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The Three-Tier Color Wheel For Mixing Paints

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Abstract

This article provides a comprehensive overview of the theory of the three-tier color wheel (Subtractive Color Model) used in mixing paints, its history, structure, and practical application. The color wheel serves as the foundation of color selection in painting, the work of artists, graphic design, and printing. The article scientifically analyzes the laws governing the formation of primary, secondary, and tertiary colors, as well as the system of new colors that emerges as a result of their mutual mixing. In addition, practical methods of using the color wheel and didactic-methodological recommendations are developed.

Keywords: color wheel, mixing paints, primary colors, secondary colors, tertiary colors, subtractive model, additive model, complementary colors, color harmony, pigment, hue, saturation, value, warm colors, cool colors, neutral colors, color contrast, complementary pairs, optical mixing of colors, coloristics.

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Introduction: Color is the oldest and most universal language in the history of humankind. From the moment primitive people drew their first images on cave walls, the art of creating new colors by mixing various substances began to develop. Enriched in medieval workshops and perfected by the masters of the Renaissance, this knowledge was placed on a scientific foundation by Isaac Newton in the seventeenth century. In 1666, Newton passed light through a prism and separated it into seven

basic colors — red, orange, yellow, green, blue, indigo, and violet. This discovery laid the scientific foundation of color science. However, for artists and painters, pigment and paint colors were more important than the colors of light. It was from this need that the concept of the Color Wheel emerged. Today, the color wheel is an essential tool not only for artists, but also for designers, architects, fashion creators, printers, and even psychologists. In this article, we explore in depth the three-tier system of the subtractive color model used in painting — the wheel of primary, secondary, and tertiary colors.

I. HISTORY AND THEORETICAL FOUNDATIONS OF THE COLOR WHEEL

2.1. Historical development of the color wheel

The first graphic representation of the color wheel was drawn by Isaac Newton in 1704. In his book “Opticks,” he transformed the spectrum of light into the shape of a circle. However, this model was intended for light, not for painting. In 1766, the Swedish botanist Moses Harris developed the first color wheel for artists, in which red, yellow, and blue were designated as the primary colors. In the nineteenth century, the German philosopher and scientist Johann Wolfgang von Goethe wrote his work “Theory of Colours” (Farbenlehre, 1810). Goethe approached colors not from a scientific standpoint, but from the perspective of human emotional and psychological perception. He deeply studied the idea of complementary (opposite) colors in the color wheel and created its aesthetic foundation.

In the twentieth century, Johannes Itten, a master of the Bauhaus school, created the 12-part color wheel in his famous work “The Art of Color” (Kunst der Farbe, 1961). This model remains the most widespread system to this day. Itten’s model gave artists, designers, and educators a practical tool for working with color.

1.2. The difference between the Subtractive and Additive color models

There are two fundamentally different physical principles of color mixing. Without understanding them, it is impossible to apply the color wheel correctly:

Characteristic	Subtractive model (RYB)	Additive model (RGB)
Primary colors	Red, Yellow, Blue	Red, Green, Blue

Mixture of all colors	Black (dark brown)	White (full light)
Field of application	Paint, pigment, printing	Screen, television, LED
Physical basis	Absorption of light	Emission of light
Example	Acrylic, oil, watercolor	Monitor, projector, phone

II. STRUCTURE OF THE THREE-TIER COLOR WHEEL

2.1. The first ring: Primary Colors

The three colors arranged in a triangle at the central core of the color wheel are considered the mother of all colors. These colors cannot be obtained by mixing other colors; they are the purest, most original colors in nature:

Color	Symbol	Pigment description	Significance in art
RED	R	Red ochre, cadmium red; distinguished by its warmth and saturation	Life, strength, love, danger; a dominant color in landscape and portrait
YELLOW	Y	Cadmium yellow, Naples yellow; the brightest primary color	Light, joy, warmth; widely used in still life and decorative art
BLUE	B	Ultramarine blue, Prussian blue; gives depth and coolness	Sky and sea; portrait shadows, deepening of backgrounds

Important rule: *When you mix the three primary colors in equal amounts, theoretically black (in practice, a dark brownish-gray) should be produced. This is the fundamental law of the subtractive model.*

2.2. The second ring: Secondary Colors

Secondary colors are produced by mixing two primary colors in equal amounts. On the color wheel, they are positioned between the primary colors:

- **Red + Yellow = Orange:** Warmth, creativity, appetite-stimulating, energizing. The color of the autumn season.
- **Yellow + Blue = Green:** Nature, balance, peace, health. The most comfortable color for the eye.
- **Blue + Red = Violet (Purple):** Mystery, intellectuality, royalty. Historically the most expensive color, valued at the price of gold.

2.3. The third ring: Tertiary Colors

The outermost and richest ring of the color wheel is formed by tertiary colors. They are produced by mixing one primary color with the adjacent secondary color. As a result, 6 new colors emerge:

Mixture	Resulting color	English name	Application
Red + Orange	Red-orange	Red-Orange	Fiery, dramatic effect
Yellow + Orange	Yellow-orange	Yellow-Orange	Autumn, fruit, warmth
Yellow + Green	Yellow-green	Yellow-Green	Spring, novelty, hope
Blue + Green	Blue-green	Blue-Green	Sea, glacier, freshness
Blue + Violet	Blue-violet	Blue-Violet	Night sky, depth
Red + Violet	Red-violet	Red-Violet	Passion, drama, ornament

III. COMPLEMENTARY COLORS AND COLOR HARMONY

Colors positioned opposite each other on the color wheel are called complementary colors. When placed side by side, they create the strongest visual contrast; when mixed, they neutralize each other (producing gray or brown). Artists use this property for balance and contrast:

- 1. Red ↔ Green:** Found in national flag colors; provides background-figure contrast in portraits
- 2. Yellow ↔ Violet:** Powerful dramatic effect; Van Gogh used this pair in many of his works
- 3. Orange ↔ Blue:** Conveys an autumn-winter feeling; popular in sports uniforms and brands
- 4. Red-orange ↔ Blue-green:** Gives an exotic, subtropical atmosphere
- 5. Yellow-orange ↔ Blue-violet:** The opposition of fire and ice
- 6. Yellow-green ↔ Red-violet:** A delicate, spring-like contrast

3.1. Five harmony schemes based on the color wheel

Using the color wheel, five classic harmony schemes applied in fine art and design can be identified:

Scheme name	Position on the color wheel	Emotional effect and application
Monochromatic	All tones of a single color	Harmony, depth, minimalism; widely used in interior design
Analogous	2–4 adjacent colors	Soft transitions, naturalness; in landscape and still life
Complementary	2 opposite colors	Maximum contrast; in attention-grabbing advertising and posters
Triadic	3 colors evenly spaced around the wheel	Liveliness and balance; in children's books and logos
Tetradic	Rectangular scheme, 4 colors	Richness; one color must be made dominant

IV. PRACTICAL RULES FOR MIXING PAINTS

4.1. Methods of darkening and lightening a color

Artists often make a mistake when mixing colors: to darken a color, they add black paint. This kills the color and gives muddiness instead of depth. The correct approach is as follows:

- 1. Darkening a color:** Do not add black! Adding a small amount of its complementary color or ultramarine blue produces a natural and deep shadow. For example: to darken red, add a little green.
- 2. Lightening a color:** When white is added, a color loses its saturation — this is called a pastel tone. To lighten yellow, white alone is sufficient.
- 3. Neutralizing (Brown/Gray):** Neutral brown or gray is obtained by mixing complementary colors. This method is extremely valuable for backgrounds and shadows.
- 4. Changing a color while preserving its tonal strength:** Preserving saturation while changing the hue — this is the secret of master artists. To achieve this, a small amount of a neighboring color is mixed in.

4.2. Optical mixing and pointillism

Color mixing can be accomplished not only by physically combining paints, but also optically. The French impressionist Georges Seurat (1859–1891) discovered the technique of “Pointillism”: by placing small colored dots close to one another, the eye mixes them from a distance.

For example: when red and yellow dots are placed side by side, the eye perceives them as orange.

This principle forms the basis of modern color printing and screen technology: offset printing (the CMYK model) and screens (the RGB model) operate on the same principle of optical mixing. Therefore, when an artist understands the color wheel, they gain the ability to work not only with paints, but also in the digital environment.

4.3. National color traditions and the color wheel

Uzbek folk art possesses rich traditions of working with color. In the miniatures of Samarkand and Bukhara, the combination of lazuli blue (obtained from lapis lazuli pigment), golden yellow, brownish-red, and white became a symbol of divine harmony. This color system is, in fact, also based on the analogous harmony scheme of the color wheel.

The colors found in the gold embroidery of the Fergana Valley, the ceramic pottery of Rishton, and the silk weaving of Namangan also correspond to the principles of the color wheel: mainly complementary and analogous schemes are applied. This national heritage serves as a source of inspiration for contemporary Uzbek designers and artists.

CONCLUSION

The color wheel is not merely a theoretical tool of color science, but a daily practical guide for the artist, the designer, and the art educator. The results of this study show that:

1. The three-tier color system (primary → secondary → tertiary) produces 12 basic colors and clearly defines the relationships among them.
2. The subtractive model (RYB) is fundamental for the artist and differs radically from the light model (RGB) — this difference must be understood in practical work.
3. Understanding complementary colors makes it possible to correctly create portrait shadows, landscape depth, and dramatic contrasts.
4. Avoiding black when mixing colors — creating natural shadows with the help of complementary colors or ultramarine blue — is one of the secrets of professional painting.
5. The harmony of national art traditions and modern color theory defines a new direction of development for Uzbek fine art.
6. Regular use of the color wheel as a visual chart in the educational process develops students' sense of color, aesthetic taste, and creative thinking.

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