



Colour Theory

Advanced Approaches & Applications

Written, Designed & Illustrated by Hunter Cairns

Front Cover Image

Lupin Botanical Piece

20 x 26in, Summer 2024 | Coloured

Pencil on Bristol Vellum Paper

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This book is the final submission of Hunter Cairns for the DESN 486 independent study course at MacEwan University in the Fall 2025, with oversight from Prof. Crystal Driedger. The following material is the result from the original written research report alongside artwork completed by myself for this course and over the duration of my education at MacEwan University. All rights and copyright ownership of the included materials is reserved for Hunter Cairns, Pause Studios Founder.



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Foreword on the Research Project

Colour Theory: Advanced Approaches & Applications

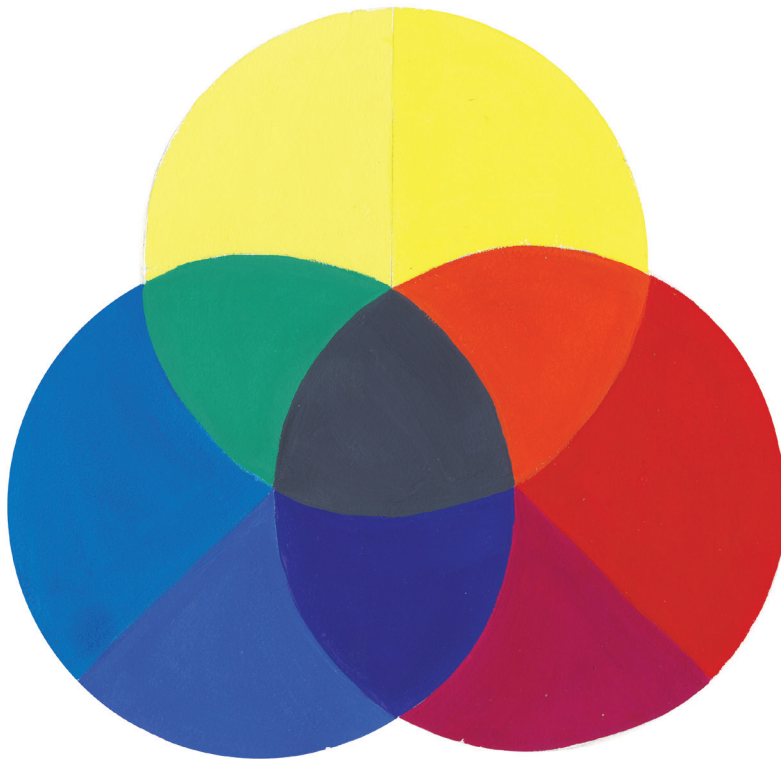
Hunter Cairns
DESN 486 | Independent Study
Prof. Crystal Driedger

The scope of this paper aims to challenge the breadth of knowledge in relation to colour theory and its application within illustrative and design thinking. As someone introduced to many foundational concepts in the first year of my studies, I expanded my understanding and awareness of colour relationships and their applications in my approach to art and design. Yet in reaching my fourth and final year of the program, I find that integration of colour, form and light halted in the early parts of my education, requiring supplementary learning and extended time spent in trial and error.

Seeing the scope others can take in history courses and extracurricular learning has expanded my intuitive understanding when approaching illustrative or design-based work. Still, the knowledge set remains only on the prediction of possible outcomes and not the knowledge of the why or how that I had sought to explore.

Over the course of this research, we will explore the fundamentals of colour theory and how it evolves and adapts to the interactions of form and light in real environments. Expanding upon reality-based rendering, we will analyze subconscious adjustments to perception and how we can take the scope of reality and apply restrictions and limitations through gamut mapping to develop mood, enhance impact, and generate enhanced storytelling ability based on the approach and understanding that colour is subjective and can be formed by our perceptions to render reality.

A brief moment of Pause. From me to you.



**Subtractive
Colour Mixing**

*7 x 7in, Fall 2025 | Acrylic Gouache
on Illustration Board*

Intro to Colour Theory

In topic one, we will start by reviewing the research pertaining to the basic fundamentals of colour terminology, the mixing and applications for adjusting the properties between colours, along with the breakdowns and reasonings behind some of the most prominent debates among artists on topics considered the 'correct approach' in painting techniques. After this foundation, we will wrap up this section with a deeper analysis of colour wheels, analyzing traditional assumptions along with the advancements in colour knowledge that have progressed into a deeper understanding of colour through the breakdown of an early 1900s three-dimensional theory that streamlined commercial productions, and continues presently into a digitally progressing world. The fundamental applications of colour theory here will act as a guide and a necessary resource tool in breaking down the advanced interactions and techniques that follow.

The Basics of Colour

Basic Colour Terms

Hue

Hue refers to the spectrum of pure colour families: red, orange, yellow, green, blue, and purple.

Colour Bias

Refers to the leading colour influence within a hue, often related to tertiary colour mixes. For example, if green is a mixture of yellow and blue, then a yellow-green hue is a yellow-biased green with less blue, whereas blue-green would be a more blue-dominant mix of green.

Value

Value refers to the relative light or dark appearance of the hue. To simplify the measurement of a colour's value, it can be easiest to think through the grayscale system. The grayscale represents the change from 0 to 100, with white being 0 (the lightest value) and black being 100 (the darkest value).

Saturation & Chroma

Chroma, more synonymously referred to as saturation, refers to the level of vibrancy or purity in the colour. "Full colour saturation defines that the colour is at the most pure and vibrant level without the diminishing impact of excess light or darkness."¹

To help explain the Munsell Colour Space in the upcoming section, we'll refer most commonly to saturation as chroma,

a term prioritized by A.H. Munsell, the creator of the Munsell colour model.

Tints, Shades & Tones

Tint

Tint is lightening the value of a pure colour hue by adding white to bring the value closer to zero, while reducing the intensity of the colour's chroma level.

Shade

Shade is the action of darkening the value of a pure colour hue by adding black to bring the value closer to 100 (black). Much like a tint, this action reduces the intensity of the colour's chroma level.

Tone

Tone refers to adding a mixture of black and white to achieve a desired value of grey on the grayscale to add to the hue.

The Value of Hues

Considering value, on a grayscale from white to black (0-100), we must consider that every pure hue has an inherent value that falls somewhere on the value scale. This factor impacts considerations of colour mixing or the impact each colour will have beside one another. A standard approach, considering the value of pure hue, we place yellow as the lightest value and the darkest often being blue or purple, depending on the medium, and red/green generally have a similar value, which should be taken into



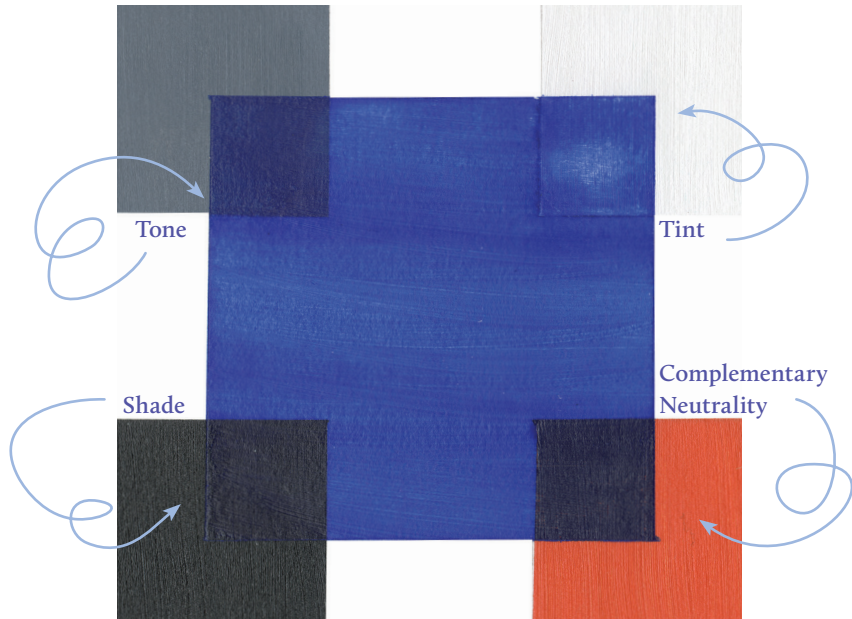
Colour Scale & Grayscale

2 x 6.5in, Fall 2025 | Acrylic Gouache
on Illustration Board

consideration when converting to grayscale or addressing red-green colourblindness.

In analyzing the studies done by Charlie Pickard, in the Artists' Masters Series Color & Light, we can further note that generally, primary colours are darker in value compared to their secondary colour counterpart. Pickard explains that "since two of the cones in our eyes are activated

when we observe a secondary colour, they mix additively" to back the understanding of how to reasonably predict the general values when utilizing colours.² However, in consideration of Pickard's writing, which focuses on additive mixing in a digital colour context using RGB (Red, Green, and Blue Primaries), we can assume the general theory remains correct, but account for the slight discrepancies between RGB and RYB (Red, Yellow, and Blue Primaries).



Colour Neutrality Study
4 x 4in, Fall 2025 | Acrylic on
Illustration Board

Colour Neutrality & Complementary Neutrality

When considering how to bring a hue towards a neutral colour, Ian Goldsmith, in his book, *Color Theory for Artists*, refers to a neutral as one with "no discernible hue/colour, or a colour that has had its 'matched complementary colour' added to it to diminish saturation, usually increasing visible darkness."³ Goldsmith outlines two primary ways to bring a hue towards neutrality when considering methods to shift a colour towards neutrality.

The first method, primarily outlined for altering a colour's value, is by adding a "value modifier" to create a shade, tint, or tone (adding either white, black or grey) that results in both an altered colour value in addition to a decrease in the saturation of the hue that moves the colour closer to neutrality, yet still maintains the influence of the starting hue.⁴

However, the second method, complementary neutrality, will act to neutralize the hue through the addition of its complementary opposite on the colour wheel. Goldsmith highlights this as the more reliable method to darken a colour without adversely affecting the hue, achieving the same result as adding a neutral black, through adding the missing primary colour(s) from the starting colour to incorporate the remaining spectrum colours.⁵ This colour combination, in turn, creates chromatic black, offering a rich and more vibrant black that retains hints of its constituent colours. Through this second method, you can alter towards the desired level of neutrality without compromising a shift from the original hue as the base of the desaturated colour.

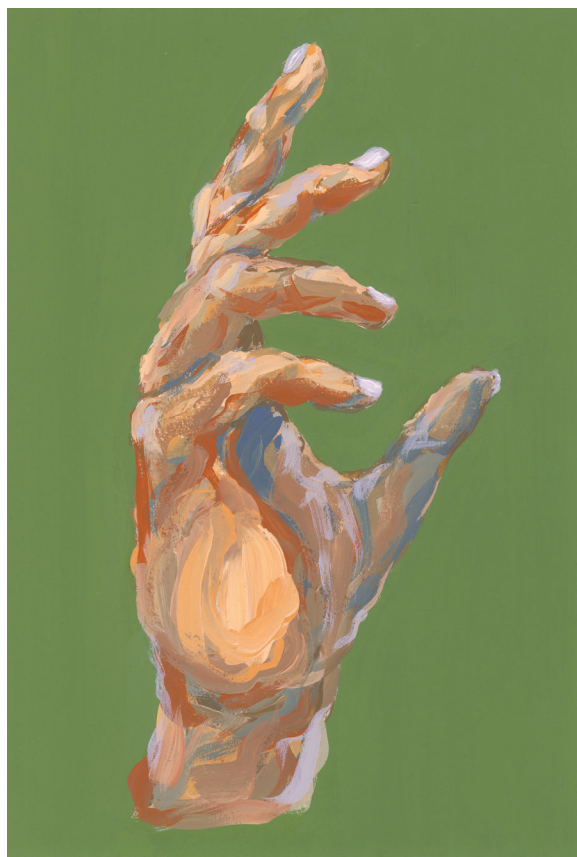
Colour Temperature & Psychology

Warm & Cool Colours

In general terms, the colour wheel can be divided into overall warm and cool colours, with warm ranging from one half of the spectrum, including yellow-greens, yellows, oranges, and reds. In contrast, the cool colours would be the other half: blue-greens, blues, and violets.⁶ The psychology of this breakdown, explored in James Gurney's book, *Color and Light*, examines the general associations invoked by this warm and cool breakdown, being that the warmer ranges instill heat, fire, energy and passion. In contrast, the cooler range evokes connotations to winter, the night and sky, restfulness and calm, and shadow.⁷

However, to develop one's understanding of colour temperature, we must acknowledge that while the general spectrum range has an overall temperature division, each primary colour zone still independently has cold and warm variations. A simple understanding of painting terms highlights the apparent differences between primary paints in red and blue colours. Most commonly, a painter's palette will have a cadmium red and an ultramarine blue that will be categorized as the warm version of that hue. In contrast, phthalo blue and alizarin crimson are classified as cold versions of those primaries. The most common use for these differences is to develop changes in depth, along with defining light and shadows in a piece. In addition to less vibrant colours receding into the background, cool colours produce longer/slower wavelengths; they appear less energized in relation to highly vibrant or warmer colours, which appear closer and more active to the viewer.

Furthermore, while we can inherently distinguish the general appearance of temperature within individual colours, there is a further consideration to this perception: the relationship between two or more colours that can impact the perception of temperature, as explored by Pickard. He explores the relationship between colours that creates a change in temperature through the eyes' process of chunking information, where the "contrast between a colour's temperature and its surrounding context"⁸ can change the way one perceives the colour as either warm or cold based on the surrounding information's overall temperature.



Reach Out

10 x 7in, Fall 2022 | Acrylic Gouache
on Hot Press Paper

The Mud Debate

Adding to the topic of colour neutrality, Gurney's analysis on page 106 outlines the divisive argument between artists he refers to as The Mud Debate. Gurney separates the argument between two schools of thought, the "Beware of Mud" school and the "Mud is a Myth" school.⁹

Beware of Mud

These artists believe in using no browns, blacks, or greys – instead, they prioritize either the utilization of overlapping transparent primaries or limiting their colour mixtures to no more than three colours to avoid over-mixing into "dead or dirty" colours. Gurney references Daniel Parkhurst's quote regarding the selected colour mixture: "When you don't get the right tint with three colours, the chances are you have used the wrong three."¹⁰

Mud is a Myth

The second faction opposes the prior basis of thinking that argues against the assumption of muddy mixtures

compromising the work, stating that “there are only muddy relationships of colour in a given composition...the effect of drabness or dullness comes from poor value or organization more than from bad mixtures or mixing practices.”¹¹ This faction embraces the power of greys as Gurney references their ability to re-purpose old paints by storing them in generalized grey mixtures for reuse in mixtures to

alter values or reduce chroma levels. The thought of grey forward can be significant in distinguishing the brushwork in artists, as many in this school of thought utilize the mellowing and cohesive nature of unifying grey remnants in dirty brushes, unless distinguishing highlights call for a clean brushstroke.

Glazing & Grisaille

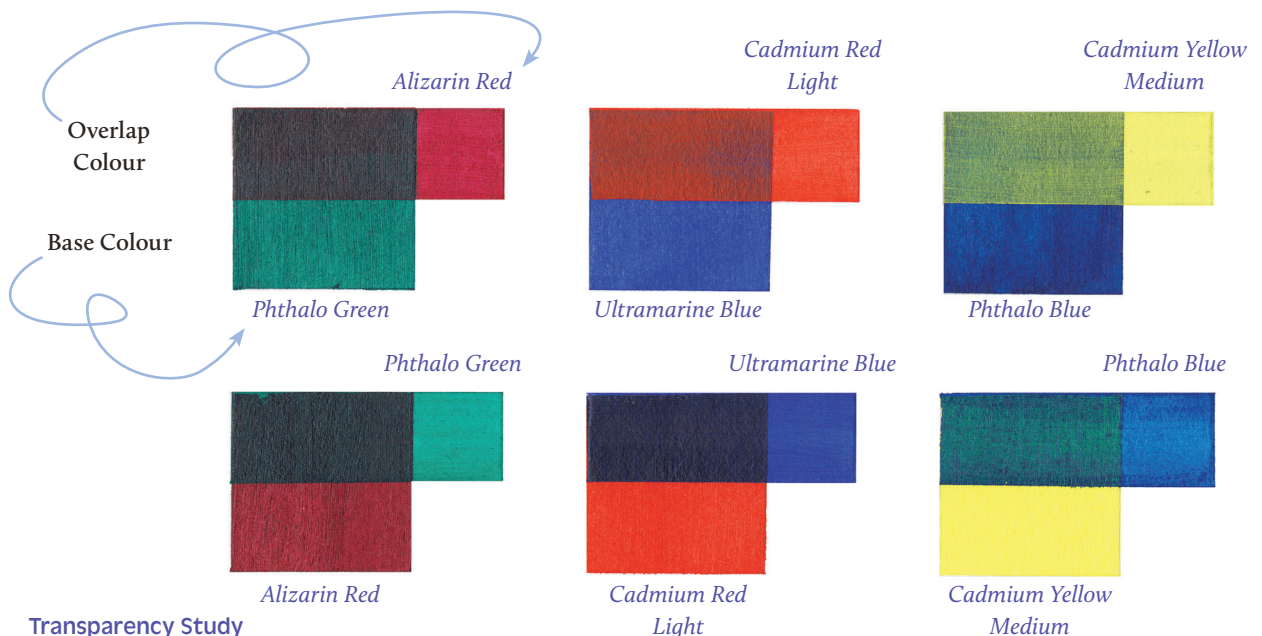
Glazing & Transparencies

Transparent paints utilize the brilliance of the colour, dependent on the amount of light passing through the pigment and reflecting off the surface, which is why transparent paints are usually applied to very white surfaces to maximize the amount of light bounced back. Grays and intermediate mixtures can also be produced by overlapping complementary transparent pairings on top of one another. While some paints are known as transparent colours, applying diluters and ‘glazing’ mediums can allow most pigments to become transparent. However a rule of thumb outlined by Goldsmith indicates that dark and pure hue colours commonly on a palette are easily adaptable for glazing, such as, ultramarine, magenta, and the phthalocyanine blue and green, along with most other primary and secondary colours on a palette with the exception for the cadmium based colours like Cadmium red, yellow, and green which are rather opaque and harder to utilize for glazing methods.¹² The action of diluting a

pigment with a transparent medium or water for an even overlay on an existing and dry surface that alters the colour of the piece is known as glazing. The benefit of the glaze can offer intensity, depth, unity, or alterations to the hue that can feel richer.¹³

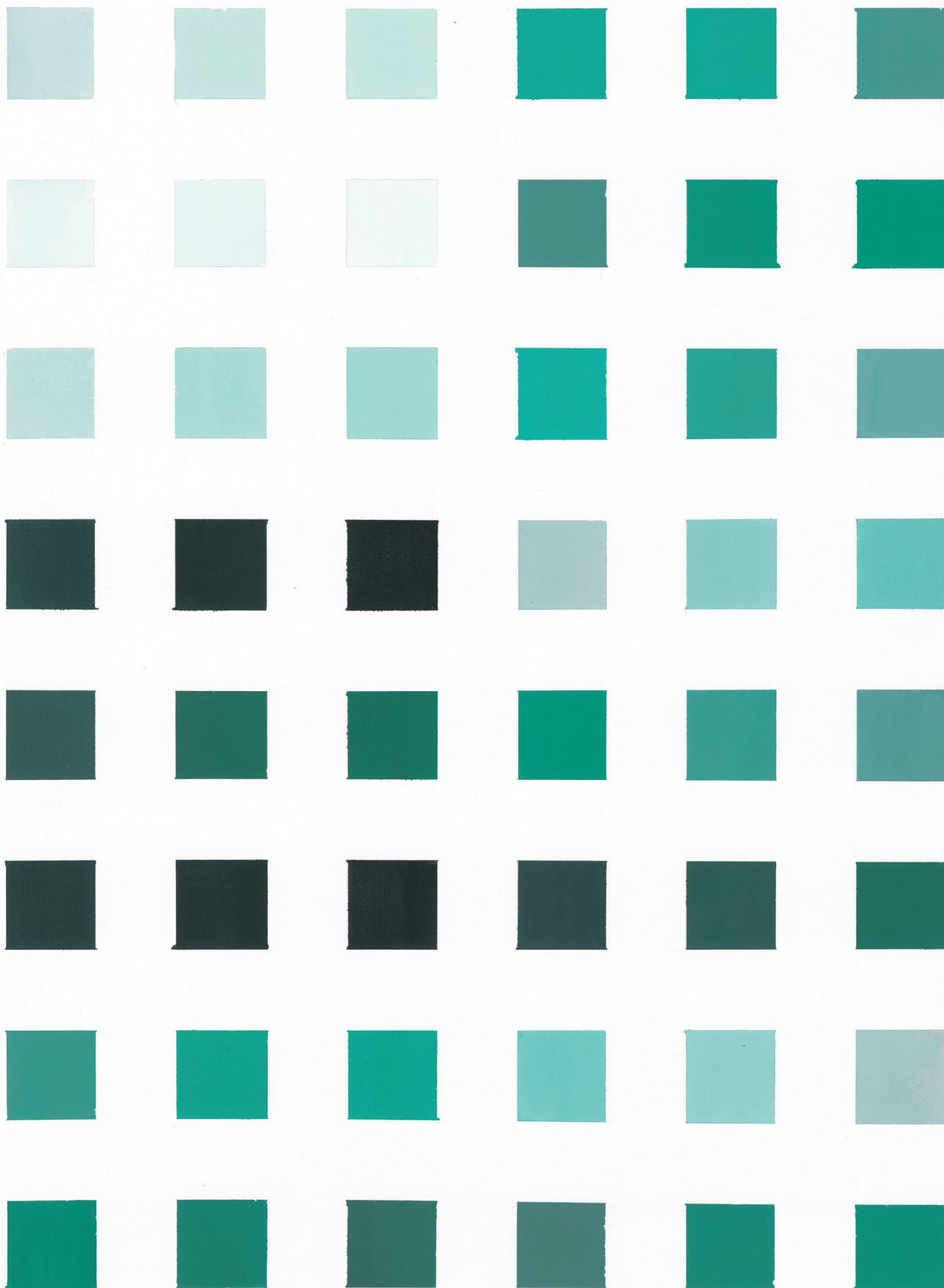
Grisaille

The traditional use for glazing was in conjunction with the Grisaille method (Gris meaning Grey), which utilizes a tonal under-painting in a monochromatic neutral or black and white under-painting to develop the tonal range and structure of the image. By applying glazing layers, the artist can build thin layers of colour over the pre-existing grayscale image to define the subtleties and dimensional changes of hues in the piece.¹⁴



Transparency Study

3 x 6.5in, Fall 2025 | Acrylic on
Illustration Board



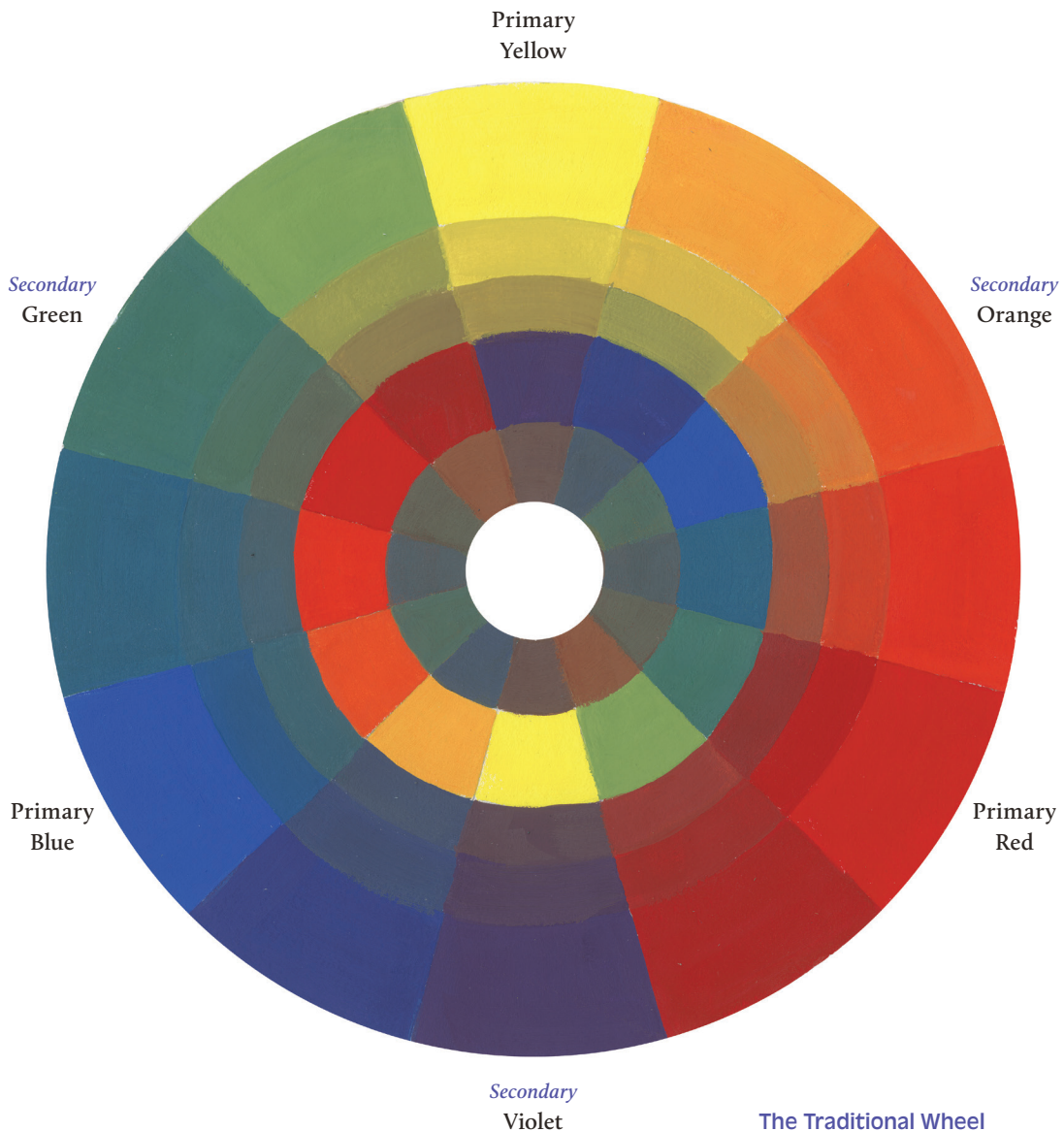
Colour Wheels & Beyond

The Spectrum & Primaries

Gurney explores the terms of how colour is named and separated in his analysis of the development of the colour wheel, highlighting that Isaac Newton first proposed the notion of wrapping the light separation from a prism into a circle, where both ends of the spectrum (red and violet) meet, as the gradation between the ends developed a smooth transition between the hues identified as ROYGBIV (red, orange, yellow, green, blue, indigo and violet).¹⁵ While artists adopted this circle, excluding indigo, they focused on the six basic colours. Artists traditionally refer to the primaries as red, blue, and yellow. Gurney further notes that in the eras of the Greeks, Romans, and the Renaissance, it was a popular opinion to include green as primary. In addition to the primaries on the wheel, the analysis of complementaries on the wheel is determined as the colour opposite the selected colour on the wheel, and when mixed, produces a neutralized grey value, however Gurney explains in the terms of after-image colour pairings this differs, as blues complementary in this respect would be yellow, not orange, as it typically is considered.¹⁶

Cobalt Colour Spaces

*16 x 20in, Fall 2025 | Acrylic Gouache
on Illustration Board*

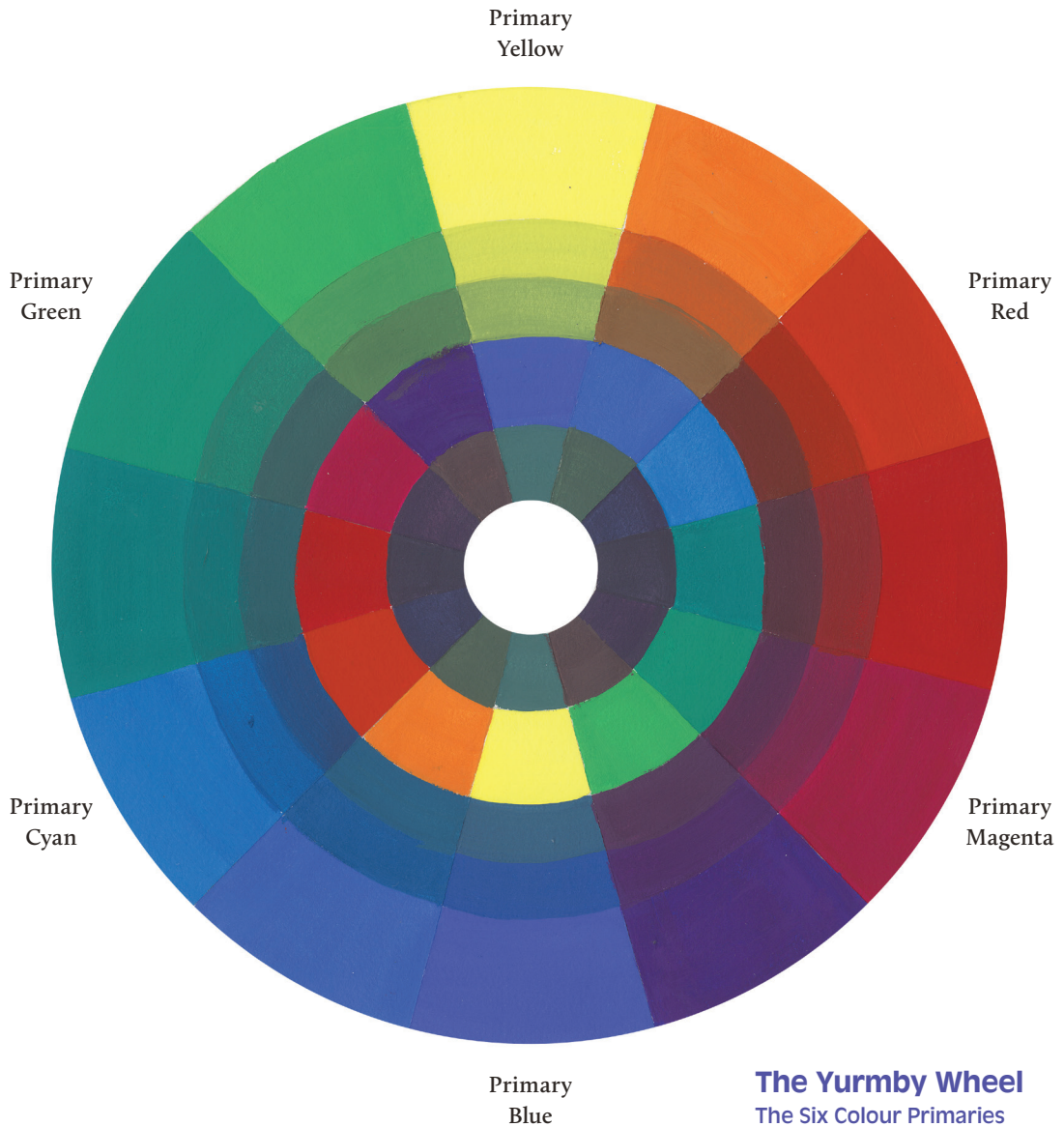


The Traditional Wheel
 7 x 7in, Fall 2025 | Acrylic Gouache
 on Illustration Board

The Traditional Wheel's Complication

While the traditional wheel is a widely accepted standard in basic colour theory, it proposes several issues concerning the structure and association of colour dynamics that Gurney outlines in contrast to other colour wheel systems. His first analysis outlines that the set restriction of a red, yellow and blue primary palette is not the only possibility, claiming that any number of hues on the outermost rim of the gradating wheel could make a claim for primary, furthermore, that “none of the other hues are secondary or composite by nature.”¹⁷

Furthermore, Gurney explains that the structure in the colour wheel to separate the traditional primaries equally across the wheel is an uneven distribution, based on the eye's higher sensitivity towards changes within the warmer yellow-orange-red wavelengths and a wider range of accessible pigments in this region, which led to the expansion of this section taking up much more spectrum space than in actuality.¹⁸



The Yurmby Wheel

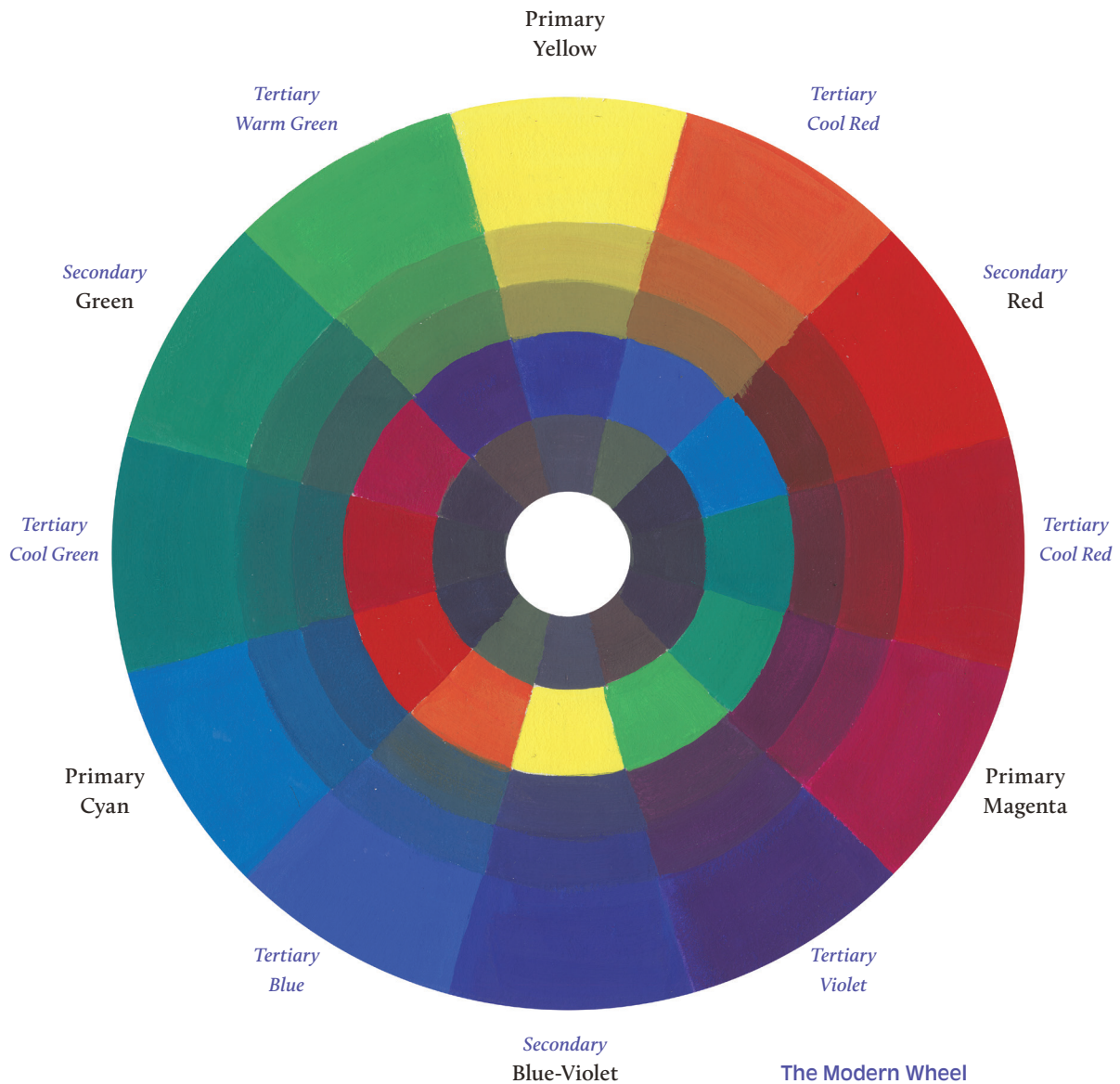
The Six Colour Primaries

7 x 7in, Fall 2025 | Acrylic Gouache
on Illustration Board

The Yurmby Wheel

In consideration towards a newer approach to balancing the wheel in relation to accurate spectrum arrangement, Gurney highlights the importance of the RGB (red, green, and blue) being the primary colours of light rather than the former primaries acting in relation to pigment, which then place CMY (cyan, magenta, and yellow) as the secondary

mixtures in relation to light interaction.¹⁹ In consideration of this approach, if you were to place RGB evenly between CMY on a colour wheel, considering them to act as six equal primaries, you create a mathematically correct universal colour wheel known as the Yurmby Wheel.²⁰



The Modern Wheel
7 x 7in, Fall 2025 | Acrylic Gouache
on Illustration Board

The CMY vs RBY Debate

With the change of digital and printed colour spaces came the shift in how colour relationships interact to create the spectrum range of colours with the most efficient amount of colours/pigments. While the traditional notion of RBY (red, blue, and yellow) primaries has been the standard practice for painters, the modern style that has come into commercial practice since the 1950's,²¹ shifts the primaries to the CMY (cyan, magenta, and yellow) primaries as the practical combination that can mix the most extensive range of high chroma hues within the three primaries.

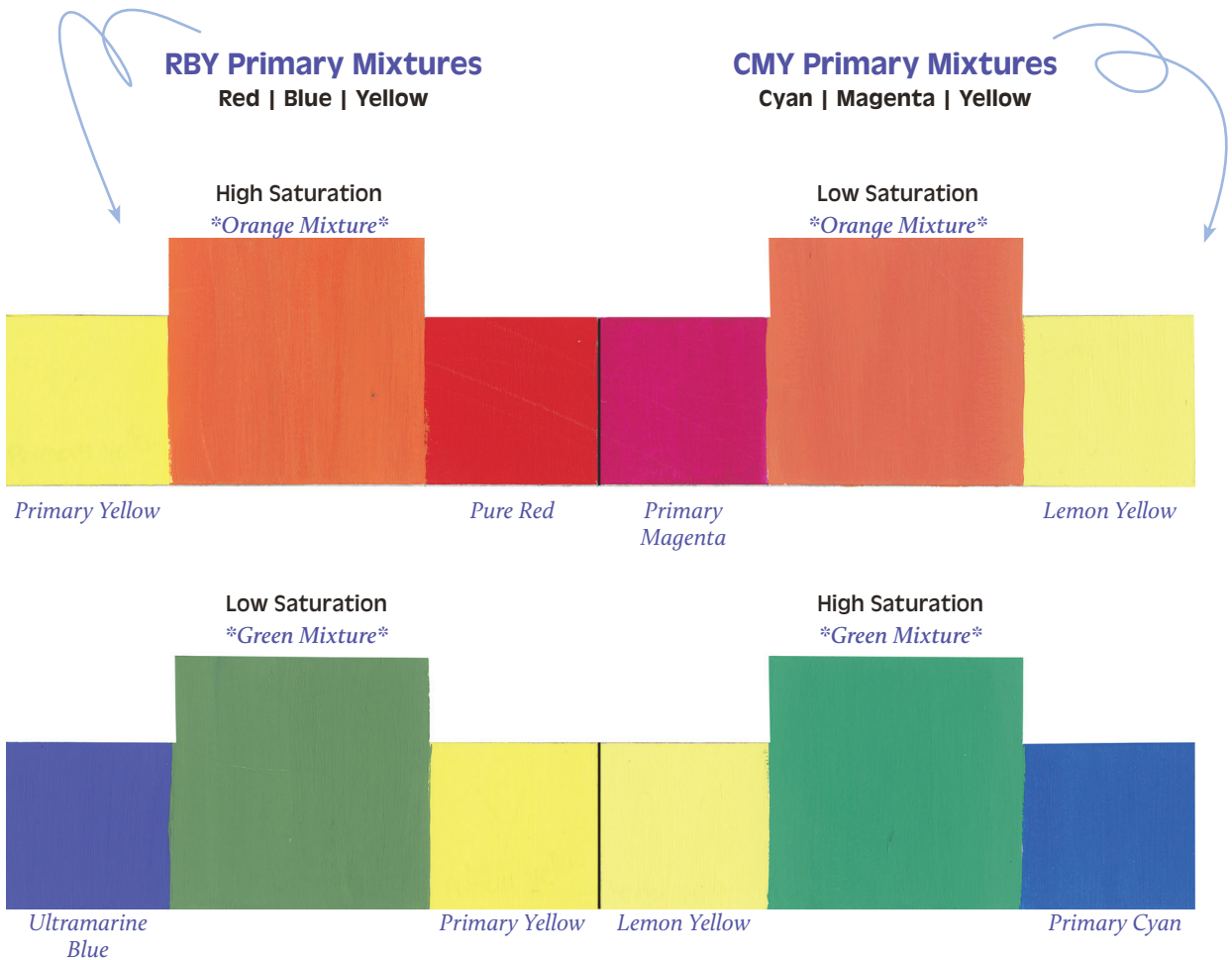
While both formats have some limitations and benefits, it's important to note that the most prominent differences in their colour mixing abilities lie in opposite regions with greater and lower chroma abilities.

Pickard outlines that in CMY mixing, the cool range of colours, violets, and greens produce a more vibrant and high chroma level than their RGB counterparts, which appear rather dull in comparison. The opposite is visible in the warmer colours and in the RBY mixing, which can

produce more vibrant chroma levels in the orange range of hues compared to the CMY range.²² The primary reasoning for this difference can be attributed to the difference in the perceived temperature of the given hues, where CMY primaries offer a cool palette while RBY offers a warm palette. The reasoning as to why is explained by Pickard through the colours differing placement on the colour spectrum, where the red and yellow colours in RBY are warm and closer on the spectrum to the desired high chroma orange compared to CMY's yellow and magenta counterparts, which costs a higher loss in subtractive mixing policies considering that mixing colours cost a larger loss in both chroma and lightness the farther apart the primaries are from the desired hue. This reverse is

true when considering the mixture for the cool palette of greens and violets, with a closer gap on the spectrum to reach the secondary colours.²³

Because of these limitations, when considering the sole combinations of primaries being either CMY or RBY, it's more beneficial to consider the basis of a "split-primary palette"²⁴ colour wheel that consists of both a warm and cool version of the primaries. This change offers a wheel that can achieve mixtures that maximize the chroma levels across the whole wheel.



The RBY & CMY Test

4 x 7in, Fall 2025 | Acrylic Gouache
on Bristol Paper



The Munsell Wheel
*7 x 7in, Fall 2025 | Acrylic Gouache
on Illustration Board*

The Munsell Colour System

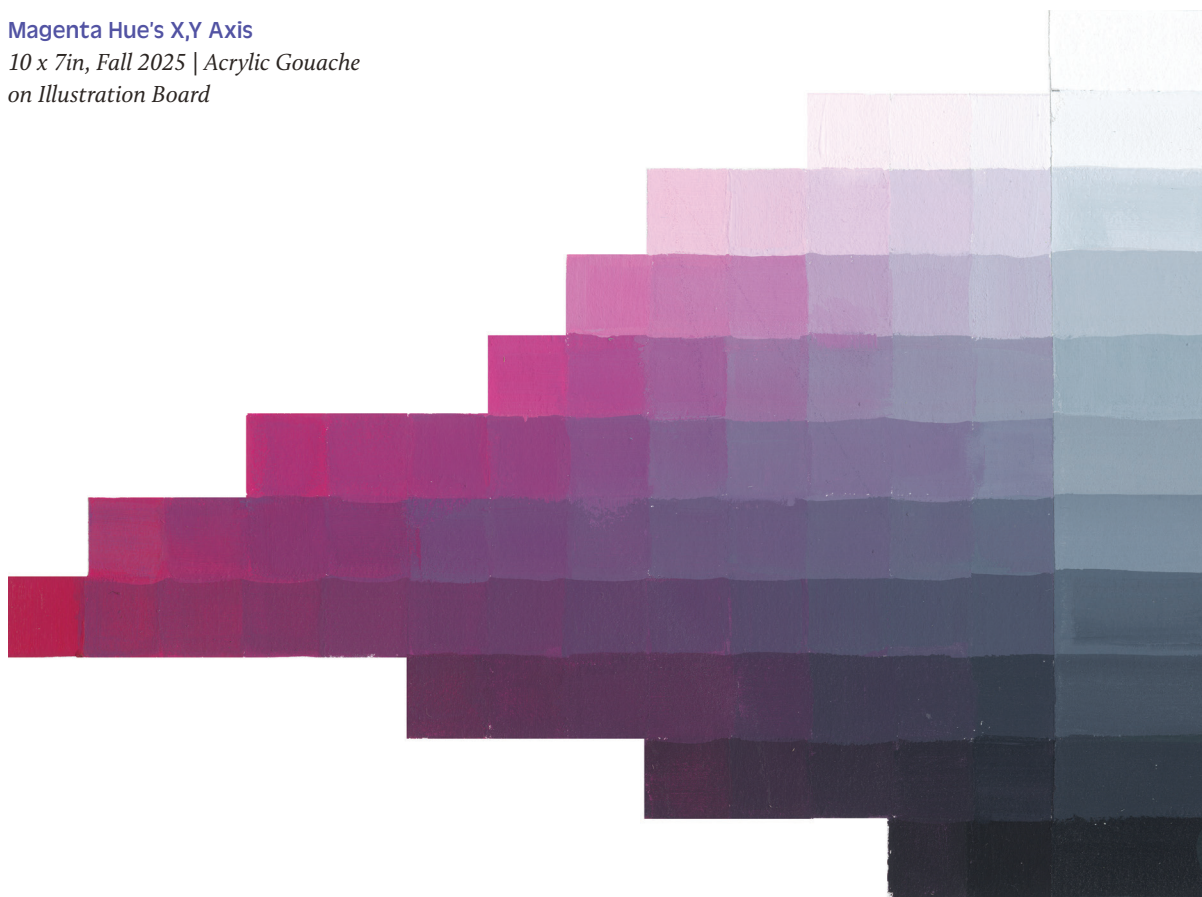
The Munsell Wheel

Through this discussion on the alternate approaches to colour and the shift away from the traditional wheel, we should address the impact on art and design from the research and categorization by Albert Munsell, who began his research into colour theory in the 1890s before publishing his 1905 book on colour notations. Gurney highlights the first topic of impact from Munsell with the Munsell Wheel, where he shifts from the other colour wheels division of a twelve section wheel with a structure of ten spectral hues on a flipped wheel that places red on the left rather than the former right side.²⁵ Gurney further explains the usefulness of this wheel through Munsell's application of exact numerical descriptions in the form of colour notes²⁶ that is still utilizes for identification in a similar format of pigment notations on artist quality paints today; labelled as the following, in order from the top of the wheel moving clockwise.

- Y | Yellow
- G-Y | Green-Yellow
- G | Green
- B-G | Blue-Green
- B | Blue
- P-B | Purple-Blue
- P | Purple
- R-P | Red-Purple
- R | Red
- Y-R | Yellow-Red

Magenta Hue's X,Y Axis

10 x 7in, Fall 2025 | Acrylic Gouache
on Illustration Board



Munsell's Colour Tree

Combining the knowledge outlined in the Colour Basics section, we can now properly address what Munsell called the Colour Tree. In the summarization given by Pickard, Munsell conceptualized a three-dimensional physical shape to his former colour wheel by combining all aspects of the spectrum's colour structure. These aspects refer to the value, chroma and hue combined into a singular numerical breakdown of the colour spectrum through three important reference points visually defined in Pickard's text that can be further broken down for simplicity as follows:²⁷

1. The Y-axis | Value

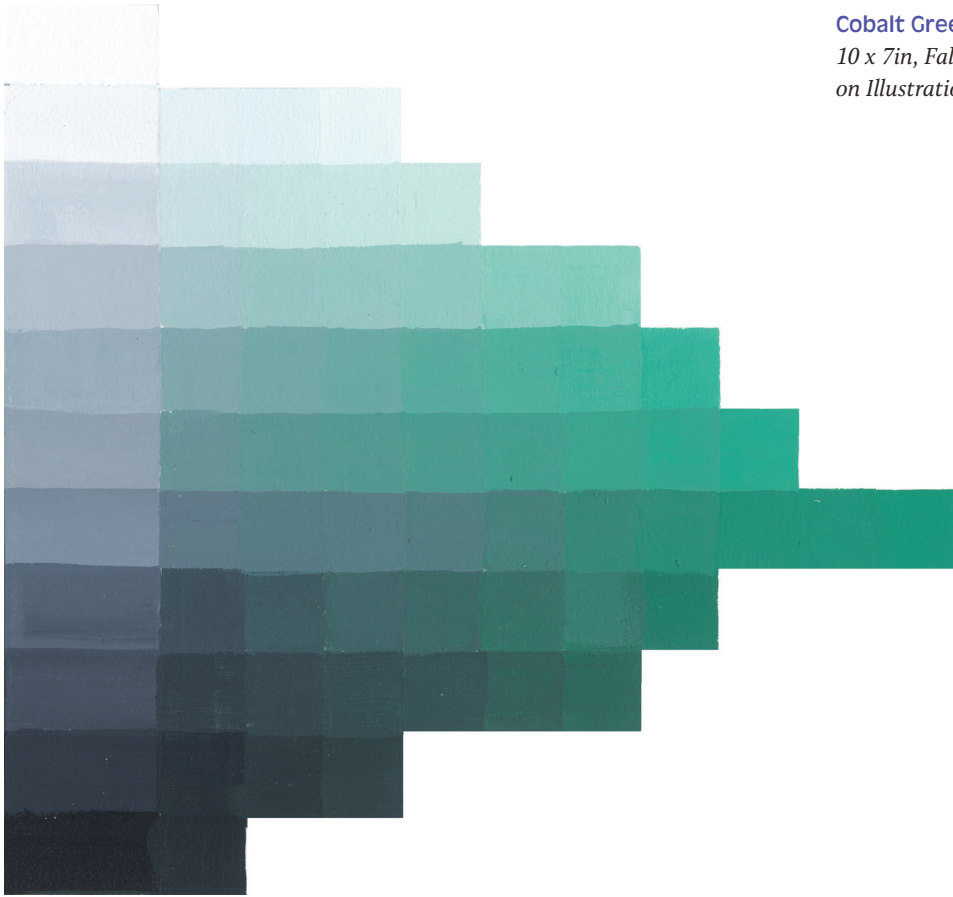
The first reference point to simplify the information considers the colour's value, which is mapped out in a 10-stage value scale along a vertical axis, with the highest of the ten points representing white (10) and the lowest of the points representing black (0). This will be best understood as the 'Trunk of the Colour Tree'.

2. The X-axis | Chroma

The second reference point defines the chroma level of the colour. Imagining the value scale or 'Trunk' as a neutral grey scale, and extending outward from the 10 value points on the horizontal axis up to a maximum of 14 steps, that can be referred to as a 'branch of the Colour Tree'. Each progression from a value level measure the intensity increase of the colour at that value stage, and since a pure colour has a set value level it's reasonable to conclude that the farthest reaching branch from the trunk would extend outward from the given colour's pure value level and the branches would progressively shrink in it's maximum reach through every increasing increment away from the pure colours value spot, meaning the pure colours maximum potential intensity decreasing with every increasing shift towards a darker or lighter value.

Cobalt Green Hue's X,Y Axis

*10 x 7in, Fall 2025 | Acrylic Gouache
on Illustration Board*



3. The Z-axis | Hue

The final reference point to Munsell's tree is through the ten spectral hues, defined with ten-point increments within each hue in Munsell's colour wheel, that wrap around the circumference of the trunk and act as radius points for which the chroma level can branch out towards. These ten points of reference act to determine the position on the colour spectrum each branch belongs to.

The summarization of this analysis means that in this three-dimensional construct, a selected x,y,z coordinate will determine the exact hue, chroma and value level of a colour. And through this notation, one can quickly recognize the exact colour, through knowing that the most vibrant and pure point of a hue will be positioned at the farthest reaching radius point for any of the ten circumference markers. The height of the trunk from which the branch point extends, will determine the given brightness or darkness level of the colour.

Munsell's Colour Space

The benefit of Munsell's three-dimensional space worked best in his time to create precise numerical identifiers that have significantly impacted commercial practices with the advancement of precision printing and numeric systems like Pantone colour identifiers. Furthermore, this system has progressed itself into an essential aspect of the digital age, over 100 years after the theories origin, through standard graphic tools seen in Adobe softwares when selecting precise colours, based off of Munsell's colour space, as our Hue/Saturation/Brightness sliders, and has developed tools of thought for us to predict mixed pigment results for painters with ease, through envisioning a linear path at which you can cross through the colour space, when mixing two colour points.²⁸



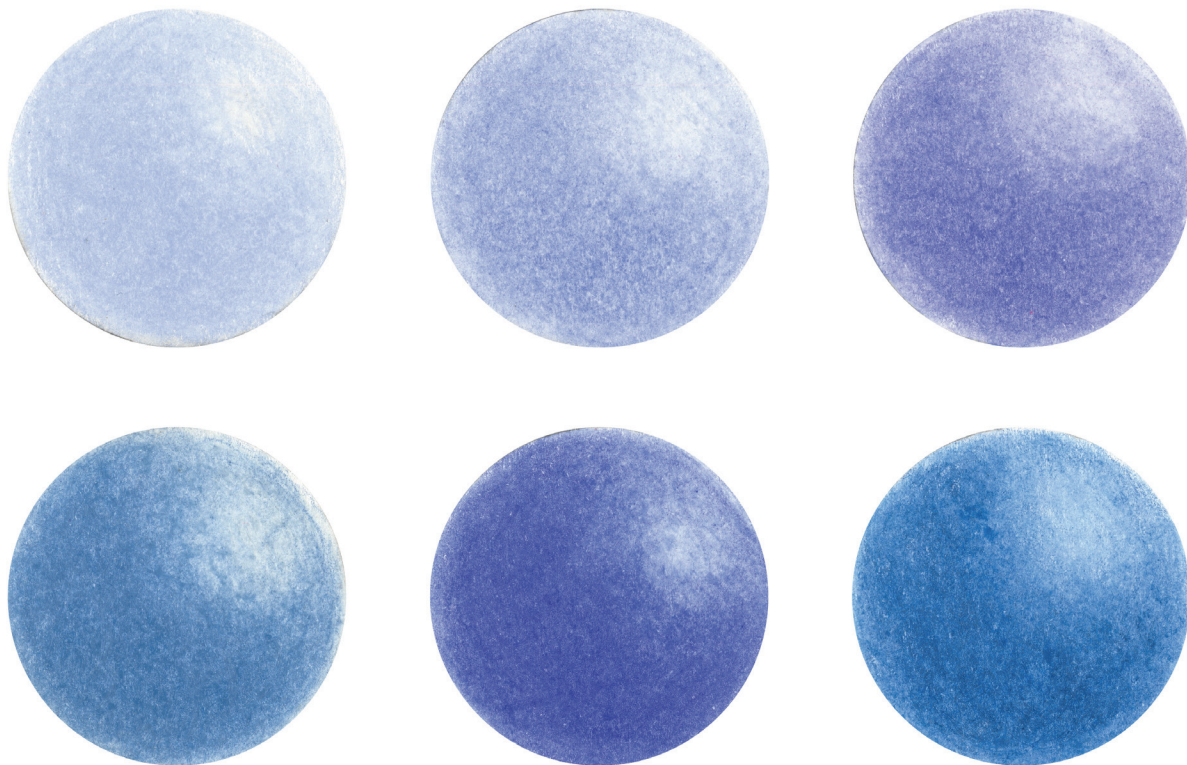
Colour Theory Chair

20 x 26in, Winter 2023 | Coloured
Pencil on Bristol Paper

Interactions of Colour & Light

Three horizontal lines of varying shades of blue and grey, stacked vertically, serving as a decorative element below the title.

Now that we have established the basic foundations of colour theory and understand how to adequately explain the qualities of a colour and the general outcome of mixing colours, we can advance into analyzing the interactions and perceptions of colours. Through this section, we will work to integrate the theory of colour into real-world applications. By understanding form, surface, and light, we can learn how colour interacts through its environment to alter how we visually perceive the world around us.



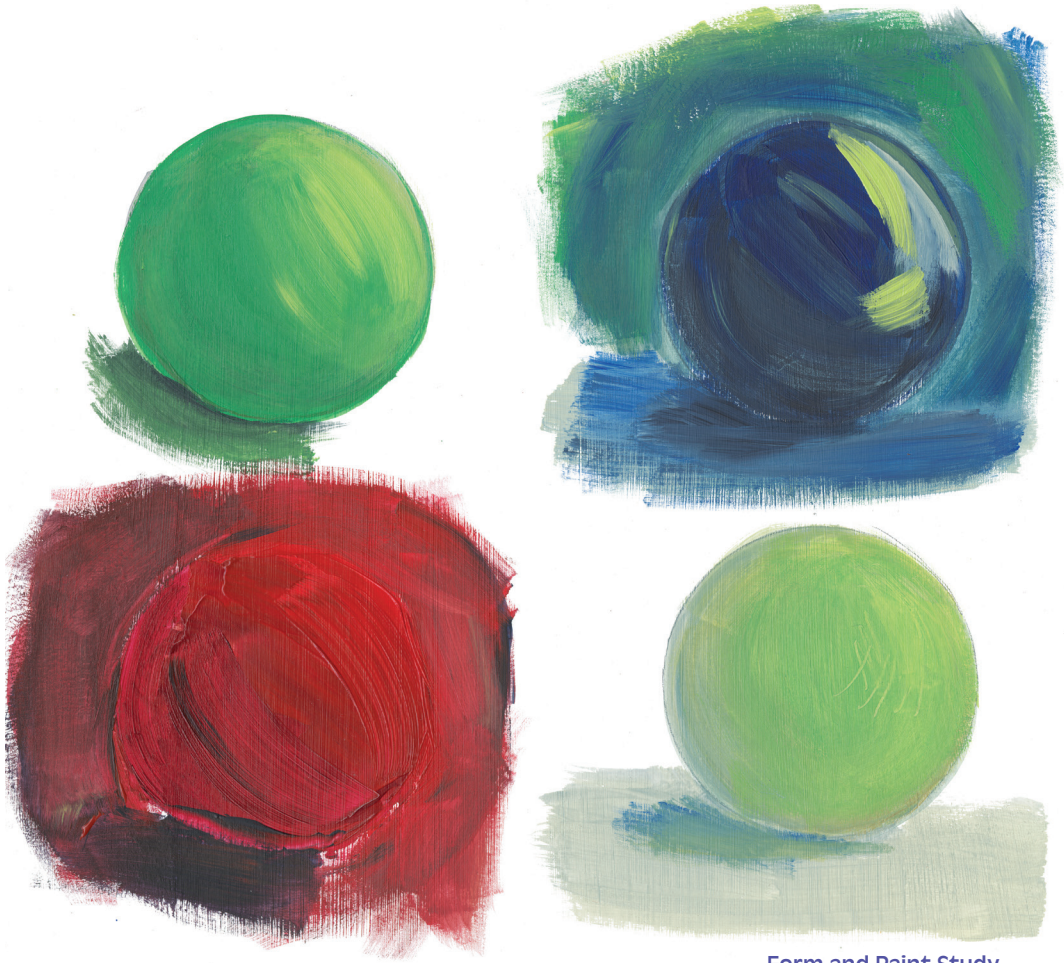
Colour Pencil Study
3 x 7in, Summer 2025 | Coloured
Pencil on Notebook Paper

Local Colour

To start explaining the importance of colour interactions, let's assume that to depict an object's colour, we simply use that exact same colour. For instance, if we were to recreate a red circle, we would use that exact same colour of red in paint and fill in a circle. Now, theoretically and physically, the colours are identical, as you have used the local colour of that first object to reproduce the painted one. But if we reference how Gurney defines local colour with an addendum towards the interaction of the environment. In that case, we can see him describe it in two parts: "Local colour is the colour of the surface of an object as it appears close up in white light...however, the colour you actually mix

to paint the object will usually be different."²⁹ The second part in Gurney's quote is a crucial note regarding differentiating local colour in general terms and in terms of its application within an environment, being that the physical surface of a reference object might be only one colour. Yet, due to the influences of its environment, our visual perception does not see it as such, and if we were to recreate a painting of the object as seen, we would need a variety of alternate paint mixtures to recreate it.

Let's assume the object in our prior explanation is now a red ball with a dimensional form. Let's further assume



Form and Paint Study

*10 x 10in, Spring 2024 | Acrylic on
Gesso Bristol Paper*

it is now placed in a tangible environment, like on top of a kitchen table. If the ball's surface were matte or shiny, how much of the table would be reflected on the ball, and how much of the ball would be influenced by that other surface? If the table were a slightly yellow-coloured wood, we must consider the amount of yellow in the reflection, which impacts how we see that section of the red ball. That section would likely shift closer to an orange hue.

Furthermore, what light source is reflected off the ball and from where? Have you noticed a visual difference in

the area of light versus its shadow? It is fair to say that the subject's surface (local colour) appears altered from the influence of the light source and the colour emitted from this source. This brief analysis begins to paint the picture of the numerous ways in which a physical object's local colour is so easily influenced by the way its environment interacts with the object and with how we piece together all this visual information, and simplify it into seeing, overall, that it is still just that red ball.



Journey Series #5

*8 x 10in, Winter 2025 | Watercolour and
Coloured Pencil on Illustration Board*

Sources of Light

To begin breaking down how colour interacts within a given setting, we must first address the influence of light. In the first section covering basic colour theory, we assumed that a uniform white-light, free of colour influence, maintained a unified point of reference. In a theoretical approach, removing the influence of light makes it easier to understand the principles behind colour theory, and now, when considering the application of colour in art, we can analyze why different light sources will alter the visual outcome of an environment and how it can be adjusted to our benefit.

Let's begin by covering the in-depth research done by Gurney to identify better the different sources of light you'll encounter, what systems of illumination you can predict in them, and what influence they'll have on the environment in relation to the outcome of your final product.



Journey Series #4

8 x 10in, Winter 2025 | Watercolour and
Coloured Pencil on Illustration Board

The Sky & Atmospheric Influence

When considering the influence of light sources, it is important to consider a secondary influencer that constantly surrounds us and, in most settings, adds enough weight to an environment that the reasoning behind its impact is worth noting. While it is not a source that creates its own light, it is a source that surrounds us, and in large enough quantities, it acts to reflect large enough amounts of light onto an environment to instill its own influence. This influence is visibly present when we look up at the sky and wonder what makes it so blue. This introductory section will begin to explore the influence of air molecules, small but mighty in number.

Why do we perceive the sky as blue but not one exact colour of blue, and why do we not perceive the air in front of us to be blue? Considering the amount of air filling the distance between us and the sky versus the amount of air filling the distance from our eyes to our hand might be the answer to our question.

The colour of the skylight and the difference in our perceptions of it is based on a term called Rayleigh Scattering

and works in conjunction with Atmospheric Perspective to explain how it impacts our perception so immensely, without even realizing. Gurney explains that Rayleigh scattering is where the molecules in the air refract more blue and violet hues, which will alter the appearance of objects based on the increased distance between you and the subject. This effect typically desaturates or cools down the colour of objects in the distance, which is why we perceive the sky to be blue, as it is the largest distance and layers of air molecules within our view, developing the blue colouring of the sky.³⁰ While the sky is not one flat colour of blue, is based in relation to the sun's influence on it, if you are looking in the direction of the sun's vicinity, the warm hues of sunlight significantly influence the overall colour in the sky and gradually decrease the further you move in the sky away from the sun; if you are looking at the sky with your back towards the sun the overall sky will appear a more saturated blue, leaning closer to violet.³¹ This quick breakdown will help to explain ways in which to develop the sky's colour gradation.



Exterior Perspective Project
24 x 30in, Fall 2024 | Acrylic on
Canvas

Direct Sunlight

Described by Gurney as present on a clear and sunny day, it offers three illumination systems to consider: the sun, the sky, and the reflected light illuminated from objects. In order of importance, Gurney notes that in this structure, the sun acts as the dominant force, being that the other two systems are created entirely from the sun's influence and act as secondary illumination based on the first.³² This environment offers room for bold and vibrant choices in colour, with the hard shapes of contrast from the light source giving energy and warmth to the setting.

The Primary Illuminator: Sunlight

In this case, the sunlight is vibrantly luminous and will influence the areas illuminated by the sunlight with a warmer colour interaction. The sky or air molecules surround the sunlight as the first point of contact on its way to us, bouncing and illuminating the sky, appearing as a diffused and soft light which reflects the light in many directions across the environment at once. Suppose the direct light source from the sun is casting shadows from objects onto surfaces it does not reach. In that case, it

is more pronouncedly influenced by the two secondary sources, the sky and light reflection from objects illuminated by the sun.

The Secondary Illuminators: The Sky and the Reflected Light

In this setting of a clear sky, it may take on a more blue-violet hue than usual, and as a result, it further impacts the hue of shadows. In relation to the sun's influence on the sky and the casted shadows not reached by the sun, the sky, being a diffused source of light, scatters and aids to illuminate those regions, which in this case create a more prominent blue influence from this source of light into the shadows. However, at the same time, the surfaces where the sunlight is reaching are also reflecting that light outward, which also competes with the skylight by bouncing warm light into the shadow regions, developing a gradation in the shadows where regions less prominently reflecting the sunlit objects/surfaces maintain the more prominent blue influence from the skylight.



Journey Series #3

8 x 10in, Winter 2025 | Watercolour and
Coloured Pencil on Illustration Board

Overcast Light

This environment, a preference for many artists, offers a soft illumination of light created from the cloud covered sky which diffuses and scatters the direction from the sunlight and in turn eliminates the extreme contrasts of direct sunlights amplified light and shadows.³³ Gurney explains that this setting allows artists an easier medium for more complicated scenes, allowing for less dramatic and altering influences on an objects colour from this sources duller and desaturated influence in comparison to direct sunlight. He further explains that from overcast lights' ability to influence a setting more evenly, colours will often appear brighter and purer in relation to the environment's more grey and desaturated influence.³⁴ In contrast to the larger influence of blue the sky has on shadows in direct light, the more clouds in the sky diffuse the sun's influence on the sky and, in turn, decrease the intensity of blue in the shadows.

Window Light

Now that we understand the general influences of lighting in an outdoor setting, we can start to consider how that environment can move indoors and be utilized to an artist's advantage by considering the external factors of how window lighting impacts a stable indoor environment. Window lighting offers an opportunity for a more constant setting while applying some added benefits from the organic light sources. Gurney explains that interior settings in daylight often provide a soft light source that enters through windows or open doorways, and is traditionally popular among artists.³⁷ His explanation focuses on settings where the sun is not directly shining through the window, as I assume the influences highlighted in the direct sunlight section above will need to have the primary influencer of sunlight creating more impact on this light system. However, in most cases, there are two primary factors of influence: any artificial light source from inside the room and the secondary influencers from the direct sunlight section that act to diffuse and reflect lighting into the window source. To clarify, we will call this secondary source the Bounced Light to eliminate confusion between direct sunlight and the window light.

The Artificial Light

Let's start with the source that offers the most control and flexibility to adjust in this environment, the artificial source. This artificial or man-made source refers to the lighting within the space: overhead lighting, lamps, or

The Limitations and Benefits of Overcast

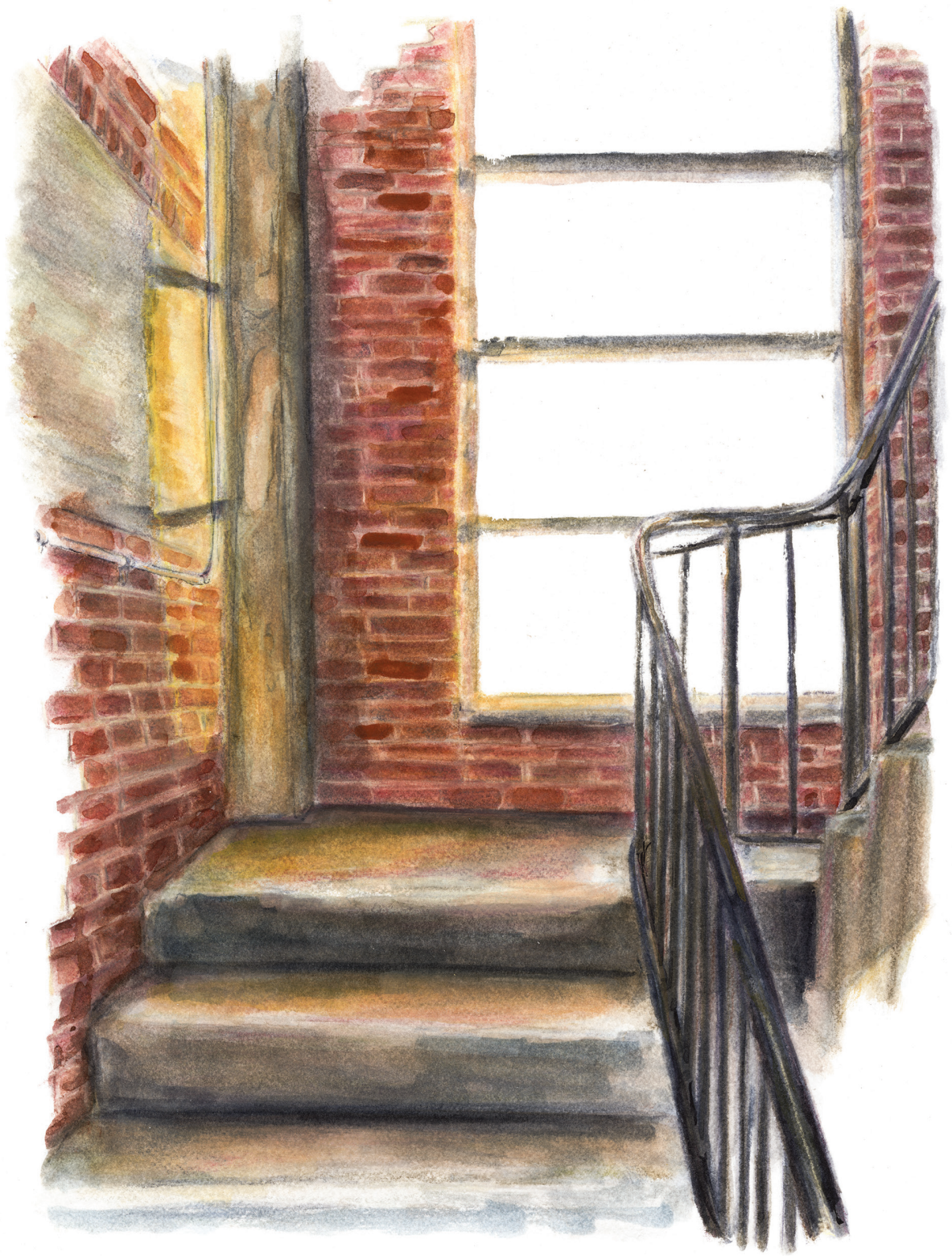
While this light source offers many optimal effects for recreating an object's true colour through reduced influence, it is limited in relation to the ability to recreate this effect in a studio setting. As we will further explore sources of light within indoor settings, we will notice that the uniqueness of this environments ability cannot be fully recreated through window lighting or an optimal ceiling fixtures because it involves a vast amount of considerations and must be an equal and even distribution of diffused light from above.³⁵ However, as Gurney notes, in the event of an overcast light source outside, it is the most advantageous setting for plein air painters to work, as overcast lighting will not change much over the span of a day, giving plein air the most extended duration of time with a subject and maintain stability in their reference.³⁶

other fixtures used to light the space. The angle and direction of these sources can be moved through the space to direct a light source to the targeted area. This source will often be in warmer orange and, in comparison, not as bright as actual sunlight, but within the space, it can become the largest source of light, depending on the amount of light directed from the window. This light will often act to cast an opposing light against the light from the window, if your subject is in some form between the window and the artificial light.

Furthermore, the temperature stated on the lightbulb signals the colour influence of the source. This measurement to assess the bulb's colour temperature is noted in Kelvin(K), which will be explored fully in the upcoming section, Indoor Electric Light Source. Typically, for homes or places of rest/relaxation, a slightly dimmer orange/yellow white lightbulb (in Kelvin reaches around 2200K-3000K) is most common. In contrast, a workplace or space promoting productivity will use a brighter and colder blue white lightbulb (3800K-4500K) that more closely resembles daylight. The type of artificial light you use can also be adjusted to alter the environment and how it interacts with the bounced light source.

The Bounced Light

Similar to how this type of light interacts in direct sunlight, the bounced light comes from two separate sources



Journey Series #1

8 x 10in, Winter 2025 | Watercolour and
Coloured Pencil on Illustration Board



Journey Series #2

8 x 10in, Winter 2025 | Watercolour and
Coloured Pencil on Illustration Board

derived from sunlight and bounces through the window from two opposing paths of origin: the sky from above and reflection from the ground below.

The Sky's Path

As noted from the sky's influence in direct light, we can infer that the blue tone will still be present in this situation. Gurney notes, "the daylight that enters a room from outside is usually bluish. The cool colour contrasts with the relatively orange colour of artificial lights shining in the room,"³⁸ to confirm the predicted influence, and from the angle of the skylight, can further address that it casts predominantly across the room's surface and bounces upward with decreasing influence.

The Ground's Path

Gurney further highlights a secondary source for this bounced light: the influence of direct sunlight's creation of reflected light on the surfaces reached by the sun. This light that reaches the ground will, in turn, bounce upwards again through the window and add to the influence within the room. Gurney highlights this warm hue's influence, which is readily evident on white ceilings and on relatively sunny days, to shift an orange or green influence on the ceiling, dependent on the colour of the ground from things such as grass or dirt.³⁹ While this source of light's influence is further reliant on the amount of sunlight outside to cause this reflection, it is inconsistent compared to the bluish surface influence from the skylight, which is more likely to dominate the window lights' influence.



Still Life | Colour Interactions
24 x 24in, Fall 2024 | Acrylic on
Canvas

Warm light = Cool Shadow Belief

In common terms, by traditional painters who were used to working outside, it was often helpful to consider the system of warm light, cool shadow as a rule to follow. However, Pickard highlights the subjective nature of that term. In consideration of the skylight often creating a cold light source to fill in the space on many surfaces in daylight settings, being a simplified way to understand colour interactions in the past, it is rather more nuanced

than this simplicity. This means that not just the skylight can illuminate the shadow space, but rather the ambient colour of the surrounding sources acts to reflect into the shadow, creating a cool or warm shadow. This understanding, in reality, means that the shadow is dependent on the strongest influence based on the combined sources of light reaching into the area.⁴⁰

Candlelight & Firelight

Moving onward into different light sources adaptable to both indoor and outdoor environments, we must consider both the influence of light from a flame and the fall-off effect to explain the rapid decrease of influence this has in a larger environment. The effects of flame-based lighting benefit from its ability, especially in art storytelling, to draw close attention to nearby areas through the large yellow-orange colour of the flame.⁴¹ This influence is more pronounced in settings where the sun is diminishing its competing influence, such as dusk, dawn, and nighttime, cooling down the larger scope of the environment's colour temperature. In these cases, the brightness and saturation

of warmth surround the source, offering a radiant focal point emanating from elements like lamplighting, candles, or campfires. Additionally, in comparison, the temperature of candlelight is a significantly warmer wavelength (1800K) in contrast to the typical warm lighting seen in artificial lighting of homes (2200K-3000K), which creates a greater orange influence in candlelight. The strength of influence bounces off nearby surfaces, yet diminishes rapidly as the distance increases, creating a dramatic focal point; due to the fall-off effect.

The Importance of Fall-Off

The fall-off is explained by Gurney through the Inverse Square Law, “which states the effect of a light shining on a surface weakens at a rate comparable to the square of the distance between source and surface...at twice the distance, the light is only one fourth as bright because the same rays must cover four times the area.”⁴² Considering this impactor from a source that does not produce a significant amount of light, this fall off appears much more drastic than it would from typical lightbulbs. For comparison, in lumens, which refers to the total light a source emits, a candle typically emits 12 lumens, whereas a 60-watt bulb emits about 800 lumens.⁴³

Indoor Electric Light

To break down the influences on a scene when considering indoor electric lighting, primarily incandescent and fluorescent, Gurney notes three primary qualities to consider when utilizing these environments in artwork: the relative brightness, its hardness or softness, and the difference in their colour cast.⁴⁴

Relative Brightness

The first consideration focuses on the bulb’s brightness or lumens, as explained in the last section when considering the fall off of the light source. When you have multiple sources of light in this setting, it is important to consider the relative brightness emitted from one source in relation to the others, in addition to the type of lamp and its distance to the subject, to understand the reach of influence and potential competing influences.⁴⁵ While wattage, which measures the energy the bulb consumes, can aid in determining sources that produce higher lumens, it is realistically not as important, based on today’s growth in economical energy consumption, yet may still hold value in older light sources or ones that require significantly larger watts to power.

Hardness or Softness

Gurney explains that this influence refers to “how large the patch of light seems from the point of view of the subject.”⁴⁶ He explains that in a hard light, the source comes from a sharp and small point, similar to how the sun or a spotlight relatively appears directional or dramatic with a crisp shadow, surface definition and strong highlights. Soft light emits from a wider area, like the overhead fluorescent striplighting often used in hospitals, schools or workshops. Soft lighting can appear flattering and optimal for what he calls “task lighting,” based on its reduction of the sharp cast shadows and more gradual tonal transitions



Red & Green Colour Study

12 x 16in, Fall 2024 | Acrylic on Wood Board

in comparison.⁴⁷ While it would be more challenging to harden a light source, Gurney explains the simple practices lighting designers utilize for converting hard lights into soft light, which is the reason lamp shades are placed over incandescent bulbs, through the addition of translucent films, fabrics or other materials that bounce or filter away light from its source to the viewer.⁴⁸

Colour Cast

The colour cast refers to the dominant wavelength of a light source, which is often measured in degrees Kelvin(K). This measure defines the dominant colour of light emitted by an object when heated to extreme temperatures.⁴⁹ While the measurement can be hard to differentiate the exact difference between sources, we can infer that generally incandescent lights strongly emit in the red and orange wavelengths and are weakest in the blue, while fluorescents emit strong yellow and green wavelengths. Gurney explains that the strong influence of orange and red in incandescent lighting amplifies red in pictures, making the blue colours appear dead in contrast.⁵⁰ To quickly aid in determining the likely colour cast of a bulb, the lower range in degrees Kelvin will emit warmer lighting. In contrast, higher measurements will emit colder

lighting, and a closer to neutral white lighting will fall around 3500K–4000K.

Streetlights & the Appearance of Night

In determining the lighting influence at night, we must consider traditional sources and the advancement of modern light sources, which now have a greater influence in night settings.

Traditional Night Lighting

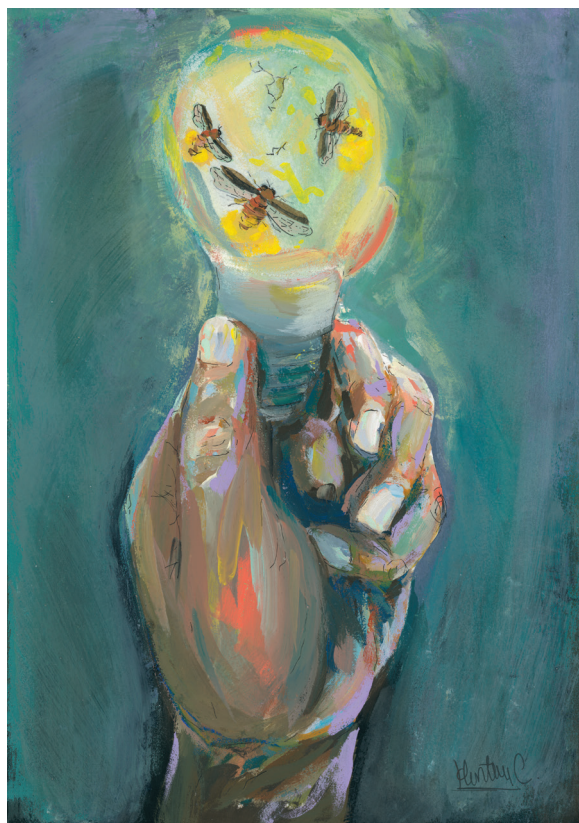
Before the advancement of electrical lighting, artists only had two sources to consider: moonlight and candlelight.⁵¹ Moonlight acts as a dominant cool cast on the environment, which appears blue or leaning towards grey. It creates a cool cast over most of the extended environment, dulling out the definition in shadow and far-away objects. While the orange lighting of candlelight, as explored in the previous segment, creates more impact within these settings, it contrasts the dominant complementary blue influence and develops a slight green/grey influence in regions competing against the moonlight.

Modern Night Lighting

In modern day, with the advancement of electrical light sources, a greater array of competing influences against the moonlight begins to appear.⁵² Gurney highlights that the modern nightscape often includes sources such as incandescent, fluorescent, neon, mercury and sodium vapours, and LEDs, each offering distinct spectral power distribution to consider.⁵³ Because of this range in alternative lighting and the challenges one would face to determine what wavelength the source is emitting, a helpful consideration if photographing a scene yourself would be to include or photograph a second shot in the same environment that provides for known objects of reference to refer back to. The ability to recognize the local colour

Hidden Light Sources

Gurney outlines the hidden light to have three different ways to light a scene: “from a source shining from outside the picture, from a light inside the picture that you can easily see, or from a light inside the scene that’s concealed from view.”⁵⁴ This source creates intrigue and draws curiosity surrounding the area influenced by this source, as the origins remain unknown to the viewer. This can be utilized in combination of ways, such as, natural sources



The Economic Electrical Draft

7 x 10in, Winter 2023 | Acrylic Gouache
on Hotpress Watercolour Paper

of those objects and the influence of their appearance within the setting will be a helpful tool in distinguishing the colour influence the lighting had over those objects and can generalize the influence on the objects within its vicinity. Realistically, comparing a colour wheel in this example would provide the best determinants of the environment's influence, but wouldn't be a practical solution to carry with you in day-to-day life constantly.

like moonlight in a doorway giving a predicable influence to colour and direction, or integrating hidden sources that emit different colour influences from various angles that create dynamic changes to the planes of a subject, determined by which source dominates the colour influence at specific angles and which can offer contrasting temperature shifts.



The Economic Electrician

*8 x 10in, Fall Winter 2023 | Acrylic
Gouache & Ink on Bristol Paper*

Luminescence

Gurney explains that luminescent light appears similarly to incandescent lighting, which gives off a warm light from heat, but instead gives off a glow at a cool temperature.⁵⁵ Furthermore, he establishes that this source can be produced by both living and nonliving things through bioluminescent and fluorescent means. Gurney notes in his analysis that these luminescent colours typically display a gradational shift of hues, with blue-green being the most common in the ocean.⁵⁶

Bioluminescent Light

This light can be produced by organisms in the ocean, like jellyfish and algae, or from land organisms, like fireflies, centipedes, and some mushrooms that grow from rotting wood, emitting a light called foxfire.⁵⁷

Fluorescent Light

This source is produced through objects that convert invisible electromagnetic energy, like ultraviolet rays, into the visible spectrum. Some minerals or crystals produce this type of light when exposed to ultraviolet rays.⁵⁸



Underpainting Study

*11 x 16in, Fall 2024 | Acrylic on Gesso
Ripple Paper*

Form & Light Conditions

Form Principle

To understand the effect of light on a subject, developing the way we visually perceive its shape and form, we must consider the laws of tonal contrast to achieve an accurate rendering of the subject. We must analyze the form principle to break down how light interacts tonally on a subject properly. Gurney defines the form principle as the analysis of nature regarding how lighting on a geometric solid will create a logical series of tones in a predictable order according to the laws of tonal contrast.⁵⁹ When analyzing the form principle, the light source will be crucial in determining the approach to this topic and considering the subject's shape. While this rule outlines the approach regarding geometric shapes, cubes, spheres, pyramids, cylinders, etc., its foundational knowledge can be applied to adjust for more organic shapes based on this principle.



Hydroflask Ad
7 x 10in, Winter 2023 | Acrylic
Gouache on Hot Press Paper

Conditions of Light

The primary consideration when assessing light is deciding the hardness or softness of the light source. A quick rule of thumb would be the consideration between the appearance of shadows in direct sunlight, being a hard division, and shadows in overcast light, which appear soft with a greater tonal diffusion.⁶⁰

Breaking Down Hard Light

If we take an example that clearly highlights the series of tone changes, recreating the hard lines of a solid sphere

lit by a singular light source in a daylight setting, creating tonal contrast across the form, we can infer several breakdowns. In this case, there will be a clear distinction between a light and dark side to the sphere, separated by the terminal line.

The Light Side

In the light side of the sphere, which is the side on which the subject faces the direction of the light source, only the light to dark halftones, the center light, and the highlight will be present.⁶¹



Egg Form Study

10 x 14in, Spring 2024 | Watercolour
on Arches Cold Press Paper

The Center Light

The center light, located directly across from the light source, as light will always travel in a straight line, is the surface plane perpendicular to the light and receives the most direct light from the source.⁶² As this factor is directly related to the light source, its region will remain unchanged unless the object or source is repositioned.

The Highlight

Unlike the center light, the highlight includes the viewer in the relationship, determining its location. As the highlight reflects the light source to the viewer from the object's surface, its position depends on your relation to the object. Since it reflects the light source to our eye, it is the brightest point perceived on the object.⁶³ It is crucial not to mix up the illumination's gradation of the center light point as being the point at which the highlight is located, as the highlight can change position, but the center light will be fixed.

The Halftones

The halftones are in the region of the object between the center light and the terminator, in a gradually shifting tonal range that starts with the lightest halftone, nearest the center light, and progressively transitions until the darkest halftone meets the terminator.

The Terminator

Gurney describes the terminator as the transitional region between the light side and the dark. It occurs at the tangent point where the light rays touch the edge of the form and do not continue directly reaching the surface past this point.⁶⁴ In this region, the light source becomes softer and indirect, creating a more gradual transition near this region as the form shadow begins just beyond the terminator.⁶⁵

The Dark Side

The shadows begin on the dark side of the form after passing over the terminator line. The shadow is not the absence of light; rather, it eliminates the direct light from influencing this region and is now influenced by the



Figure Tonal Study

10 x 14in, Spring 2024 | Ink on
Watercolour Ripple Paper

light of other weaker sources reflected into this region.⁶⁶ Gurney explains that this reflected light raises the tones within this region and is derived from light bouncing off of nearby surfaces or the ground, with the darkest space at the point of contact with another surface, called the occlusion shadow.⁶⁷

Considerations in the Shadows

While rendering the object's shadow region, consider the darker regions and visual factors to better represent this space's distinction. Consider the core of the shadow's structure when representing this space outside the

occlusion shadow. Gurney points out the dark region just past the terminator line, referred to as the core or hump of the shadow, which only occurs when the secondary reflected light sources are not prominent enough to overlap with the primary light source.⁶⁸ In addition to observing for the core shadow, the consideration that visually the eye cannot perceive subtleties as clearly within darker regions and should be rendered with this in consideration by reducing the textural detail in the darker side compared to the light side for a more accurate appearance of the form.⁶⁹

Working in Diffused Light

While working in harder, direct light settings offers a clear breakdown in defining the appearance of the form principle, there is a more overlapped application of these rules in diffused light settings. Gurney explains that there are no clear distinctions between the light and dark side or the terminator line within scenes of softer light.⁷⁰ However, he analyzes that the more upward or source-facing sides will likely appear lighter, often due to the diffused lighting in overhead light sources or clouds that distribute more light across those regions, even in areas considered as a region of shadow, as the diffused lighting will still scatter within these regions falling outside of the dominant light source.⁷¹ As the more shaded sides will still lean lighter than in a direct setting, the occlusion shadows will still maintain regions of the darkest space from the contact between surfaces.

Cast Shadow

When rendering an environmental setting, you must also look past the object itself and consider the effect of the shadow it casts on the surrounding surface, called the cast shadow. This dark region aids in establishing the object's depth and presence within the environment. This shadow pertains to the obstructed region past the object not directly reached by the dominant light source. As a result, the influence of the region's colour temperature is determined based on the reflected sources within the surrounding vicinity. This breakdown is explored in application through Gurney's text, which states: "On sunny days, cast shadows tend to be blue because they look up to the blue of the sky...on partly cloudy days, the light above is more white, ... and other sources are more dominant."⁷²

The Light at the Casts Edge

While a cast shadow is closely associated with the temperature of the other reflected sources, it will also characteristically act in relationship to the nature of the source. Gurney points out that in soft lighting, the edges of a cast shadow carry a more diffused trait with blurry edges, while a hard light source will cast a harder and sharper edge in comparison.⁷³ Yet, in addition to source light, one must also consider distancing in this analysis. This refers to both the distance from the object and the surface it is casting on, and the distance in that relationship from the distance of the viewer. This is explained through the text and image analysis in Gurney's work when referencing a hard light's cast shadow, the surface close to the object creating the shadow will be the region with the sharpest distinction between shadow and light, yet in the example



Tonal Form Study

10 x 16in, Fall 2024 | Acrylic on Gesso
Ripple Paper

of a tall building casting across the ground, he analyses the further from the origin of the shadow, like the cast of the fourth floor being much farther away, the edges will in turn become blurry and diffused, due to increased influence from secondary sources and more reflected lighting reaching between that space.⁷⁴ In turn, this will also impact the appearance of spaces further away from the viewer, partly due to the influence of atmospheric perspective reflecting more of the blue in the skylight between you and the reference. This understanding can become a perceptive tool in rendering environments to appear more realistic in depth by developing the visual illusion of spacing, through enhancing the separation of foreground and background on a two-dimensional surface.

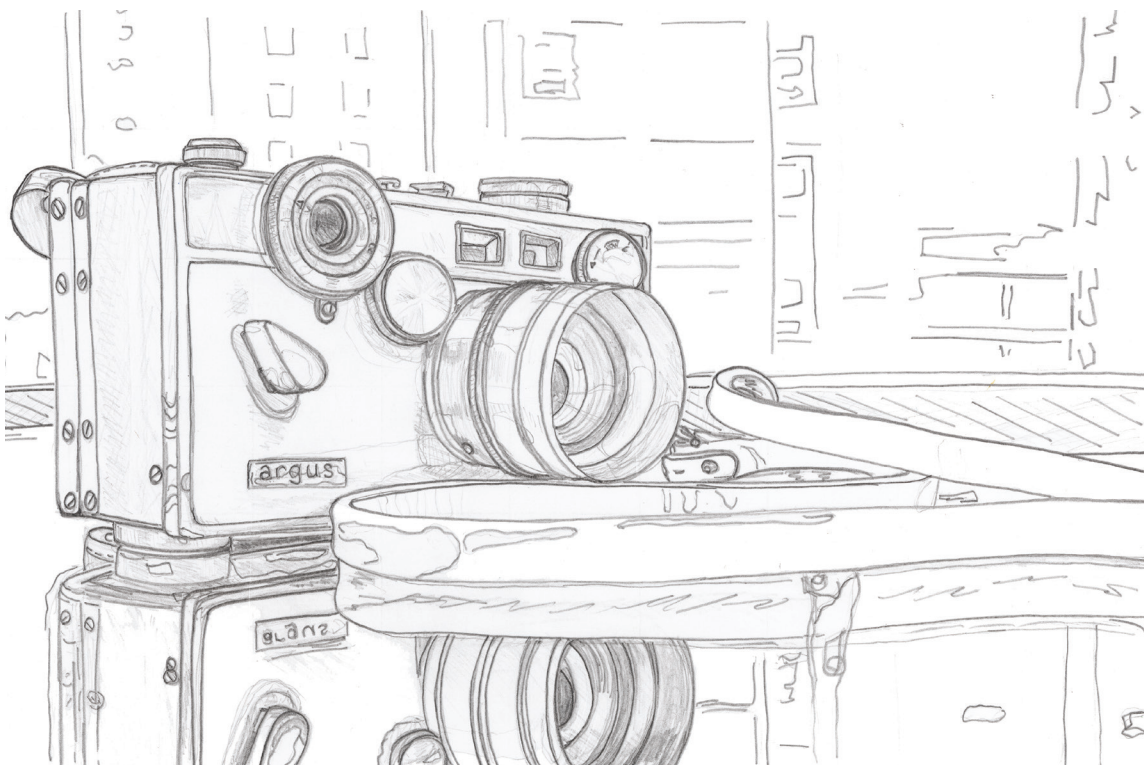


Future World Series #1

*11 x 16in, Winter 2025 | Coloured
Pencil on Arches Hot Press*

The Effect of Special Surfaces

In the prior sections, we assessed how to understand and predict how light influences a subject with the added assumption of a solid object without special characteristics to the surface. The following regions explore what happens to light if the surface conditions or qualities create a new interaction outside the general systems outlined previously. These special conditions can appear within the previously stated environments, but we will have an alternate approach to how we might predict the lights' interaction with these objects.



Reflection Outline

10 x 8in, Spring 2024 | Pencil on
Bristol Paper

Reflected Light

With the foundational understanding of how a source light influences the environment and offers structure in perceiving forms, we can now push our knowledge past the primary sources of influence and expand upon the brief acknowledgement given towards reflected lighting into a refined ability to predict, use, and adapt this source. Gurney explains that “every object in a scene that receives strong light becomes its own source of light. Therefore any nearby area of shadow will be affected by it,”⁷⁵ which explains that while a primary source of light asserts its dominance over a setting, it will then, in turn, act to create new light sources independently from the original source as subsequent sources producing new influence towards the environment, specifically in regions of weak to no influence from the primary.

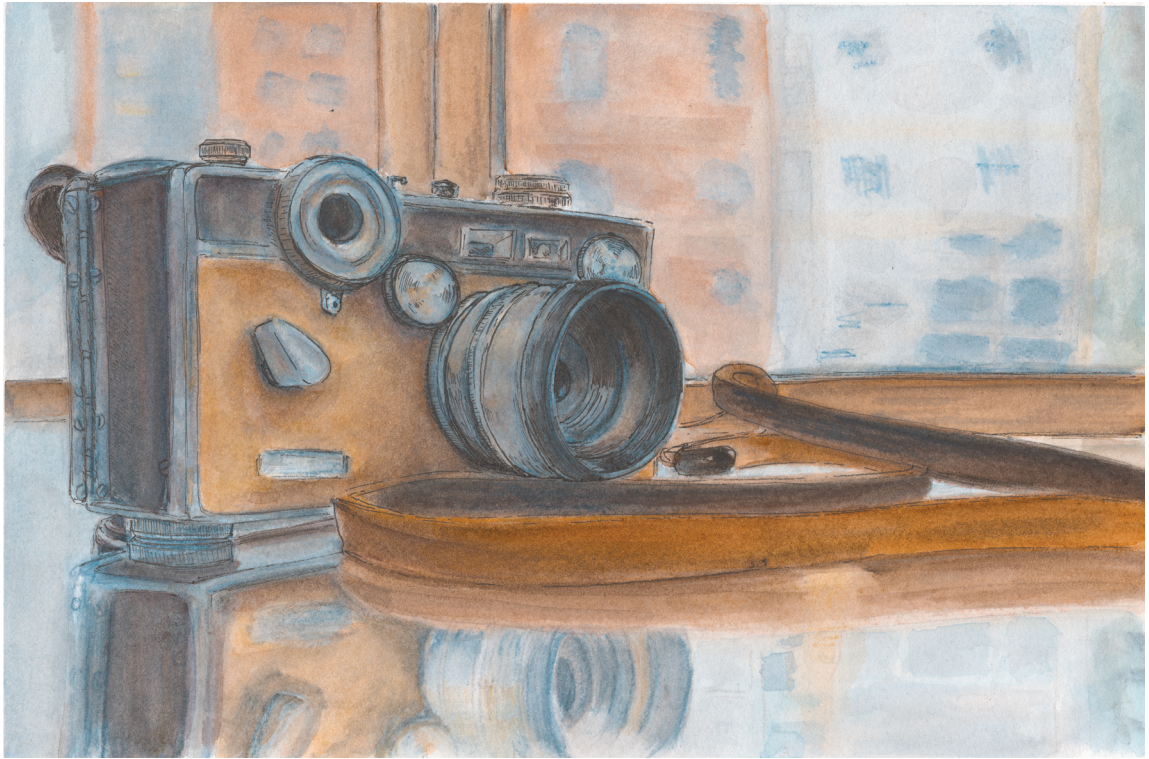
The Influence of Objects

If a bright light source is shining upon an object, it will become apparent that the object begins to emit its own

light by reflecting the original source off its surface with the added qualities of that object. This can be apparent by adding a white surface beside the reflected object while keeping it at an angle away from the original light source, and we will notice the object’s colour carrying its influence when bouncing onto the adjacent surface. In addition to this effect, Gurney highlights the rapid fall-off of influence the further away from the reflected source, and the colour of the influence will gradually mix into the colours of the surrounding areas.⁷⁶

The Angle of Planes

While we can utilize the influence of colour reflecting onto surfaces by changing the colour of surrounding objects and the angles at which the source light hits them, there are general rules of thumb when considering the temperature of light being reflected in natural environments. Gurney highlights these as the five general truths for colour influence in reflected light:⁷⁷



Reflection Project

10 x 8in, Spring 2024 | Ink &

Watercolour on Arches Cold Press

Up and Down Planes

For shadows in general, you can assume that upward-facing planes are cool and downward-facing planes are warm. This is most likely due to the cool nature of the sky-light moving downward, whereas the reflection upward from the ground is often warm.

Reflected Fall-Off

Unless the reflected source is very large in comparison, the reflected light will fall off quickly as you move away from the source.

Isolating the Effect

If you can remove additional sources of reflected light and isolate any additional fill lights from the area, leaving only the primary light source and a more pronounced shadow, the influence from the reflected light will appear more pronounced.

Distinguishing Colour in Shadow

To understand the colour apparent within the shadow regions, you must factor the sum of all illumination reflected from the surrounding sources to combine with the local colour of the shadow's surface.

Predictable Sunny Planes

On a sunny day, in addition to the influence between the upward and downward planes stated prior, we can assume that vertical planes fall in conjunction with both and will then receive two reflected sources: the warm reflection upward from the ground and the cool downward reflection from the blue sky.

The Verdict Plant
11 x 16in, Fall 2025 | Coloured Pencil
on Arches Hot Press



Transmitted Light

We'll start these specialized surface interactions with the concept of transmitted light. This effect occurs when light travels through thin, transparent materials like plant leaves or stained glass. This light source, passing through, creates a light richly infused with the colour of the surface, while the prior surfaces learned, which only create reflected light, feel dull by comparison.⁷⁸ Through Gurney's analysis, breaking down this effect on plant life, we can develop several key takeaways to consider when working with plant life and botanicals.

The Four Lights on Leaves

In scenes filled with foliage, it's essential to understand the nuances in play when working with large segments of surfaces acting on different planes for the transmitted light, altering the saturation, highlights, and subtle changes between greens and yellows to achieve realistic renderings.⁷⁹ When considering trees or foliage backlit by the sun, these four distinct changes in foliage will be apparent, regardless of the ability to distinguish individual leaves. He notes practices aimed at grouping regions of the tree where the following four categories most apparently apply.

The Transmitted Light

In regions of foliage where the leaf is in direct sunlight and the viewer sees the backside of the leaf where the transmitted light is passing through, a strong chromatic effect is in play. This effect enriches both the warm influence of the sunlight and the green of the foliage, thus creating a vibrant yellow-green mixture.

The Direct Sunlight

In the region where the leaf is in direct sunlight and the viewer sees the topside of the leaf before the light passes through to create transmitted lighting, it takes on the normal surface interaction. This region shows the area of the highest value scale, as it also reflects light off its surface. Gurney also notes this region to be of lower chroma, in part due to the waxy surfacing of the leaf, but with additional consideration that, in comparison to the amplified richness of transmitted light, this region is dull in contrast.⁸⁰ This section also carries the most textural region to consider, as Gurney explicitly noted regarding the areas nearest the terminator lines.⁸¹

The Leaf in Shadow | Down-facing Shadow

In instances of shadow on the leaf while having a downward angle, it has the regions of darkest greens and

receives a warmer influence from the warm surface reflection bouncing upward. This is with the consideration of proximity to the reflected lighting off other leaves, which can impact the value of the shadow.

The Leaf in Shadow | Up-facing Shadow

For cases where the leaf's shadow faces upward, the planes are influenced by the sky's blue lighting and will shift these regions towards a blue-green colouring.

In all aspects, while considering the influences of light upon these four categories, we must consider that, in theory, this is the general rule of thumb. External influences reflected from additional sources or other objects will still alter influence in some way and should be considered a factor when working in real settings.

Subsurface Scattering

Continuing to develop our understanding of translucent interactions where some light passes through and some reflects, we must now consider what effect this will have on subjects with more depth and volume than in thinner subjects, where transmitted light is created. Light spreads beneath the surface level for these instances, creating a glowing effect called subsurface scattering.⁸² Example instances where this effect takes place can be seen in pieces of fruit like orange slices, or in skin like ears and the edges of fingers; holding one's hand up against a light source will show that these regions with fewer layers of skin will illuminate.

In instances of depth in translucent subjects, the surface, when front-lit, appears to reflect less light to the viewer, resulting from more light being trapped inside to bounce around and eventually pass through the opposing end, creating a glowing effect out that side.⁸³ The thicker the object is, the light is required to move through more surface area to exit, and in turn, more will be absorbed inside, so the thinner the object, the brighter the glow will become.⁸⁴ Some of the effects can be seen from the front-lit side, but primarily will impact the back-lit side, and Gurney highlights that this effect will show up more strikingly if three conditions are met: "Translucent flesh, small forms, and backlighting."⁸⁵



RedBull Lighting Study
8 x 10in, Fall 2025 | Acrylic on
Illustration Board

Specular Reflections

Unlike the most common material quality in objects, matte materials, which exhibit a combination of light interactions such as reflection, absorption, and transmission, some materials maximize reflection qualities.

Pickard defines these as specular reflectors: “perfect reflectors of light, such as mirrors,”⁸⁶ while other shiny materials he describes as imperfect specular reflectors. So how does this work, and how can we account for it when

describing this instance in art? These surfaces reflect the light off their surface at the same relative angle away from which the light approached it. In contrast, surfaces like matte materials diffuse the reflection in all directions.⁸⁷ To recreate the effects of specular reflectors, one must consider three rules for specular rendering:

Reflection Strength

In paint application, the more reflective the surface, the broader the value range needed to recreate it.⁸⁸

Curved Surfaces

If the subject's surface is convex or curved, the reflected view increases and includes a miniature view of the surrounding scene, often beyond the extent of your composition.⁸⁹ In addition to this understanding, Pickard highlights the extent of the curve, being mild to extreme, will act to push the reflection tighter together by creating the appearance of less space between the objects. In contrast, in concave mirrors, light reflects into a singular focal point that can be found if the image is placed in a position where its reflection extends across the entirety of the reflected surface.⁹⁰ Additionally, in consideration, when a subject is within the focal point range, the distortion is easy to recognize as a stretched reflection. In contrast, when it extends past the focal point, two things occur: light begins to overlap with itself and will, in turn,

create a flipped positioning of the reflected objects on alternate sides of the mirror, in addition to squishing the objects, similarly to how a convex reflection acts.⁹¹

Layering the Reflection

When approaching this surface in digital or physical mediums, it's best practice to model the form of the subject as an initial layer to understand the structural principles of the form first, and then add the reflected imagery over the form, as the normal modelling will influence the way in which the reflection appears.⁹²

In addition to the effects of specular reflection from mirrored sources, it can have a further extensive approach to other subjects in the form of highlights. Highlights are seen as specular reflections created from wet and shiny surfaces that act to directly reflect the light source off a surface angle to you. These highlights will be visible in any plane that is parallel to that mirrored surface and will act to reflect the highlight of this light source to you.⁹³ When recreating these reflections, one must consider the lessons within the form principle, as highlights act in relation to the viewer and will move based on your position, so the highlights do not act in accordance of the center lighting of the subject but will be the brightest tonal value of the object.

Coloured Light Interactions

While considering the influence of a light source on a subject, one must consider the impact of multiple light sources on a subject and the interaction that will be created. This refers to the meaning of colour mixtures with light that we refer to as Additive Colour Mixing.⁹⁴ Additive colour mixing occurs as a colour blending of light in the eye, unlike subtractive colour mixing with pigments, where blending creates a lower colour value; additive mixing results in a higher value than either source can offer independently.⁹⁵

The resulting hues of additive mixing also differ from subtractive or pigment mixing. When working with green and red-toned lights against a subject, the overlapping regions of these two sources will, in turn, create yellow-toned light. This infers a key detail when predicting the paint pigments to use when rendering light interactions, which will actually be mixed through an RGB colour wheel. When predicting how two colours will overlap, as a painter, one might think of it in an RBY scale, but interactions will

need to be viewed in the scope of RGB and then rendered through subtractive paint mixing.

In addition to the standard assumption of working with a singular light source, such as daylight, where the shadow's influence is determined by either the skylight, reflected ground, or a combination based on the angle, if two light sources shine onto the same subject, the subject will produce two cast shadows acting in relation to their respective source. However, in this circumstance, the light source from the other source will become the influencing source on the opposing cast shadow, creating complementary shadows of the other source.⁹⁶



Adjusting Colour & Outcome

In the final section of the research, we delve deeper into art application with the previous methods and theories on understanding the environment, its influences, and how to adapt to them and predict the perception of colour in realistic settings. Now we can approach the method of unified colour adjustment and image outcome. Here, we will begin this section by explaining how altering colour can still represent reality, focusing on colour in adaptation to extreme coloured lighting environments in conjunction with the idea of colour constancy, which explores why we still interpret these extreme colour influences as realistic. Next, we will explore the use of palette selection in artwork, from understanding colour harmonies and colour strings that will refine our understanding of paint mixing as we move into the culmination of these topics through the understanding of gamut. Through gamut, we will explore how to map it into a gamut mask based on limiting its shape to colour schemes that will create a controlled gamut range for approaching artwork.

Covid Identity Project

*11 x 14in, Spring 2024 | Acrylic on
Canvas Board*



Some Silence is Loud Series #2-3
 7 x 9.8in, Winter 2025 | Acrylic
 Gouache on Illustration Board

Coloured Light Sources

While a white light source can be ideal to assess the local colours of objects, as artists, altering the colour of an environment can hold power in what you are trying to represent within your work. To understand how to shift the colour of an environment, you must understand how it impacts all aspects within the environment. In Pickard's research study on coloured light sources, he examines how alternating the colour of light projected onto a line of seven coloured balls, representing the colour spectrum (Red, Orange, Yellow, Green, Cyan, Blue, Magenta), changes the chroma and hue of the objects' local colours in extreme colour settings. In these experiments, he first starts with white light, to express all colours with minimal influence and compare the differences in three colour category experiments.⁹⁷

Warm & Cool Lights

In more common situations, Pickard analyzes working with more balanced warm and cool lights seen in everyday environments, creating a less extreme version of the previous situations. In these light settings, the green object, which, considering the spectrum influence, is typically considered a neutral-toned colour, will show the least influence from these sources, remaining primarily unchanged. However, Pickard analyzed an essential factor about the remaining spectrum when shifting your palette in these settings: "In cool light, the cold colours that are usually less chromatic become more chromatic, while warm colours appear darker and less chromatic. The reverse effect is true for warm light."⁹⁸ This breakdown on adjusting colour outcomes in the extremes and the natural settings can become a helpful tool when aiming to alter the approach of one's palette to their benefit in hiding and amplifying regions of focus in your artwork that will be explored further through the upcoming sections.



Some Silence is Loud Series #4-5
7 x 9.8in, Winter 2025 | Acrylic
Gouache on Illustration Board

Primary Coloured Light Sources

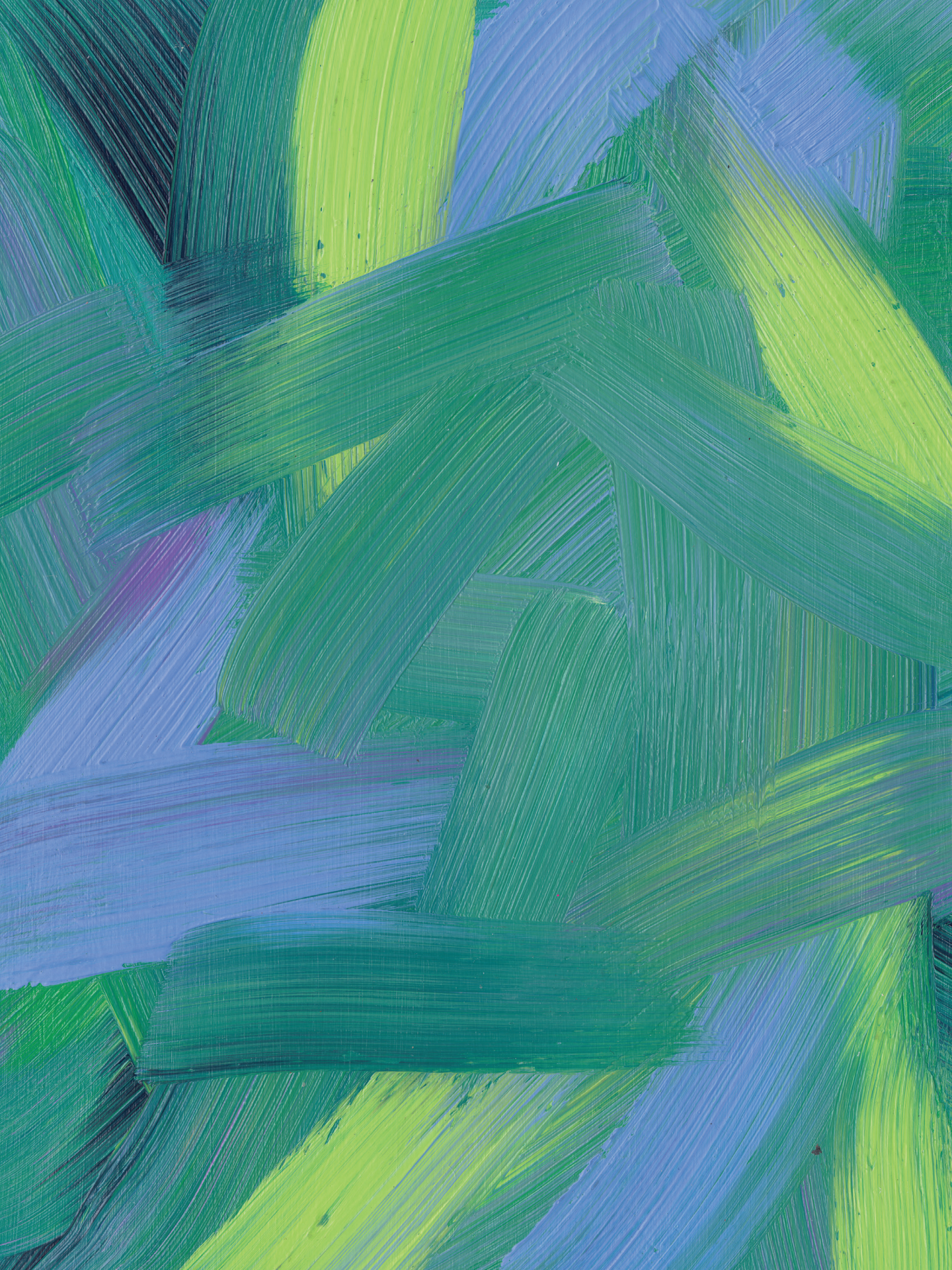
The first experiment examines how the seven colours interact with a primary coloured light source (Red, green, and Blue). In this extreme setting where only one primary light is present within the environment, he shows that the other two primary colours cannot reflect light, and in turn will appear as a black local coloured object. In each environment, only the colours with that primary colour included will act to reflect that light, stating the “first rule of coloured light: The local colour of an object will mix subtractively with the colour of a coloured light source.”⁹⁹ The colours visible in each light are as follows;

- Red light reflects light on red, orange, yellow, and magenta objects.
- Green light reflects light on yellow, green, and cyan objects.
- Blue light reflects light on cyan and blue objects.

Secondary Coloured Light Sources

In instances of a secondary light source, which includes two colour wavelengths (Cyan, Magenta, or Yellow), we can still observe a third colour when only two wavelengths are present. This signals that we do not need every wavelength in light to perceive different colours. This highlights the second rule from Pickard: “We only need to worry about the RGB portion of our light. The other colours will resolve in our eyes.”¹⁰⁰ In these cases, two primaries are reflecting, and the only colours that do not reflect light, and appear as black are as follows;

- Cyan light reflects on blue and green surfaces, while the red object appears black.
- Magenta light reflects on blue and red surfaces, while the green object appears black.
- Yellow light reflects on green and red surfaces, while the blue object appears black.



Colour Harmony

To begin the analysis of colour harmony and complementary pairings, we must first outline the basic terminology for selecting these pairings, based on the information provided by The Color Wheel Company;¹⁰¹

Harmonious Colour Schemes

Monochromatic

Using only shades, tints or tones of one colour. If you choose blue, the variations would be the selected blue's tonal range.

Analogous

Using only shades, tints or tones of colours in a segment where all colours lie adjacent on the wheel. An example would be using Red, Red-Violet, and Violet's tonal ranges.

Achromatic

Utilizing a scheme without colour, only black, grey or white.

Complementary Colours

The combination of a shade, tint, or tone of one colour with the colour opposite to it on the wheel. Examples on a traditional wheel: Blue – Orange, Red – Green, Yellow – Violet.

Split Complements

Selecting one colour and the two additional colours beside the complementary colour. Example on a traditional wheel: Yellow and the two colours adjacent to violet (Red-Violet and Blue-Violet)

Diad

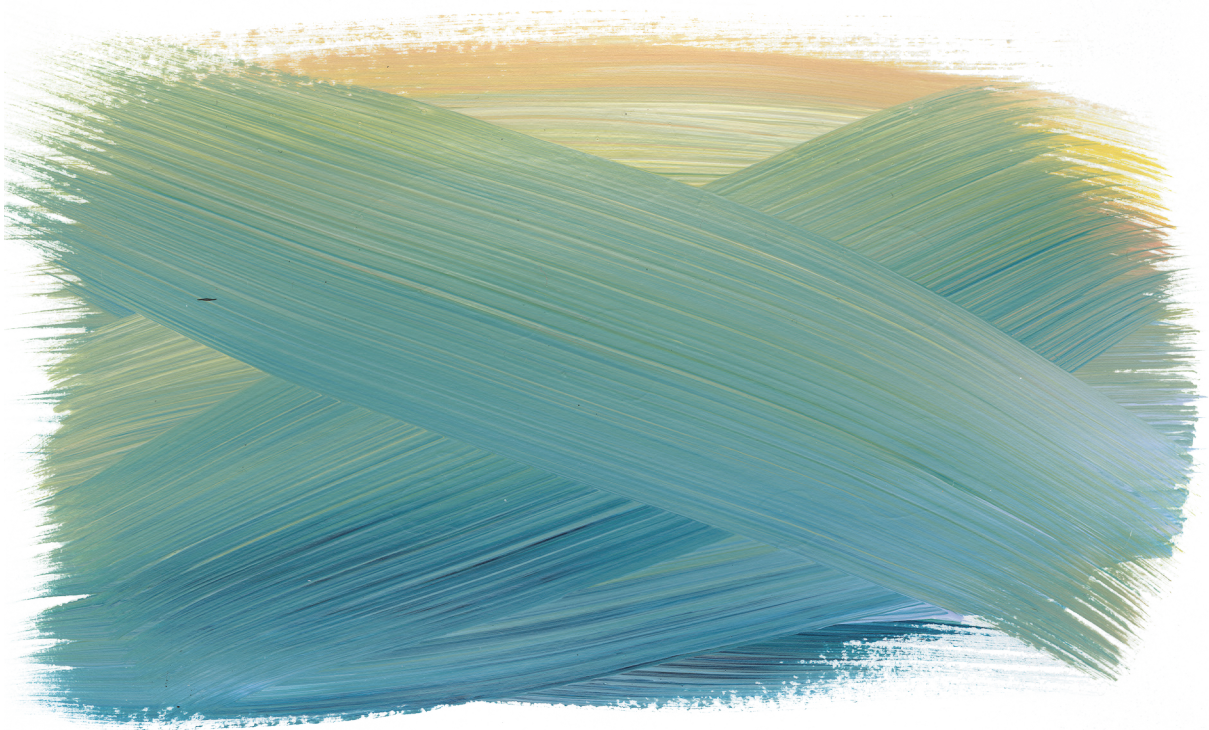
A diad pairing is two colours that are two colours apart on the colour wheel, such as Blue and Yellow-Green.

Triad

This colour scheme selects three colours that are equally spaced apart on the wheel. Examples on a traditional wheel could consist of the primaries (Red, Blue, and Yellow) or the secondary colours (Orange, Green, and Violet).

Tetrad

This refers to utilizing a contrast of four or more colours on the wheel.



Developing Colour Harmony

As Marco Bucci explained, colour harmony is “the combination of simultaneously displayed colours that produce a pleasing effect,”¹⁰² which is a crucial factor when deciding how to select a colour palette. While deciding on a harmonious colour scheme can be a good place to start, it is more nuanced than just choosing base hues. Considering a selected scheme, we should consider how it will represent the subject matter and lighting influences on the form.

Suppose we use pure colours to saturate the surface thoroughly. In that case, the clash of high contrast and colour shifts can quickly become harsh and disorienting in terms of subtle transitioning and harmony. When mixing

colours to recreate a subject, we often rely on intuition in colour selection and experiment with combinations until we determine visually pleasing outcomes. Other times, we may resort to incorporating additional pigments and premixed paints or become heavily reliant on remixing to match every noted shift in colour to depict the subject. However, considering colour constancy, the same colour can appear drastically different in other regions based on the surrounding influences and disorients our approach to the subject. We must consider the power of desaturation and grey to address these conflicting issues and consider trial-and-error approaches.

The Grey Approach

Bucci highlights the adaptability of grey to be significant based on its ability to communicate with other colours. If we lower the saturation in our selected colour palette, we could establish a common ground between them since “the colours are now based on relative degrees of grey.”¹⁰³ By utilizing the subtle transitioning of colours on a desaturated level, we can create smoother transitions within these regions to utilize the very saturated versions to accent the overall picture. Through Bucci’s video lecture, he explored the benefits of the transitional qualities of greys relative to the surrounding environment by considering colour constancy. In the demonstration, using the same neutral grey, he places the grey pigment in two separate regions

of his painting. When placing the neutral grey in an environment saturated with orange, the grey appears closer to blue; if mapped out on a colour wheel, we can analyze that in comparison to the orange, it’s the closest colour to the opposite side of the wheel (blue), which leaves the impression that the colour is the complement of orange. This example is also adaptable across the palette, as vice versa to the orange, if the neutral grey is placed in a blue dominant region, it will appear closer to orange, as in contrast, it is now the warmest colour in relation, rather than in the orange dominant space, it was the coldest. This complementary relationship does not, in addition, need to be possible solely from exact complementary pairings either.



Tapestry Colour Study

16 x 20in, Fall 2024 | Acrylic on
Wood Board

The tapestry paint study depicted above utilizes mixtures of Raw Umber, Phthalo Blue, & Titanium White. The cold, recessive nature of the blue pushes depth, and the super-saturated quality of phthalo, when not neutralized, jumps into the foreground. The raw umber neutralizes the overall appearance, creating moments of warmth, desaturation, and perceptions of grey that develop a sense of cohesion.



Abstract Harmony

20 x 24in, Summer 2023 | Acrylic on
Canvas

The Nuance of Compliments

In the video lecture by Florent Forges, he approaches the fundamentals of complementary harmony, in addition to its nuances and ways we may consider general tools as guides in developing a stronger sense of application. Forges a basic breakdown of a complementary colour, which defines them as opposed on the wheel and considered an antagonistic pairing, which means “one is composed of all the nuances of the spectrum that are missing from the other.”¹⁰⁴ However, this rigid definition is explored to carry more nuance concerning harmony as it does not need exact complements. He explains that this sense of complementarity can range to general opposites on the wheel, which can rather fall within an overall balance between a colour on the warm half of the wheel and one on the cold side.

A tighter mixing range from a two-colour system allows the creation of effects closer to black-and-white depictions and relies upon the relationship in your choice of hues. However, as most settings and subjects of focus carry a variety of colours and can require more nuances than black-and-white, we should consider the increase in challenges when working with three colours.

In a three colour system, an over-reliance on hue selection for a harmonious palette can lead to issues in image construction. In these instances, harmony requires more awareness than just hue; instead, one must further consider the ranges in each colour’s chroma and value levels to control for developing cohesion.¹⁰⁵ Forges outlines in his lecture an approach used by interior designers called the 60 – 30 – 10 rule, which breaks up the general range of visual space that prioritizes how to balance common ground, similarly to how Bucci considers the communicative effect in greys. The breakdown of the rule allocates 60 percent to neutralized colour, 30 percent to the primary colour, and 10 percent to the accent colour as a general tool to avoid oversaturation and promote spatial balance.¹⁰⁶ In addition to this common rule, Forges utilizes terms in musical harmony to adapt a similar balance. The three concepts to compose chroma and harmony he calls Tonic, Dominant, and Accent, which can be summarized as:¹⁰⁷

Tonic

The main colour is the colour you would likely associate with the painting.

Dominant

The colour which occupies the most surface space in the piece is generally duller or muted.

Accent

The slight touch of colour attracts the eye and brings impact, but is not structurally integral to the composition. This adaptable concept can be altered, added to, or removed without impacting the piece’s structure.



Small Notebook Cover Painting

5 x 7in, Fall 2024 | Acrylic on 150gsm Notebook Paper



Photo sample of the colour string process used with the magenta acrylic gouache in making the Munsell colour tree chart on pg. 14.

Colour Strings

With the considerations on colour harmony aiding its initial selection for your palette, we can now refer back to Gurney in understanding how to utilize and organize a limited palette by mixing colour strings. While there are two approaches to paint mixing: free-mixing and pre-mixing, the latter choice of premixing can save time when working observationally by not stopping to remix consistently, and reduces the likelihood of painting right from the tube and oversaturating the piece.¹⁰⁸

With the premixing method, we can observe the tonal and chroma range needed in a painting and map out the estimated scale changes on our palette to work from, which maintains the range seen in the subject. Gurney outlines a prominent method for this to adapt, the Reilley method, where you mix out a maximum of tonal steps for each

principal hue alongside a corresponding scale of greys to utilize.¹⁰⁹ The breakdowns for these stages highlight two to three steps for the lights, four to five steps for intermediate values, and two steps for the shadows in the hue, which allows for the ability to span the possible ranges you need to blend into.¹¹⁰ This range can take much of the palette spacing and is beneficial in slow-drying mediums like oils. However, acrylics can also dry up too fast without any slow-dry additives. In response, you can reduce the steps of tonal changes to four or five in the early stages to prioritize colour and tonal blocking of the piece, which you can continue to detail after you have achieved general planes and forms mapped out to work within.



Some Silence is Loud Series #1

7 x 9.8in, Winter 2025 | Acrylic
Gouache on Illustration Board

The series piece, depicted on the left, focused on explorative applications with colour alteration. Promoting a vibrant pink underpainting with a priority of blue and violet tones overlapped to develop space and act as a tool for narrative storytelling.

Colour Constancy

Knowing how subjective hue and colour can be is evident in Pickard's writing, stating that "hue is just the spice of the image and is more responsible for a work's expression than it is for achieving realism."¹¹¹ Signal the importance of context in an object's surroundings, specifically how that surrounding context can influence the appearance of the object's colour. This segways the topic of colour constancy, which Gurney explains as the "automatic habit of interpreting local colours as stable and unchanging, regardless of the effects of coloured illumination, and the distraction of cast shadows."¹¹² This statement is also inferred by Pickard, explaining the reality of constant changes in light sources in our surroundings, which alter the colours of objects, yet our unconscious mind will

constantly be at work to construct a subjective interpretation and correct these changes to appear as constants in our environment.

With the knowledge of how subjective these elements are, due to our internal nature of correcting them, artists have a powerful tool in terms of expression with art rendering. With the ability to manipulate through the relationship between colours, we can recreate an image utilizing any range of hues as an additional method of expression, while still creating an illusion of realism. This knowledge is the foundation for the following section on gamut mapping and its importance in art manipulation.



**Some Silence is
Loud Draft**

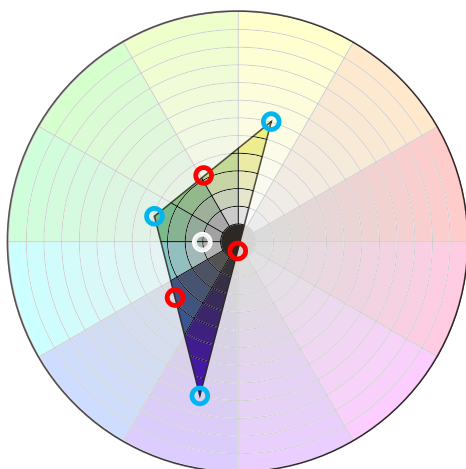
*5 x 7in, Winter 2025 | Acrylic
Gouache on Bristol*

Gamut Mapping

To better understand how we'll combine the previous knowledge for addressing how to control and shift colours in artwork, we must explore the idea of colour gamut, which Pickard describes as “the range of colours available within a colour space.”¹¹³ This means to highlight that with there being an extensive range of colours available to the human eye, there will still only be an achievable range of colours within that range that can be recreated through pigments or our digital systems that are defined though the gamut as the limited range of visible colours we can create though the given medium or physical materials available to the artist. Yet the importance of understanding a gamut means we can shift the limit range within the available section to control how we represent the outcome and, in turn, control the mood of the artwork.¹¹⁴ Gurney explains the idea of gamut mapping to be “the practice of marking the boundaries of [a colour scheme’s polygon] shape on top of the colour wheel to describe or define the range and limits of a colour scheme,” to understand precisely what is available within your range for use.¹¹⁵ Within the map’s range, there are three primary considerations Gurney explores for understanding how to utilize the gamut map.

Gamut Restriction | Cold Triadic

●→ New Primaries ●→ Mixed Secondaries ○→ Gamut Neutrality

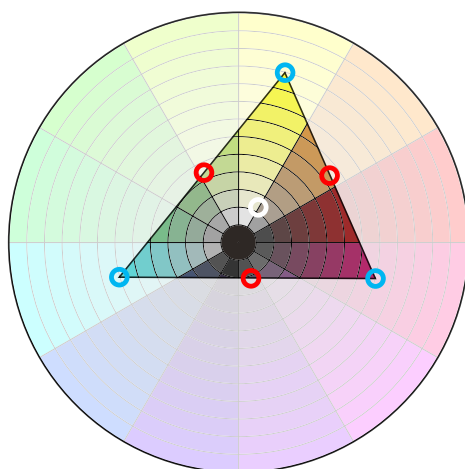


Gamut mask applied to pg. 62 painting.

Gamut mask applied to pg. 63 painting.

Gamut Restriction | Warm Triadic

●→ New Primaries ●→ Mixed Secondaries ○→ Gamut Neutrality



Digital samples highlighting the shifting neutrality, primaries and their secondary counterparts from a gamut mask application.

Subjective Primaries

The outer lines of the maps shape outline what will be the cleanest possible mixtures between any two of the connected starting colours, which mark those starting colours as the subjective primaries. The halfway point between the two subjective primaries is marked as the purest secondary mixtures possible, defining those points as the subjective secondaries, and the colour ranges outside of the map on the wheel can no longer be considered possible based on the limit in subtractive colour mixing.¹¹⁶

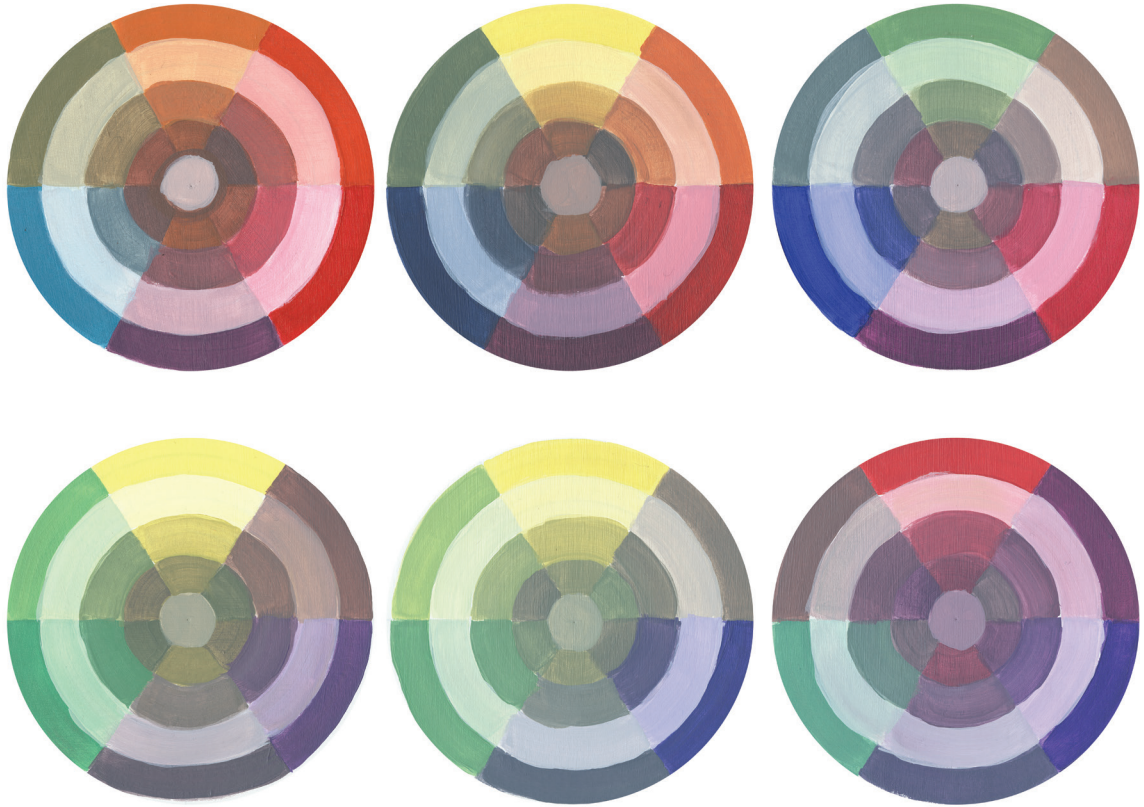
Subjective Neutrals

While normally looking at the gamut mask placed over the colour, we assume that the initial wheel's center is the neutral zone. However, as our primaries have shifted subject to the map borders, so will the neutral zone.¹¹⁷ In these instances, the gamut creates what is called the subjective neutral, and is placed in the "geometric center" of the gamut map, and will likely shift into a colour zone, yet as we learned from the section on colour constancy, since the colour range will shift, so too will the perception of neutrality. Gurney further highlights the subjective neutral to now the same as the colour cast over the whole image.¹¹⁸

Saturation Cost

Physical mediums utilize a subtractive system for colour mixing, where no secondary mixtures can achieve a level brighter than the brightest pigment used. Knowing that the secondary mixtures will have a much lower chroma cost than the primaries involved with triadic gamut maps is especially important. The halfway point between the primaries on a triadic map will always fall much closer to the zero-chroma center of the original colour wheel.¹¹⁹

The benefit of forming a gamut mask means you can select your own pigment primaries to act in relation to one another and can be reintergrated as the primaries on your own version of a colour wheel that can detail the extent of range achievable within your new wheel's limitations to go off of and create colour strings from. Suppose you feel stuck in selecting your desired colours to create your scheme. In that case, you can create a standardized wheel like a Yurmby wheel, shifting towards neutrality in the center and move transparent cutouts of the possible harmonious schemes over the wheel to help isolate the possible ranges one can select to use.



Gamut Scheme Studies

*16 x 20in, Fall 2025 | Acrylic on
Arches Hot Press*

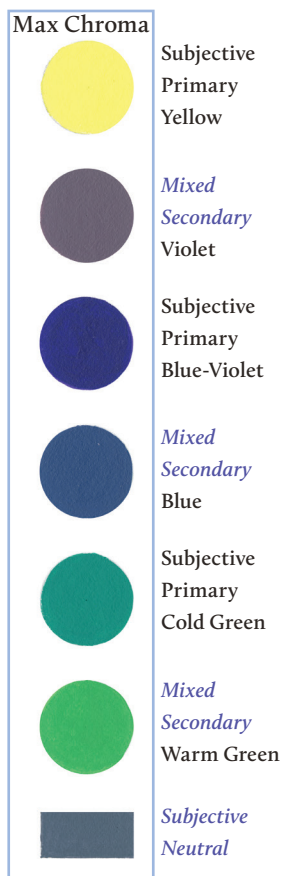
Exploring Schemes

When developing scheme options for your palette, we must consider the lessons in colour harmony, the power of greys, and controlling the value and chroma levels. In correlation to those regions, Gurney highlights the impact of a dominantly intense primary with subordinate primaries of lesser chroma value. This consideration can aid in balancing the overall palette or prioritizing attention to specified regions. In addition to these factors, he explores other possibilities to play with and influences on outcomes like an atmospheric triad or a mood and accent scheme.

In an atmospheric triad, an equilateral triangle map is placed on one side of the wheel, not crossing the center, enhancing mood with subjective influence, highlighted as an ideal choice in colour scripting for films or graphic novels.¹²⁰ Other options to consider include a complementary gamut scheme, which takes on a diamond shape, stretching across the center, maintaining the natural neutral and is described as a stable gamut map to utilize more easily. Switching to a subjective neutral can add

attractive influences for a near-complementary scheme if one plays with a complementary scheme balanced off-center. However, it is noted to easily create an unsettling or jarring effect interpreted by the viewer.¹²¹ In consideration of what he calls a mood and accent scheme, he explores the creating of a multi-mapped gamut, where an atmospheric triad might be utilized to influence the mood of the setting, while a small segment of one colour is separated from the rest of the scheme, with no intermediate mixtures to create an accent of focus to be integrated in the piece for dynamic impact.¹²²

While Gurney highlights many system structures to utilize for known impacts on the piece, these are not the restrictive possibility range one must follow. One can construct infinite possibilities for a limited gamut mask, as long as one maintains control within the limited palette and accounts for the influence of the subjective primaries and subjective neutrality zones in the work.



Skull | Colder Gamut Restriction
 8 x 10in, Fall 2025 | Acrylic on
 Illustration Board

Mixing Controlled Gamuts

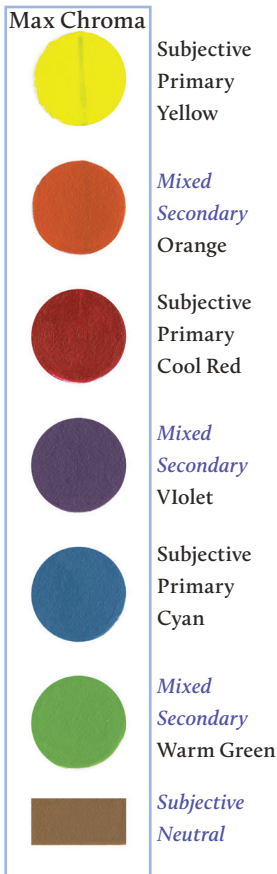
Once gamut masking has been selected, we can circle back to applying colour strings, which will become the foundational colours for the whole painting and help keep you within your gamut map. When mixing the colour string,

ensure that you have both your initial colour wheel and your gamut mask as a reference to begin constructing. We will refer to a summary of Gurney's breakdown for a practical approach to constructing these strings.

The Gamut Strings

After mixing your subjective primaries from your tube colours to match the points on your gamut map, you may begin to extend each source into four values (above and below the source value for the widest range), while aiming to retain both the chroma and hue consistent for each colour.¹²³ Next, assess along the map's outline the position of your subjective secondaries to mix the in-between colours from the colour strings of your primaries as the secondary colour strings.¹²⁴

After compiling your gamut strings, you can remove the paint tubes used to mix the primaries, except white, to avoid returning to them and altering your gamut range. When starting with the piece, it's essential to acknowledge that we must avoid reverting to the traditional wheel of colour. Gurney explains that through the process, your eyes will begin to adapt to the mood constructed and understand through colour constancy the colours of relative warmth that will easily appear as you progress into the work.¹²⁵



The images above showcase the difference to outcome when approaching the same subject under different restrictions. In comparison, the image on the left is much colder than the version on the right due to the restriction the right-hand image has on a more limited range of cold hues.

Skull | Warmer Gamut Restriction
8 x 10in, Fall 2025 | Acrylic on
Illustration Board

Reversing Traditional Approach

Through forcibly restricting your colour range, in comparison to mixing from a full colour range, he highlights that we have to develop a reverse approach to traditional mixing. Instead of acting to neutralize mixtures, you will need to consider applying accent relationships, as harmony and unity are already built into the strings; you will not have to work to develop these systems as we would with a full palette range.¹²⁶

Additionally, you can take the gamut strings and fill out your own gamut scheme or new colour wheel separately to aid the positioning understanding and colour ranges you started with, if necessary, to return to the piece, touch up, or re-mix your palette. Having a separate wheel based on the colour strings can also help you distinguish your

relative warm and cold colours, saturation differences, and subjective neutral point as a reference point to refer back to. Through this final method, we can now address how to represent real environmental settings and push past into harmony and unity within the control we have developed over the subjective nature of colour by gamut representation. Incorporating the knowledge of colour theory, with the design thinking approach towards application and communicative storytelling.

Closing Statement

Reflecting on the Project

Over the scope of the research, we started with the fundamental frameworks of basic colour theory, which established the history, advancements, and approaches developed to explain the foundations of colour theory. This foundational section touches on several key aspects of the course material taught in early design education and expands into the why and how these systems came into place.

After establishing a strong foundation of the basics to refer back to for aid, we explored how this theory interacted in a real environment, covering the influences of light and its source on an environment, depicting the science and depth of its application to expand the knowledge of how to account and adjust outcomes to a setting. After exploring light in an environment, we addressed the forms within the space to solidify how an environment can carry influence before addressing the influence of forms independently that will adjust according to their environment, and the cases where forms can carry specialized materials or effects.

And finally, we assessed the cases of extreme colour influences and subconscious adjustments to visual perceptions that develop the stages of advanced application. In the final sections, we compiled the knowledge of colour, environment, light, shadow, and form, to prepare us to shift everything according to gamut restriction. The research breadth analyzed prepares us to take the foundations of what we see and alter its perception as a visual communication tool to create mood and storytelling in realistic environments.

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Endnotes

- [1] Goldsmith, 21.
- [2] Pickard et al., 47.
- [3] Goldsmith, 19.
- [4] Goldsmith, 19.
- [5] Goldsmith, 43.
- [6] Goldsmith, 75.
- [7] Gurney, 112.
- [8] Pickard et al., 46.
- [9] Gurney, 106.
- [10] Gurney, 106.
- [11] Gurney, 106.
- [12] Goldsmith, 76.
- [13] Gurney, 100.
- [14] Goldsmith, 57.
- [15] Gurney, 74.
- [16] Gurney, 74.
- [17] Gurney, 74-75.
- [18] Gurney, 75.
- [19] Gurney, 75.
- [20] Gurney, 75.
- [21] Pickard et al., 33.
- [22] Pickard et al., 33.
- [23] Pickard et al., 34.
- [24] Pickard et al., 35.
- [25] Gurney, 75.
- [26] Gurney, 75.
- [27] Pickard et al., 13.
- [28] Pickard et al., 15.
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A brief moment of Pause. Thank you.

Colour Theory

Advanced Approaches & Applications

This publication aims to expand knowledge of colour theory and its application in illustrative and design thinking. I was introduced to many foundational concepts in the early stages of my undergraduate degree. Yet, without receiving a developed focus on general terms, it has led me to expand my understanding and awareness of colour relationships and their applications in my approach to art and design. After years of supplemental learning and extensive trial-and-error, I have been given the opportunity through my independent study at MacEwan University to take a thorough view of the subject and how to apply it in my own work.

Over the course of this research, we will explore the fundamentals of colour theory and how it evolves and adapts to the interactions of form and light in real environments. Expanding upon reality-based rendering, we will analyze subconscious adjustments to perception and how we can take the scope of reality and apply restrictions and limitations through gamut mapping to develop mood, enhance impact, and generate enhanced storytelling ability based on the approach and understanding that colour is subjective and can be formed by our perceptions to render reality.

