply the colors to the canvas and compare the relationships between them. Only then define the shapes and finally finish the finer details.

After reading this book, you already know that you cannot separate light and color, because they are essentially one and the same. Finally, let your imagination run wild for a moment and imagine that you are floating through a dark universe and surrounded by darkness. If you raise your hand, you can only see the light because of its reflection off your hand which implies that unless the light has an obstacle in its path you cannot see it. So yes, light is invisible which must also be true of color. I will therefore allow myself to enter a deeper level of human knowledge in conclusion for the sake of interest. Even though I am not personally a believer in the form of God as it is generally presented, it is possible to trace an interesting passage in the Bible. Specifically, in St. John 8:12 it states, "I am the light of the world." If you ever claim, I am the light know that you are not far from the truth.

Glossary of terms

Glazing – applying thin translucent layers of paint.

Imprimatura – a base layer of oil paint that has insulating and optical properties for future artwork.

Tonal contrast – the value difference between a bright and a dark place.

Monochromatic underpainting – underpainting made in a uniform hue of, for example, brown or grey.

Chroma – saturation of color. Highly chromatic colors are saturated (cadmium red, cadmium yellow, etc.). Low chromatic colors have lower saturation (yellow ochre, raw umber, etc.).

Grisaille – monochromatic underpainting in shades of grey.

Lateral frontal illumination – illuminating the model from a semi profile at an angle of approximately 45 degrees.

Plein air painting – painting outdoors in nature according to a live model.

Value – how dark or light a particular place is on the black and white scale.

Subtractive mixing – a method of mixing colors whereby with each additional color added, some of the original light is removed.

Additive mixing – a method of mixing colors where the individual color components are added together to produce light of greater intensity.

Dichromatic – 2 cones in the eye = 2 visible colors (dog)

Trichromatic – 3 cones in the eye = 3 visible colors (human)

Complementary color – it lies in the color wheel exactly opposite. Together with the selected color, it forms the maximum color contrast.

RGB – Red, Green, Blue

RBY – Red, Blue, Yellow

CMYK – Cyan, Magenta, Yellow, Black

Gamut – The visible range of the color field.

Web resources used

https://munsell.com/

https://www.smartermarx.com

http://www.colorexpleined.com/

http://www.essentialvermeer.com/

https://www.royaltalens.com/en/

About author

M8
PAINTING TECHNIQUES

MATE ART (Jan Matejak) focuses on teaching and painting oil paintings in the layered technique of the Old Flemish Masters and their direct painting methods. He specializes mainly in Renaissance layered techniques and the study of the technical aspects of the techniques of the Old Masters.

His aim is not only to rediscover the qualities, skills, and knowledge of the old masters, but above all to pass on this knowledge and skill across regions, countries, and continents to people who, like him, once had the desire to paint a classical work.

Driven by an inner urge, he created and runs websites on his initiative, were not only teaching texts but also PDF files with teaching videos are available free of charge. Thanks to this philanthropic approach, anyone interested in this art can not only learn the basics of these skills, but above all avoid the transgressions, mistakes, and dead ends inherent in all beginnings.

www.matejakart.com

Gallery

Beauty of posthumous consciousness – *Oil on canvas 100 × 70 cm*

The Crow – *Oil on ACM 50 × 60 cm*

Red grapes and pomegranate – *Oil on canvas 35 × 30 cm*

A moment for a real man – *Oil on canvas 24 × 30 cm*

White rose – *Oil on canvas 50 × 60 cm*

Spring – *Oil on ACM 40 × 30 cm*

White rose – *Oil on ACM 35 × 40 cm*

Egg and spoon – *Oil on canvas 35 × 35 cm*

Iris – *Oil on board 24 × 30 cm*

On the pond – *Oil on board 30 × 24 cm*

Morning tea – *Oil on ACM 80 × 60 cm*

Rural still life – *Oil on ACM 50 × 40 cm*

In the garden – *Oil on canvas 40 × 30 cm*

Ace high – *Oil on canvas 40 × 30 cm*