

PLAYING (WITH) COLOR

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The necessity for the use of color in its various phases has only been felt by artists since 1800. The intensity of modern life has made a greater intensity necessary in art. Only by being more intense than life can art hold its own as a vital factor in either taste or inspiration.

– Stanton Macdonald-Wright, *A Treatise on Color*, 1924

I didn't know my grandfather; he died before I was born. But I did know a particular image of him. As a child, I used to visit a mural that was part of Weinold Reiss' magnificent Cincinnati Union Terminal suite. There, my grandfather, who had posed for Reiss, stood at the controls of a big green mixing machine with the most beautiful yellow liquid flowing into the barrels below.



Figure 1. Detail from Weinold Reiss' Cincinnati Union Terminal Mural. This panel was one of 14 mosaics, which were moved to the Northern Kentucky/Greater Cincinnati International Airport in the 1970s before Union Terminal's concourse was destroyed. Image courtesy of Cincinnati Museum Center at Union Terminal, Cincinnati, Ohio.



As a paint-mixer for the Ault & Weiborg Corporation, he spent the long hours of each workday staring into large vats where he controlled levers and dials that transformed a few basic pigments into the variety of colors that the expanding demands of early 20th century taste required. Those who knew my grandfather said that he was a mellow man. Of course, inhaling paint fumes day after day could explain this reported temperament—though I like to think spending so much time with color also played a role.

Years after having visited the mural, as I got to know some of the work of modern artists, I was struck by a 1964 musing of Frank Stella, quoted in David Batchelor's *Chromophobia*:

I knew a wise-guy who used to make fun of my painting, but he didn't like the Abstract Expressionists either. He said they would be good painters if they could only keep the paint as good as it is in the can. And that's what I tried to do.¹

And that's what my grandfather witnessed each working day—the paint “as good as it was in the can.” Color, pure and simple.

Color is an essential aspect of how we see the world. Whatever else visual artists set out to do, they cannot get around the need to attend to color. Even the absence of it constitutes a choice, since this, too, is a way of dealing with it. It is therefore no surprise that mankind's fascination with visual instruments began with color. Over two centuries ago, dreamers started to imagine instruments that would use combinations and sequences of color to calm us, delight us, confound and intrigue us, much as musicians do with combinations and sequences of sounds.

Color Scales

Sir Isaac Newton puzzled over the nature of light and its relationship to sound. The physicist understood, as have many inventors and artists since, that both are wave phenomena that operate over a range of frequencies. With this knowledge, many pioneers became interested in creating an art of light—like the art of music—by creating instruments to make “color music.”^{2, 3}

Newton associated each of the seven colors that he saw in prismatic light with the seven notes of the harmonic scale. Visual artist Karl Gerstner pointed out the randomness of this mapping, claiming that “Newton saw seven colors in the spectrum because *he wanted* to see seven colors, in order to correlate them with the notes and not vice versa...In actual fact observers can distinguish as many shades of color in the spectrum as they want: red, green, and blue

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being the most prominent, with fluid but short transitions.”⁴ Gerstner attributes this unscientific color mapping to Newton's involvement in alchemy.

Still, Newton inspired a movement that has lasted for three centuries. In 1725, responding in part to Newton's ideas about the nature of light, Louis Bertrand Castel, a Jesuit priest and physicist, wrote an essay announcing his invention of an ocular harpsichord. He proposed making colors transient the way that musical notes are. Using the keys of an ordinary harpsichord would reveal colors alone or in combinations, producing a succession that would elevate painting to the level of music. Castel proclaimed that his invention would lend colors “a certain vivacity and lightness which on an immobile and inanimate canvas they never have.”⁵

The idea of relating the notes of the musical scale to various colors occurred many times over the succeeding two centuries (Figure 2). Beyond their obvious arbitrariness, additional problems also exist with these scales.⁶ Perhaps the most significant is that they don't account for how differently we make sense of visual and audio information. A pattern that sounds harmonious doesn't necessarily look harmonious.

In addition to relating various hues to particular musical notes, painters have explored the emotional content of colors and their potential for musical expression. Most famous among such characterizations can be found in Wassily Kandinsky's classic essay, *On the Spiritual in Art*. Kandinsky describes each of the most common colors and compares them to musical sounds. He writes that “absolute green is the most peaceful color there is: it does not move in any direction, has no overtones of joy or sorrow or passion, demands nothing, calls out to no one...I would think the best way of char-

		C	C#	D	D#	E	F	F#	G	G#	A
Isaac Newton	1704	Red		Orange		Yellow	Green		Blue		Purple
Louis Bertrand Castel	1734	Blue	Teal	Green	Light Green	Yellow	Orange	Red	Brown	Pink	
George Field	1816	Blue		Purple		Red	Orange		Yellow		Light Green
D. D. Jameson	1844	Red	Orange	Light Orange	Yellow	Light Green	Teal	Blue	Purple	Pink	
H. von Helmholtz	1867	Yellow	Green	Teal	Blue	Purple	Pink	Brown	Red	Orange	Light Orange
Theodor Seemann	1881	Brown	Red	Orange	Light Orange	Yellow	Green	Teal	Blue	Purple	Pink
A. Wallace Rimington	1893	Red	Brown	Orange	Light Orange	Yellow	Light Green	Green	Teal	Light Teal	Purple
Bainbridge Bishop	1893	Red	Brown	Orange	Yellow	Light Green	Green	Teal	Purple	Pink	
Alexander Scriabin	1911	Red	Pink	Yellow	Light Blue	Blue	Brown	Blue	Orange	Purple	Green
Adrian Bernard Klein	1930	Brown	Red	Orange	Light Orange	Yellow	Light Green	Green	Teal	Blue	Purple
August Aeppli	1940	Red		Orange		Yellow		Green	Teal		Blue
I. J. Belmont	1944	Red	Orange	Light Orange	Yellow	Light Green	Green	Teal	Blue	Purple	
Steve Zieverink	2004	Light Green	Green	Teal	Blue	Purple	Pink	Brown	Red	Orange	

acterizing absolute green would be the quiet, expansive middle register of the violin.”⁷

therefore has something sad, an air of something sickly, something extinguished about it (like a slag heap).”⁷

The painter Stanton Macdonald-Wright also characterized the emotional meanings of a dozen colors: “Yellow is superficial, has no depth of character, is frivolous, light, young-girlish and gay...Violet, we might sum up as being a cry, *de profundis*. It is the color of deepest depression, which comprises unhappiness, sorrow, silence, and the nearest approach to death in color.”⁸

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“Absolute green
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But Kandinsky’s characterization of yellow is a different matter. He believed that “yellow, when directly observed (in some kind of geometrical form), is disquieting to the spectator, pricking him, stimulating him, revealing the nature of the power expressed in this color, which has an effect upon our sensibilities at once impudent and importunate.” Furthermore, he believed that yellow was “a color that inclines considerably toward the brighter tones, [that could] be raised to a pitch of intensity unbearable to the eye and to the

Many of Kandinsky and Macdonald-Wright’s characterizations are in close agreement: Green is calm, quiet and peaceful; blue is ethereal, tranquil and heavenly; and red is deep, powerful and energetic. And Kandinsky’s description of violet evokes Macdonald-Wright’s: “Violet is thus a cooled-down red, in both a physical and a psychological sense. It

spirit. Upon such intensification, it affects us like the shrill sound of a trumpet being played louder and louder, or the sound of a high-pitched fanfare.”⁷

This depiction of yellow is hardly the “frivolous, light, young-girlish” thing we find in Macdonald-Wright’s characterization, and such differences of opinion underscore the challenge of establishing parallels between color and sound.



Figure 2. Three Centuries of Color Scales. Courtesy of the author. Sources: Newton: Isaac Newton, *Opticks*, 1704, Book 1, Part II, Proposition VI, Problem 2; Castel: Kenneth Peacock "Instruments to Perform Color-Music," Leonardo (1988), 400; Field: Adrian Bernard Klein, *Colour-Music*, 1927, 69; Jameson: D. D. Jameson, *Colour-Music*, 1844, 12; Helmholtz: Herman von Helmholtz, *Treatise on Physiological Optics*, Vol. 2, 1962, 117; Bishop: Bainbridge Bishop, *A Souvenir of the Color Organ*, 1893, 11; Seaman: Klein, *Colour-Music*, 86; Rimington: Peacock, 402; Scriabin: Tom Douglas Jones, *The Art of Light & Color*, 1972, 104; Klein: Klein, 209; Aeppli: Gerstner, *The Forms of Color*, 169; Belmont: I.J. Belmont, *The Modern Dilemma in Art*, 1944, 226; Zieverink: Steve Zieverink, *Twelve + Twelve*, 2004, *UnMuseum*, Contemporary Arts Center, Cincinnati.

Color Harmonies

Much of the effect of music has to do with the simultaneous occurrence of multiple notes. The intervals between the notes create consonances and dissonances. The color theorist Wilhelm Ostwald (1921; cited in Gerstner⁴) proposed a system based on musical intervals. To each musical interval (e.g. the minor second) he assigned a shade composed of two color tones (e.g. a reddish yellow and a greenish yellow). By careful arrangement of his scale, he was able to capture many elements of musical consonance and dissonance.

Others, though, have taken advantage of the fact that colors are rarely perceived in isolation. They exist instead in a world of other colors and our perception of each color is affected by its context. In the early 19th century, Michel Eugène Chevreul, a French chemist and color theorist, studied this phenomenon. While working in a yarn-dyeing factory, he noticed that some colored yarn appeared different when seen in the context of other colors. He referred to this occurrence as "simultaneous contrast."⁹

This notion of color context became prominent in the minds of color instrument designers. By the end of the 19th century, experimenters like Bainbridge Bishop turned their attention to how color music could evoke harmony and discord. Bishop believed that "by carefully examining the scale it will be seen that a direct contrast of color comes in as a discord—for example, a true green and red, or an orange and blue; but if we change the green for a bluish or yellowish green, the effect is much more harmonious."¹⁰

Many theorists of the time—Ogden Rood and Percyval Tudor-Hart among them—investigated the perceptual effects of various color combinations that would result in different visual harmonies and dissonances. These advancements in color theory inspired Stanton Macdonald-Wright and Morgan Russell, two of Tudor-Hart's students, to found a new style of painting called Synchronism, a movement dedicated to the physical and emotional effects of color. Rood's theory of harmonious

color triads, or colors separated on the color wheel by 120 degrees, formed the bases of many of the Synchronists' paintings. And Tudor-Hart's conviction that sound and light are perceived in analogous ways became their inspiration.

Russell and Macdonald-Wright both pushed their interest in color and light to the point where it lifted off of the canvas. For Russell, this took the form of a *Kinetic Light Machine*, which he first wrote about in 1912. He actually designed several machines, which were described in detail in his notebooks. A central feature of all of his machines was the use of rheostats, devices that allowed a "coming and dying out" effect with light. Russell wrote to Macdonald-Wright about his experiments: "I felt that abstraction led to lights and had fiddled with them in winter 1915-16 and late spring 1914 a bit." And in a later letter he concluded: "As a matter of fact when I left off the synchronies in paint I got to meddling with lights also, but never got funds or encouragement...It was inevitable that synchronies should lead to this [manipulation of light]."¹¹

Macdonald-Wright's response to the same basic impulse took a slightly different form. In 1919, he painted over five thousand pastels, each three by four feet. These were made into what he claimed was "the first full-length, stop-motion film ever made in color."¹² Russell and Macdonald-Wright saw their efforts as the creation of a new art—an art that differed from painting and dealt directly with time, movement and light itself.

Stanton's brother, Willard Huntington-Wright, drew on the experiences of the pair to speculate about the future of art. In a magnificent little book, *The Future of Painting*, he opens by arguing that "modernist painting" has little to do with painting as it has come to be understood. Instead, it is an accident that its practitioners have been driven to use pigments on canvas. Despite their struggles and the challenges of experimentation with new materials, what these artists are creat-





ing with color instruments is an art that is more of a performance, like a symphony, than a decorative art. The last chapter of Huntington-Wright's essay opens this way:

The color-instrument of the future will not merely throw pretty squares, circles, coils, and volutes of colored light on a screen, but will be able to record the artist's moods, desires and emotions along any visually formal aesthetic line. Only when such an instrument has been perfected can the modern artist's creative conceptions be properly expressed. With the completion of this new medium the art of color will have entirely dissociated itself from the art of painting, not only in impulse and conception, but in the world's attitude toward it.¹³

Russell and Macdonald-Wright's color scale represents an important development in the art of "playing light." Their scale revealed that soft and harmonious color combinations arise from pairing a color with one of its near-complements, or one of the colors on either side of its color complement. Likewise, they discovered that using complementary pairs would produce the color equivalent of dissonance in music. Macdonald-Wright instructed that "if a harsh clash is desired use red-orange and blue-green. For a clash less harsh use orange and blue. All sets of complementaries follow in the order of their harshness: yellow-orange and blue-violet; yellow-green and red-violet; green and red; and softest of all opposites, yellow and violet."⁸ The intensity of the clash or dissonance is reduced as the colors are neutralized, by reducing their saturation or tonality (value).⁸ Taken together, these and other insights from the Synchronists provide a remarkably rich and musical approach to the construction of color harmonies and dissonances. Huntington-Wright sensed the importance of these insights for the developing art of light, and compared the use of color dissonance to the role that *fortissimo* passages play when we attend a symphony concert.

Because they are such important musical concepts, current work continues to focus on harmony and dissonance. Katherine Lubar, for example, has explored color harmonies using Johannes Itten's color wheel to create color intervals analogous to the intervals of tonal music. She went on to examine the color intervals for their similarity to the effects of corresponding musical intervals (consonance or dissonance). Among Lubar's observations was that "tonal value plays an important role in the inter-

pretation of the intervals between color" and that "the closer an interval gets to the tritone [complementary color], the more interestingly/harmoniously it works as a color combination."¹⁴

Color Tones

The discussions of scales and harmonies relate largely to how hues can affect emotion in a musical way. Controlling saturation and value can add expressive capabilities to a visual instrument in that the artist can achieve a variety of grays and tinted tones. An attention to saturation is illustrated in the work of one of the earliest color instrument designers, previously discussed.

Bainbridge Bishop's color organ placed a large white screen atop an ordinary organ. In addition to producing music, the controls pulled blinds down to expose stained glass windows of various colors through which light passed. In 1893, Bishop wrote about experiments in which he found that the use of tinted gray tones helped to produce a more musical quality to the light:

I soon found that a simple color did not give the sensation of a musical tone, but a color softened by gradations into neutral shades or tinted grays did so; also, that combinations of colors softened by gradations into neutral shades or tinted grays, with the edges of the main colors blending together, or nearly together, rendered the sensation of musical chords very well indeed.¹⁰


Additionally, changes in the value of a color alter how dark it appears, achieving an effect which can also have a fairly direct relationship to musical tone. Having done an extensive analysis of Van Gogh's paintings and letters, Kurt Badt pointed to this relationship by noting that "dark and light colors do actually have effects which are comparable to low and high musical tones. Dark colors are sonorous, powerful, mighty like deep tones. But light colors, like those of the Impressionists, act, when they alone make up a whole work, with the magic of high voices: floating, light, youthful, care-free, and probably cool, too."¹⁵

In 1725...Louis Bertrand Castel, a Jesuit priest and physicist, proposed making colors transient the way that musical notes are.

Concluding Remarks

Color theory has not enjoyed the success that music theory has. Consider, for example, the widely disseminated theory of the additive and subtractive varieties of color mixing. Additive/subtractive theory asserts that the rules by which colored lights combine are the inverse of those by which pigments combine. When the wavelengths on one color are added to another, they produce a color defined by the total. Similarly when one pigment is combined with another, it produces a color based upon the difference of their wavelengths. After describing some obvious problems with the theory, Patricia Sloane concludes that, as with much of color theory, the idea has little more going for it than its apparent elegance. "Additive/subtractive theory had acquired a reputation for being scientific and technically unimpeachable, before it came to the attention of the editors of the *Life* science series. The question, as often in color theory, is how so ill-conceived an idea survived for so long."¹⁶

Still, the Synchronists, Bainbridge Bishop and the others have managed to move us beyond the naïve mappings that dominated discussions of color music for so long. In wrestling as they have, at the level of perceptual issues, they have provided clues about how we should proceed in our consideration and advancement of this movement.

In my own experience, one *does* tend to land in places that are harmonious or dissonant when following their guidelines. Gradations *do* seem more musical and interesting, and darkness and lightness *can* effectively reinforce sonorous or light passages respectively. So, I continue to find inspiration in the work of these experimentalists and those who have followed them. Their efforts to articulate how various color elements work, and to reflect on and write about their choices, provide guidelines that serve us well in the absence of a comprehensive theory of color. 

References

1. Batchelor, David, *Chromophobia* (London: Reaktion Book, 2000) 98.
2. Klein, Adrian Bernard, *Colour-Music: The Art of Light* (London: Crosby Lockwood and Son, 1930).
3. Peacock, Kenneth, "Instruments to Perform Color-Music: Two Centuries of Technological Experimentation," *Leonardo* 21, No. 4, 397-406 (1988). (complete text available at <http://rhythmiclight.com/archives/bibliography.html>)
4. Gerstner, Karl, *The Forms of Color: The Interaction of Visual Elements* (Cambridge, MA: MIT Press, 1986) 168, 173.
5. Franssen, Maarten, "The Ocular Harpsichord of Louis-Bertrand Castel. The Science and Aesthetics of an Eighteenth-Century Cause Célèbre," *Tractrix: Yearbook for the History of Science, Medicine, Technology and Mathematics* (1991) 15-77. (complete text available at www.tbm.tudelft.nl/live/pagina.jsp?id=1d0f8e1b-89e5-41fa-8d4d-b90aed364d44&lang=en&binary=/doc/OcuHarpsCastel.pdf)
6. Collopy, Fred, "Color, Form and Motion: Dimensions of a Musical Art of Light," *Leonardo* 33, No. 5, 355-360 (2000). (complete text available at <http://rhythmiclight.com/archives/bibliography.html>).
7. Kandinsky, Wassily, *On the Spiritual in Art and Painting in Particular* (Munich, 1912) In *Kandinsky Complete Writings on Art*, Lindsay, K.C. and Vergo, P. eds. (New York: DaCapo Press, 1994) 183, 189, 180-181.
8. Macdonald-Wright, Stanton, *A Treatise on Color*, (Los Angeles, 1924) 19-20, 23, 23-24.
9. Chevreul, Michel Eugene, *The Principles of Harmony and Contrast of Colors*, (1839), Excerpted in *Primary Sources: Selected Writings on Color from Aristotle to Albers*, Patricia Sloane, ed. (New York: Design Press, 1991) 24-33.
10. Bishop, Bainbridge, *A Souvenir of the Color Organ, with Some Suggestions in Regard to the Soul of the Rainbow and the Harmony of Light* (New Russia, NY, 1893) 10-11, 4. (complete text available at <http://rhythmiclight.com/archives/index.html>).
11. Kushner, Marilyn S., *Morgan Russell* (New York: Hudson Hills Press, 1990) 105.
12. Macdonald-Wright, Stanton, *The Art of Stanton Macdonald Wright* (Washington, D.C.: Smithsonian Press, 1967) 22.
13. Huntington-Wright, Willard, *The Future of Painting* (New York: B.W. Huesch, Inc., 1923) 51. (complete text available at <http://rhythmiclight.com/archives/index.html>).
14. Lubar, Katherine, "Color Intervals: Applying Concepts of Musical Consonance and Dissonance to Color," *Leonardo* 37, 127-132 (2004).
15. Badt, Kurt, *Die Farbenlehre van Gogh*, (Cologne, Germany: DuMont Schauberg, 1961), as cited in Gerstner (see 4).
16. Sloane, Patricia, *The Visual Nature of Color* (New York: Design Press, 1989) 328. (complete text available at <http://rhythmiclight.com/archives/index.html>).