Filling the Colorless Void: The Cybernetic Synaesthesia of Neil Harbisson

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What would be truly surprising would be to find that sound could not suggest colour, that colours could not evoke the idea of a melody, and that sound and colour were unsuitable for the translation of ideas, seeing that things have always found their expression through a system of reciprocal analogy.

– Charles Baudelaire, “Correspondences”

The phenomenon described by French poet Charles Baudelaire is known as synaesthesia, a condition that has mesmerized artists and musicians since the mid-nineteenth century. The Oxford English Dictionary defines the term synaesthesia as the "production, from a sense impression of one kind, of an associated mental image of a sense impression of another kind" as well as "the production of a synaesthetic effect" through the "use of metaphor.”

Derived from the Greek word syn (union) and aesthesis (sensation), this condition occurs neurologically in some, while others (typically artists, musicians, and writers) make use of aesthetical metaphor in order to impart the synaesthetic sensation onto the viewer or listener.

Since the mid-nineteenth century, it has been an objective of creative individuals to unite the adjacent disciplines of music and art. Visual artists, such as James McNeil Whistler and Wassily Kandinsky, desired to give a static image the temporality and transient nature of music. The synaesthetic zeitgeist was also championed by poetic and literary figures (including

Charles Baudelaire, Arthur Rimbaud, Vladimir Nabokov, among others) who manipulated language in attempts to create illogical associations in the minds of their readers. This rhetorical trope might cause a reader to contemplate such specious ludicrosities as the smell of a color, the taste of a melodious tone, or the sound of a photograph.

A contemporary artist whose work and life exemplifies synaesthesia is Neil Harbisson. This paper argues that Harbisson has cohesively introduced both the aesthetically symbolic and neuropsychological aspects of synaesthesia into his work and life. Harbisson, born with achromatopsia (complete absence of color vision), lives every second of life with a cybernetic device that serves as an extension of his own sensory system. This device allows Harbisson to perceive variations in color saturation and hue through sound waves. Harbisson is a living embodiment of synaesthesia in its truest, yet its most artificial, form.3

The term synaesthesia first entered neuro-scientific discourse in 1880, with Sir Francis Galton’s theory that a certain number of people in the general population experience sensations in several modalities as a result of the stimulation of a single modality. In his seminal text on the topic, Inquiries into Human Faculty and its Development, Galton relayed his findings regarding a multiplicity of synaesthetes (people who experience synaesthesia), determining that the visualization of forms is hereditary and unique to each individual.4 He provides his reader with an excerpt from his correspondence with synaesthete Baron Von Osten Sacken: “In my mind’s


eye the figures appear in front of me, within a limited space. My peculiarity, however, consists in the fact that the numerals from 1 to 9 are differently coloured; (1) black, (2) yellow, (3) pale brick red, (4) brown, (5) blackish gray, (6) reddish brown, (7) green, (8) bluish, (9) reddish brown, somewhat like 6.”

Galton’s findings regarding this “peculiar habit of mind” confront the orthodox view of perception first articulated by Aristotle in his 250 BCE treatise, On Sense and Sensibililia, in which he argues that each of the five senses – sight, smell, taste, touch, sound – correspond to (and stimulate) “a distinct and proper sphere of activity.” The existence of synaesthesia disproves this traditional notion by implying that sense correspondence is not universally distinct, and there is no “proper” perception of any particular sense. Without the scientific advancements in the century since Galton’s experimentation, it is impossible to say whether or not Harbisson would have been able to utilize the synaesthetic phenomenon to overcome his achromatopsia.

In order to fully grasp the ingenuity and significance of Harbisson’s cyborgical innovation, one must first understand the contextual duality of synaesthesia. As noted above, the synaesthete (one who experiences synaesthesia) subsists in two realms: the neuropsychological realm, in which the individual automatically and unwittingly attributes a certain sensation to another typically unrelated sensation (hearing colors, smelling sounds, etc.); and the realms of aesthetics, in which visual, auditory, or literary techniques are used by the

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6 The Encyclopedia of Aesthetics, s. v. Synaesthesia,” by John Gage
artist to impose upon its audience a certain atypical sensory reaction. Yet, the term synaesthesia is primarily used to describe “abnormal” sense perceptions experienced by a small minority of humankind. In so doing, the term connotes its antithesis as “normal” sense perceptions, the sensory phenomenon typically known and felt by the majority of humanity.

In the case of many creative artists, the distinctions between the metaphorical (aesthetical) and neuropsychological become blurred. It is often unclear whether these individuals are true synaesthetes, or if synaesthesia occurs as a result of artistic intention. The latter could be described as artificial or simulated rather than naturally occurring. As synaesthesia scholar and neuroscientist Dr. Vilayanur Subramanian Ramachandran writes, “Synaesthesia is seven times more common among artists, novelists and poets, and creative people in general … artists often have the ability to link unconnected domains, have the power of metaphor, and the capability of blending realities.” It is uncertain whether the phenomenon that Ramachandran refers to is aesthetic or neurological; however, a brief examination of art and literary history reveals that many creators have used their respective media in attempts to disarrange the senses.

Around the time of Galton’s advancements in the study of sense perception, many late-19th century artists undertook the task of synaesthetically “blending realities.” French Symbolist poet Arthur Rimbaud does exactly this in the opening line of his 1871 poem Les

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Voyelles (The Vowels). It reads “A noir, E blanc, I rouge, U vert, O bleu: voyelles.” In this simple, arbitrary attribution of colors to vowels, Rimbaud’s text serves as the vehicle for transmitting the irrational synaesthetic association to the mind of his reader. Almost a century later, Russian-American novelist Vladimir Nabokov, a self-proclaimed synaesthete, provides his reader with a glimpse of his bizarre perception of the world around him. In his 1966 autobiography, Speak Memory, he writes, “The long a of the English alphabet...has for me the tint of weathered wood, but a French a evokes polished ebony.” Nabokov’s writings embody both the natural and artificial synaesthesiae in that he is describing his true synaesthetic observation of the letter A, but he has placed this observation in a context (his novel) which serves to transmit his unique sensations to a reader.

Disarrangement of the senses was not merely the task of literary figures. In the early twentieth century, as abstraction began to take precedence in Western Art, Wassilly Kandinsky attempted to visually simulate and capture the fleeting sensation of a symphony. Kandinsky, widely recognized as the creator of the first truly abstract painting, was perhaps assisted in this monumental task by his muddled senses: he is said to have discovered his synaesthesia while attending a Wagner opera in Moscow, and of this occasion he states, “I saw all my colours in spirit, before my eyes. Wild, almost crazy lines were sketched in front of me.” He created purely abstract paintings by visually transcribing chords and musical notes into a fervorous

array of line, color, and form. Some of these works were given musical titles such as *Composition VII* (Figure 1) and *Fugue* (Figure 2).\(^\text{12}\)

As the nineteenth and twentieth centuries saw Baudelaire, Rimbaud, Nabokov, and Kandinsky, among many others, utilizing their atypical responses to sensory stimuli for creative means, twenty-first century technological advancements and audacious ingenuity have allowed for contemporary artist Neil Harbisson to serve as the absolute embodiment of aesthetic (artificial) and neuropsychological (naturally occurring) synaesthesia.

Harbisson was born in Ireland in 1982, yet he spent most of his young life in the Catalan region of northern Spain. In his early youth, it became evident that he had been born with a condition called achromatopsia, or complete color-blindness. The young Harbisson responded to his grayscale view of the world in a variety of ways, namely by dressing exclusively in black, white, and gray clothing. As he developed into an artist, he painted in a strict monochromatic scale, stating: “I never used colours to paint because I feel completely distant to them. Colours create a mysterious reaction to people that I still don’t quite understand.”\(^\text{13}\) This apparent disconnect from the world of color and a chance meeting with an expert in cybernetics would have a profound effect on Harbisson’s life, art, and perception of reality.

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In October of 2003, during his second year at England’s Dartington College of Arts, Harbisson attended a lecture on cybernetic sensory extensions given by digital futures/cybernetics expert Adam Montandon. Cybernetics is the theoretical study of communication and control processes in biological, mechanical, and electronic systems. This scientific discourse is often discussed in regards to comparing artificial and man-made regulatory systems and the most efficient utilization of these processes.14

Intrigued with the idea of digitally augmenting his senses, Harbisson approached Montandon and they began work on a radical new type of prosthesis: a cybernetic body apparatus that would make use of Harbisson’s existing senses to create an entirely new, artificial sense.15 Montandon ingeniously recognized that marriage of the musical spectrum and the color spectrum would allow for Harbisson to perceive his grayscale world in an entirely unique way. In reference to his attempt to fabricate a new sense, Montandon stated: “By using sound, I felt that it would give [Harbisson] a good approximation of colour as he has very good pitch perception, as he is a keen musician. I was confident that shifting colour into sound would be an appropriate and effective way of re-mapping Neil’s brain, as the natural occurrence of synesthesia seems to suggest that the visual and auditory senses can in some case become overlapping.”16

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The receptor device created by Montandon is known as the “Eyeborg” (Figure 3). In a June, 2012, interview with arts and science blog *CultureLab*, Harbisson, when asked how the Eyeborg works, described the basic functions of the cybernetic apparatus:

Colour is basically hue, saturation, and light. Right now, I can see light in shades of grey, but I can’t see its saturation or hue. This gadget detects the light’s hue, and converts the light into a sound frequency that I can hear as a note [wavelength is inversely proportional to frequency so it can easily convert the wavelength of the light into a sound frequency]. It also translates the saturation of the colour into volume. So if it’s a vivid red I will hear it more loudly.\(^\text{17}\)

The device, similar to a digital webcam, works in association with software on a laptop computer that Harbisson carries in a backpack at all times. This software serves as a processing center, detecting the color in front of Harbisson and converting it to a distinct sound frequency. The tone is then sent to a chip implanted in the back of Harbisson’s neck, passing sound waves through his bones and into his inner ear. In September, 2012, Harbisson underwent a surgical procedure to have a microchip osteointegrated, or put inside a bone in his neck, enhancing sound quality and resonation.\(^\text{18}\) Montandon’s creation capitalized on the plasticity of the human mind, as well as the notion of overlapping senses (synaesthesia), synaptically re-mapping

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Harbisson’s brain to recognize 360 different hues by their particular tones. In this respect, Harbisson is the world’s first genetically engineered synaesthete.

While genetically-engineered senses or robotically-enhanced limbs generally exist in the realm of science fiction movies and comic books, the notion of the cyborg has become deeply enmeshed in society. A condensed version of the phrase ‘cybernetic organism’, a cyborg is defined as “a person whose physiological functioning is aided by or dependent upon a mechanical or electronic device.” To some, Harbisson’s “Eyeborg” is an extreme example of the hybridization of man and machine; however, this symbiosis may be seen as symbolic of humanity’s transition into a new type of being. According to cyborg anthropologist Amber Case, smart phones and computers have become “external brains” of sorts, which alter the ways in which humans communicate, form memories, and interact with the world. Rather than being gradually swept towards synergism by the unrelenting current of technological advancements (like the majority of society), Harbisson consciously and deliberately embraced cyborgism.

Harbisson makes use of his augmented senses to create unique and striking works of art. His work perpetuates the endeavor to meld the disciplines of visual art and auditory sensation that fueled Kandinsky in the early twentieth century. Harbisson uses his cyborgical sense to create direct visual representations of songs. He does this by reversing his typical perception,


21 “Amber Case: We are all cyborgs now | Video on TED.com.” TED.com, last modified January, 2011, http://www.ted.com/talks/amber_case_we_are_all_cyborgs_now.html.
transposing each note within the song to its corresponding color. Harbisson has created highly structured, colorful paintings from complex classical arrangements such as Beethoven’s *Fur Elise* (Figure 4), and Vivaldi’s *Spring* (Figure 4), as well as garish modern pop songs like Justin Bieber’s *Baby* (Figure 6). Harbisson has also utilized the Eyeborg to create sound portraits. In examination of the hue of a person’s face, Harbisson attributes a single tone or chord. Harbisson has created portraits of Woody Allen, Prince Charles, Leonardo Di Caprio, Tracey Emin, Nicole Kidman, and countless others. Considering these portraits as works of art, one must infer that every time Harbisson meets another person, he is sonically painting their portrait. Through his work, Harbisson is relaying to his audience his artificial synaesthetic view of the world, as did Kandinsky, Rimbaud, Nabokov, etc. However, unlike those figures of the past, Harbisson has rewired his brain to accept this union of sensation.

In *Phenomenology of Synaesthesia*, behavioral neuroscientist Dr. Vilayanur S. Ramachadran poses several questions regarding the future of this sensory phenomenon: “Can synaesthesia be learned or cultivated?” and “will it ever be ‘genetically’ possible, to become a synaesthete?” It is clear that with twenty-first century technologies, daring, and understanding of human brain function, cultivation of synaesthesia is indeed possible. Harbisson, once confined to a grayscale existence, has now, with the aid of modern cybernetic prosthesis, become a manufactured synaesthete. In this regard, Harbisson’s digitally


manipulated, overlapping senses allow him to perceive his once-monochromatic world as a wonderfully diverse, ever-changing sound painting.

Figure 1. Wassily Kandinsky, Composition VII, Oil on Canvas, 1913, The State Tretyakov Gallery, Moscow, Russia.
Figure 2. Wassily Kandinsky, *Fugue*, Oil on Canvas, 1914, Collection Ernst Beyeler, Bazel, Switzerland.
Figure 3. Neil Harbisson wearing the *Eyeborg*, 2010.
Figure 4. Neil Harbisson, *Colour Scores: Beethoven’s Fur Elise (left), Vivaldi’s Spring (right)*, 2004.
Figure 5. Neil Harbisson, *Colour Scores: Justin Beiber’s Baby*, 2012.