Synesthesia and Perfect Pitch: A Possible Connection?

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ABSTRACT

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Synesthesia -- the mixing of senses -- and perfect pitch -- auditory recognition of a musical pitch -- are two separate phenomena, ways of experiencing the world. These perceptions have been misunderstood for many years. They have bugged psychologists for ages, and scientific breakthroughs have only been made in the last century. This research can help not only musicians with perfect pitch, but also anybody else who sees the world -- literally -- in a different way. It can also help those who don’t understand their world to see it through their eyes and understand how these people operate.

This thesis, written in a persuasive style, first gives a short history of synesthesia and perfect pitch, what they are, and how they have been studied. It then looks at how those two phenomena interact in the music world. It includes interviews with people who have perfect pitch or synesthesia. It also includes a personal statement and gives a conclusion: synesthesia is mostly genetic, while perfect pitch can come from both genetics and outside influences.

For me, this project is not only a scholarly effort but a process of self-discovery, as I happen to have both perfect pitch and synesthesia. Where do these two come from? Do they interact at all? And how does that relate to me as a person and as a musical composer? I attempt to answer these questions and more within the pages of this thesis.

In addition, as part of my thesis, I created a video that demonstrated synesthesia with music. This video attempt to show what perception is like for those who can see colors when music is played.
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Introduction
Since the beginning of time, there have been mysteries that the human mind, on its own, cannot explain. Often these mysteries are unseen, in the mind's eye. These mysteries give way to science, which tries to explain the world and succeeds with considerable results; yet, even with scientific breakthroughs, there is still much to be explained.

In today's world, there is a call for tolerance of all backgrounds, faiths, sexual orientations, political viewpoints, and lifestyles. This includes the seen, as well as the unseen. Our culture is changing to make this acceptance more in the mainstream. Lifestyles with clear labels -- the color of one’s skin, their religion, their sexual orientation, the choices they make -- are becoming more accepted. It is the unseen that is not understood. There is still a misunderstanding about one’s perception of the world and the differences from person to person. This issue often stems from one of (a lack of) self-confidence. As a selfish culture, we often only care about the way we see things, and “we don't care” about how others see it.

Meanwhile, while we are too busy being narcissistic, those who actually can physically see the world differently are in a world all their own. (I am talking about those who can actually perceive something others can't; I am not covering those who have a chemical imbalance or a mental disability. These people are otherwise completely normal.) Often, instead of being afraid of their perception of the world, they hide it. Sometimes they don’t even notice they are seeing things differently. Instead of noticing their differences, they tend to assume that their perception is the same as everybody else’s. Only upon realizing that they do not see the same way as everybody else do they recognize their difference.

Therefore, even those who physically see or hear the world differently are confused about their situation. They don’t know where to go when they discover that they are “different.” They might even think that there is something wrong with them that needs to be fixed. This is a reality for me. I physically see and hear the world in ways that other people can't even dream of. When thinking of ideas for a thesis project, I kept thinking about my perception. I wanted to figure out why I am the way I am, and why I see what I see. Is there some explanation for the way I see life? Or am I the one who is wrong? This project is the
result of those questions.

One must note the change in research over the past two hundred years. In an attempt to find the unseen unity that binds the universe together, scientists have discovered synesthesia, or the mixing of the senses. Musicians have also discovered absolute, or perfect, pitch, the ability to recognize musical pitches, or notes, without additional aid. These are both two separate ways to perceive parts of the world that surround us, ways of perceiving that the great majority of the population does not have. With this research, some of the mysteries are solved, and those who have these perceptions of the world are better able to understand their views.

In order to accept both synesthesia and perfect pitch, one must be willing to learn about them and to see that people do see from this point of view. Yet rarer still is when a person is in possession of both of these phenomena. This is my dilemma, and why I have chosen to write my thesis on the combination of perfect pitch and synesthesia. How did I get perfect pitch and synesthesia? Where do synesthesia and perfect pitch come from? Furthermore, can they be combined? Do they come from the same place? And have they affected each other at all, in me and in others who might have this same problem? These are some of the questions I will attempt to answer here.

Objectives

Any thesis can fail if its objectives are not clear and concise. Therefore, I am stating my objectives first and foremost to give this thesis clarity and to keep its focus. The objectives are as follows:

1. To give a very short history of both synesthesia and perfect pitch and their purposes;
2. How both synesthesia and perfect pitch, on their own, relate to the musical arts and how they can help or hinder musicians;
3. To examine a combining of perfect pitch and synesthesia and what that would detail;
4. Interviewing current subjects with perfect pitch, synesthesia, or both, and detailing how they and their abilities are treated in a real-world environment;
5. To come to a conclusion about any similarities synesthesia and perfect pitch may have; and
6. To present in a visible form the merging of synesthesia and perfect pitch, in a way that the nonsynesthete might understand.
What is synesthesia?

Synesthesia comes from the Ancient Greek “syn,” which means “together,” and “aisthēsis,” which means “sensation.” Synesthesia is not a mental illness or a disorder; rather, it is a condition, a phenomenon that happens to certain people; a different way of looking at the senses.

Synesthesia, as defined by Kevin Dann’s “Bright Colors Falsely Seen: Synesthesia and the Search for Transcendental Knowledge,” is “an involuntary joining in which the real information of one sense is accompanied by a perception in another sense.” When one sense is registering something, another sense responds as well. This is a very real experience; the person in question is not hallucinating. They actually feel the other sense in connection to another. Any of the senses can be crossed; sight with hearing, smell with touch. However, the senses that cross the most in synesthetes are the senses that have centers near each other in the brain.

The study of synesthesia has been ongoing for several years, ever since the beginning of the nineteenth century. Scientific publication on synesthesia began when Dr. George T. L. Sachs talked about his experiences, as well as his sister’s experiences, with synesthesia in his 1812 dissertation. Sachs’s main point in his dissertation was his albinism, which he had been born with. However, toward the end of his dissertation, he talked about how he could see colors along with numbers and letters. This publication became wildly popular -- the study of albino people had never been done before, but in addition, people were mystified. How could someone see colors along with letters and musical pitches? Even today, Sachs’s dissertation remains one of the original sources of information on synesthesia.

Other early studies of synesthesia were done by those who had heard of Sachs and the condition he shared with his sister. Many of these people were part of the Fin de Siecle movement in France. Calling it “audition colorée,” or “color hearing,” the Fin de Siecle Symbolists of that time insisted that “…true reality lies only in dreams” (Dann 18) and that those who could see color while hearing musical pitches could somehow reach another world. To them, it was another colorful world these people were seeing, and they wanted to be able to achieve the same thing. They were interested in this type of synesthesia because it blurred reality, much like dreams can, and weren’t interested as much in the scientific side of synesthesia. Because of their work, throughout the nineteenth and into the twentieth centuries, the view of synesthesia wasn’t a very concrete one. Rather, synesthesia was seen as a window into another world, something that people could aspire to.

The scholarly world became more fascinated with synesthesia after Arthur Rimbaud and Charles Baudelaire published poems about the idea in literary magazines. Published in the
1880’s and the 1850’s respectively, they garnered quite a bit of discussion. “Voyelles” was one of the most argued about poems in the world at the time of its publication, most people offering mystical and spiritual explanations for what Rimbaud was going through (Dann 25). Likewise, Baudelaire’s poem, entitled “Correspondences,” was often tied to Emanuel Swedenborg’s work; Swedenborg stated in his papers that, according to him, all of the senses had relation to each other. Baudelaire himself wrote about Swedenborg often, believing with his ideals. This led people to make a connection between “Correspondences” and synesthesia, the correspondence of senses.

The fame of synesthesia didn’t stop there. Artists such as Rimbaud, Aleksandr Scriabin, and Wassily Kandinsky experimented with color synesthesia in their works. This led many to believe that they were synesthetic when in fact they were not. Essentially, synesthesia quickly became a misunderstood phenomenon; people thought that those who had it could connect with the spiritual realms, and that authors who were inspired by it actually had it. Those who read about it were either skeptical that it even existed or fascinated with words other than their own.

It wasn’t until the 1920’s that a rational, scientific explanation for synesthesia was provided. Raymond Holder Wheeler and his student, Thomas D. Cutsforth, wrote a series of papers that didn’t focus on synesthesia as a freak event. They rationalized that synesthesia wasn’t some connector to another world. In fact, it wasn’t an external stimulus at all. Rather, they insisted that synesthesia, to the synesthete, was normal, a part of their normal thought process. Synesthesia was like another sense, and it had been integrated in with the rest of the synesthete’s senses. It was a brain process, an idea not of perception but conception (Dann 52).

The papers proved that synesthesia doesn’t come from an external source, like another world. In fact, it comes from inside the synesthete’s brain and how the brain is wired. The workings inside mix the senses up and create the illusion (or reality) of colors, which the synesthete then sees. This also works with the other senses.

Cutsforth had been synesthetic before he lost his sight at a young age. Surprisingly, he retained his synesthesia, and was able to describe the colors he saw “in his head” to Wheeler, who recorded them. Therefore, despite the fact that Cutsforth was blind, he lived in a very colorful world, a world others could not see. Dann references:

“Cutsforth heard a particular voice as “brownish yellow, the color of a ripe English walnut,” another as yellowish, poorly saturated, like old beeswax,”...he experienced color imagery for each of the letters of the alphabet...for names of the days of the week and months of the year, for numerals, dates, telephone numbers, for the cardinal directions, and colored forms for numbers, weeks, months, centuries, and alphabets.” (82)
Furthermore, to Cutsforth, he depended on his synesthesia to make sense of the world around him. Since he could not see, he could read his synesthesia to identify voices or sounds he heard. If he tried to change the color in his head, his hearing would be distorted. Without synesthesia, he could not operate. It was built into him as much as the separate senses are built into “normal” people.

Wheeler and Cutsforth published several lengthy papers between the years of 1921 and 1927. Regardless of this lengthy explanation of synesthesia, most people ignored it. Peers dismissed Wheeler and Cutsforth’s papers, believing that synesthesia couldn’t possibly be normal at any stage in life. Today, Wheeler and Cutsforth’s papers are more accepted in the scientific world, even being used as a basis for synesthesia research. While the mystery surrounding synesthesia prevails to this day, more research has been done to uncover the secrets behind the sense mixing, in an attempt to better understand it.

More recent studies have focused on synesthesia in children, where it is more prevalent. Research shows that infants are very synesthetic, perceiving their world as a confusion of the senses. A touch provokes a sound; a voice can show colors and feelings as well. This would mean that all humans are synesthetic when they are born, and continue to keep some synesthesia through their early years. As children grow, however, the senses sort themselves out. Smell becomes smell, sight becomes sight, and with growth, most children lose their synesthesia in a couple of years, before they can even remember having it. Patricia Duffy describes this in “Blue Cats and Chartreuse Kittens: How Synesthetes Color Their Worlds:”

“As the brain matures, it clearly delineates its sensory responses into “this is sight,” “this is sound,” “this is smell,” ...the brain develops and compartmentalizes its functions, and the synesthetic fusion of infancy gives way to the discrete sensory experiences of later childhood and adulthood.” (11-12)

Sometimes this compartmentalization never happens, and what is left is an adult with synesthesia. This adult has learned how to associate colors with letters or musical notes, or other senses with others. Someone with synesthesia isn’t developmentally challenged; it’s not as if the lack of “compartmentalization” makes them less of a person. Rather, it changes the perception of their world.

If synesthetes have fully learned how to utilize their synesthesia, no matter what they do, they can’t remove the colors. If they try to fully forget them, it hampers their perception and can cause confusion. They can ignore them for a while, however, preferring to focus on the actual color in front of them. Some synesthetes say that their synesthesia is much like looking through a screen, or a plastic bag. If they focus their attention on the physical words in front of them, the synesthesia lessens to a degree. Only when they switch their attentions to the synesthesia do the colors snap back into their reality. This way, synesthetes can perceive the way the same way non-synesthetes do, and if they focus on the world
around them too much, they may forget they have synesthesia, not even realizing they have it (as I did for a long time). Because of this ability to see what others don’t, but also having the ability to see what others do, many synesthetes seem like they live in two separate worlds.

Most people do not lose their synesthesia as they get older. However, some people can lose their synesthesia if their brain changes. This does not happen often but happens when the brain is damaged, such as in a car accident. While non-synesthetes may guess colors for letters and change their guesses over short time periods, synesthetes always see the same color. It does not change over time or as people age.

Synesthesia can form in two different ways. It can form either from a gene that a person has, or it can form from an outside stimulus. These stimuli include perception-altering drugs such as LSD. Drugs have been taken many times in history to experience other perceptions; most noted in our modern world today for being taken in the “psychedelic 60’s.” While drugs were taken in the 1950’s and 1960’s to study synesthesia, and also in an attempt to “reach the unknown,” these acid trips are only a temporary foray into the synesthetic world. Furthermore, the research still raised a lot of questions, and synesthesia itself was never central to the research (those researching LSD were looking to see if it would be helpful in a truth serum (Ward 70)).

The gene-forming synesthesia can affect any of different parts of the brain. Certain nearby parts of the brain affect each other; as the centers for color recognition and letter recognition are close together, they are often crossed over by genes. (Often is relative, as most people do not have synesthesia.) Another frequent synesthetic example is a spatial one; some synesthetes who see other things in front of their faces (like those with letter-color synesthesia) see maps in front of them when faced with certain ideas, like days of the week or strings of numbers. This could possibly be because the system for recognition of space is close to letter and number recognition in the brain; things that are numbered, such as numbers and days of the week, for these people, appear in a line, squiggles, or other such visions.

There are many different types of synesthesia, as the senses can mix with each other in differing ways. Smell can mix with sight, taste can mix with hearing, et cetera. For consistency, when mention synesthesia from here on out in this thesis, I will be referring exclusively to the music-color type of synesthesia, where a person hears a note or sees it on the staff paper and sees a color in relation. This is because I will be comparing synesthesia, and especially this type of synesthesia, to another phenomenon.

What is perfect pitch?
Perfect pitch, otherwise known as absolute pitch, is the ability to tell what a note is based on its frequency, without any other aid. Oliver Sacks describes perfect pitch this way in his book “Musicophilia: Tales of Music and the Brain:”

“...to those with absolute pitch, every tone, every key seems qualitatively different, each possessing its own “flavor” or “feel,” its own character. Those who have absolute pitch often compare it to color -- they “hear” G-sharpness as instantly and automatically as we “see” blue.”

Note that Sacks does not say anywhere that people with perfect pitch actually see the color, which would constitute a mixing of senses. In people with solely perfect pitch, the sensation is purely auditory.

While the definition of perfect pitch is clear, the origins are ambiguous. Research has met varying results, with many scientists still unsure as to how perfect pitch forms. At the same time, entrepreneurs are jumping on the bandwagon, insisting they know how perfect pitch works, it can be taught, and this secret can be yours (for a small fee, of course). The only fact people seem to agree on is that perfect pitch exists. I will try to clear up some of this confusion surrounding perfect pitch here.

The problem with perfect pitch is that it relies extensively on an external stimulus. That stimulus is the certain pitch that is received by the ears. Although everybody can hear a difference between notes, what perfect pitch requires is a certain ability to recognize which pitch is which, without comparing it to another note. It has nothing to do with the actual ear itself; rather, it is a brain construct. (Someone with perfect pitch can also think of a note in their head and name it; this does not require any external stimulus.)

The key argument about perfect pitch is this: can it be taught, or is it something a person is born with? This can go back to a central argument in psychology: nature versus nurture. Is a person the way they are because nature -- their DNA -- has made them that way, or are they that way because they were nurtured a certain way as a child? Other fields of psychology have dealt with this question for years, if not centuries. There is no solution; this is an ongoing problem. This problem extends to perfect pitch: Is someone born with it? Or do they learn it at an early age?

Synesthesia, our other stimulus, is clearly genetic, and perfect pitch may be this way as well. This would mean that only certain people -- those with the “perfect pitch gene” -- could have perfect pitch. It would remain something elusive, or something that one could only crack in a DNA map. People who have perfect pitch would have to be sought out, tested for, and identified. Those with this ability would seem to be superhuman (as they seem to be even now).
However, the argument can be considered from the “nurture” standpoint as well. Rather than being born with a gene that can tell which pitch is which, these people say that perfect pitch is something that can be taught. As such, anybody (with varying degrees of success) can be taught it. Perfect pitch could be something that could be taught, a code that would be cracked. Several businesses insist that this is the case and they’ve cracked the proverbial code.

Further complicating measures is the lack of consistent study done on those who have perfect pitch. Many studies done on perfect pitch measure the wrong controls and fail to make any jumps in actual scientific endeavor. They might tell how many people have perfect pitch, but they fail to attempt to discover where it comes from or how people use it. In addition, another problem is that the tests are not clearly defined. Most musicians possess relative pitch, or the ability to know what a note is in relation to another note. (For example, when they hear C followed by D and they are told the first note is C, they can identify D.) This can affect their testing in a perfect pitch test; if they remember what the last pitch they were played is, they can relatively place the rest of the pitches accordingly, and researchers might think the musician has perfect pitch when in reality they do not.

A study done by Elizabeth Theusch and her assistants from the University of California, San Francisco, provided some clarity to the matter. Starting in 1998, they focused on genetics by finding people through the Internet to interview and take DNA samples from. They traced perfect pitch through families. They finally discovered part of a gene that is apparently linked to perfect pitch. The gene is most significant in people of European descent, and shows that more than one gene can influence perfect pitch (the gene in question is just one of them). They also advocated that perfect pitch not only comes about through genetic gift, but also through early childhood training. The study was published in several venues, including *The American Journal of Human Genetics*. An online reporter summarized this from the research, on the topic of whether perfect pitch is genetic or learned:

“All human traits, especially behavioral ones, are developed through the interplay of genetic and environmental factors. In the case of perfect pitch we now have the beginnings of the details of this interplay. Having the genes for perfect pitch are key, but developing perfect pitch also requires musical training.”

Theusch and her associates combine the ideas of nurture and nature, as stated in another review of their work (Gregersen 2):

“Genes and environment interact, and the interaction goes both ways. Teasing apart these effects, especially in retrospect, is extremely difficult, and it is wise to be cautious about drawing any firm conclusions from this kind of historical data.”

Some businessmen insist they have the ability to teach perfect pitch to people. These peo-
People have built their philosophy off of the “nurture” argument of perfect pitch, insisting that perfect pitch can be taught. The program is offered as a set of CDs that make the buyer slow down and listen to each note, figuring out the “tone color” of each note and comparing it with others. The advertisement insist it works; there is a 97% success rate listed. The website even gives information on studies that have been done on this method, proving they all work.

Further research reveals people who have had positive experiences with this course, and also others who are frustrated with it. “Don’t waste your money,” they tell people on boards and weblogs. The Amazon.com listing for the Perfect Pitch Ear Training SuperCourse gives the course three stars out of five, getting that rating from user reviews. Of the reviews on the site, eight were completely positive; seven were completely negative. The difference between the reviews, upon reading them, seems to be the time invested in them. The more time and practice put into the course, the more one walks away with “perfect pitch.”

From the previous research, one can see that these teachings can work, but there are varying degrees of success depending on the person, how hard they are trying with the method, and their DNA map. For example, if a person is predisposed to having perfect pitch, these methods will “work” for them. If they work hard and use the method every day, for a long period of time (ideally longer than a year), they will finally be able to identify their perfect pitch, learning how to use it and to hear the tone colors appropriately. In that case, it is a win-win situation, the student getting perfect pitch and the creators getting paid (unless the student is taught nothing, and then should request a refund). If a person is not predisposed to having perfect pitch, the method might work to different degrees. Someone who has no gene for perfect pitch at all might learn it through a method, with lots of hard work and ear training. However, it takes dedication to get to that level; if they expect it to come easily, it never will.

A person doesn’t have to have perfect pitch in order to become a good musician. Many of the world’s musicians discover they have perfect pitch only after playing for so long; others are extremely good but regardless never have perfect pitch. Perfect pitch can certainly aid a musician, but it can also be considered a curse, especially when somebody is playing an instrument or singing out of tune. People with perfect pitch say hearing someone play or sing off pitch is akin to hearing somebody scratching their nails on a chalkboard. This can mess up their ability to play or sing, since it is a distraction.

Additionally, someone can have perfect pitch, but they have to know how to use it. Someone can hear the difference between pitches, but they’re still not going to know that C is C and D is D without being told by somebody who already knows. Therefore, some musical training is required to fully take advantage of perfect pitch. People who never have musical
training might actually have perfect pitch, or at least the gene for it, but never realize it because it is never utilized.

Perfect pitch is more common among those people who are fluent in certain languages, such as Chinese and Vietnamese. This is because those languages have pitch variations, and most likely because, from birth, these people have trained their ears to hear more variation in words and how they are spoken. In Chinese, on paper when spelled out in pinyin (the English alphabet), four words might look the exact same; it is only how they are pronounced that is different. There are slight pitch variations, which mean the difference between one word and another. This variation is so slight that the Chinese ear must be trained to hear it; therefore, that same ear is positioned to hear clear distances in sounds such as music. Regardless of DNA map, all children who learn tonal languages from birth are trained to hear these differences. This helps prove that, with perfect pitch, there could be some training to it and it is not just genetic.

In addition, perfect pitch is like synesthesia, in which it must be caught and harnessed early on. Children who start music lessons early on also have a higher rate of perfect pitch, most likely because they are around music while their brains are still forming essential components. Just like a Chinese ear must be trained to hear the different pitch variations in language, children around music sometimes naturally train themselves to hear differences between the notes. Studies have been done about this from a language standpoint; children who are exposed to languages (including ones spoken outside the home) before the age of three often pick up these languages and become fluent in them without much effort. There is the rare case of somebody ‘learning’ perfect pitch when they are older; in most cases, the person would have already been genetically predisposed, ready to learn what they have been predestined in their genes for.

This leads us to the current consensus on the origin of perfect pitch: someone is predisposed to having a more sensitive ear, which would make it easier for them to learn the nuts and bolts of what is defined as perfect pitch. If they learn these nuts and bolts at an early age, they can fully harness this genetic power, and perfect pitch becomes another ‘language’ for them. In a perfect world, a child would be tested for a perfect pitch gene early on, and if they possessed that gene, they could be trained while the window of opportunity is still open. This could become the reality in the future; for now, there is not enough research to make it plausible.

The Art Connection

Both synesthesia and perfect pitch, regardless of their origins, have connected artists to their art in extraordinary ways. Synesthetes not only can see the world differently, but they
can see their art in ways that other people can't; this creates an entirely new world for them to experience and live in. This world becomes their art. Not all artists have synesthesia, and not all synesthetes make art, but there is definitely a connection between synesthetes and the world of fine arts.

Patricia Duffy, in her book, talks of a composer, Michael Torke, who sees music in color. He lets this synesthesia affect his compositions and writes pieces in green (E-major) and in orange (G-sharp). When writing music for the New York City Ballet, Torke takes his colors into consideration. His “Ecstatic Orange” (the aforementioned piece in G-sharp) doesn't stay in G-sharp the entire time, only for the last movement. However, it is orange enough for Torke to name the entire piece after it. The ballet company choreographed orange along with the movement, although Torke says “it was not the orange that I saw when I wrote the music” (Duffy 80).

Sometimes synesthetic artists go to great lengths to make their colors known in their work; other times, they don't particularly care. Novelist Vladimir Nabokov (mentioned in Duffy on page 82) never printed his novels in color to get his vision across; it was the strength of his writing that got him published, not the colors he saw in front of him when he was writing those same words.

Jamie Ward, the author of “The Frog Who Croaked Blue: Synesthesia and the Mixing of Senses” talks about artists who could have synesthesia (he admits that it's hard to tell if an artist is synesthetic if they're dead). He mentions Kandinsky, as well as others. The notes I found most interesting were the ones on Olivier Messiaen, a composer:

“Composers, as well as visual artists, may utilize their synesthesia in order to inspire and inform their music. The composer Olivier Messiaen, a likely synesthete, describes how his choice of musical chords may be affected by their color, and his hand-written scores contain many examples in which he had noted down color correspondences.”

The effect isn't only visible in music. Other visual artistic professions, such as painters and writers, are filled with synesthetes as well. Perhaps those with synesthesia see art as a way for them to translate what they see into a form others can see as well.

Synesthesia and art do not directly go hand in hand, however. Would people who taste words or who hear sounds when they touch something be more inclined to experience the arts? Most researchers doubt it. It is mostly those who have visual synesthesia, such as those who see a color when they hear a musical pitch, that are more inclined to be a part of the fine arts.
If a non-musician has perfect pitch, they still have that perfect pitch. But if they do not know how to use it, there is no way for them to connect the dots. A note might sound wrong to them, but they will be unable to tell if that note is D or E or whatever note it is.

This brings me to my central point. Both perfect pitch and synesthesia can be used in positive ways by their perceivers in the arts. Since synesthesia and perfect pitch seem to be so similar -- phenomenon of perception that others can't see -- could they somehow be connected? Perhaps the gene that signifies synesthesia is similar to one that would provide perfect pitch. Or they could be learned together. Can one affect the other? Do people with synesthesia get perfect pitch more easily, or the other way around? And can they somehow work together to create an entirely new perception of the world?

Dunn argues that often, people with music-color synesthesia will often use their colors to correct their pitch when singing or playing an instrument. He even lists the fact that Aleksandr Scriabin did not have perfect pitch as proof that Scriabin did not, in fact, have synesthesia. This would not be the same as genetic perfect pitch, although if one learns how to have perfect pitch, they can compare it with their synesthesia if they have that as well.

If a person is conscious of their synesthesia and perfect pitch, and even if they are not, it is possible that they can work together in ways they don't even recognize to create a new way of learning music, albeit one that is unique to that person. This is exactly what happened with me during my discovery process; my brain, through the “correspondences” my senses were creating, made an entirely new world for me to perceive.

**Personal Experience**

Without any provoking from me, my perfect pitch and synesthesia had molded together so that when I heard a note, I saw a color, and for a long time, I only related notes to colors. This method is one that has stuck with me long after my early years; I use my synesthesia to practice, to memorize pieces, and also to tune my violin. Even listening to music is a colorful experience. I often pay attention to the colors in a piece and try to determine which of those colors is the one indicating the key the song is in.

I discovered I had perfect pitch at the end of sixth grade. I remember my path to discovery clearer for perfect pitch than I do for synesthesia. This is probably because, for me, having perfect pitch has always been part of my life. My path to perfect pitch involved synesthesia along the way, however.

From the beginning, I was interested in music. I didn’t know what keys songs were in to start with, but I knew they had their own colors from my synesthesia. If I heard a song, I saw the color; this way, each key had its own color, much like each key has its name (as all
people are taught in Western culture). I didn’t know all of these color keys were different until I myself got behind the keys of a piano and was able to physically see the difference between pitches. This happened when my mother bought my sister an eight-key piano for Christmas in 1994. My sister played on it a little, but I found myself entranced by the colored piano.

The more I played the eight-key piano, the more I could distinguish between different notes. Furthermore, I could make relationships between pitches and could copy songs from wherever I heard them. Since, as a child, I came into contact with a lot of younger pop culture, I often played songs from the television and radio, and especially Disney movies, onto my eight key piano. This disturbed my mother, who quickly figured out I wasn’t exactly normal, and she signed me up for piano lessons. By then, my experiments with the eight key piano had been going on for six months, and I was reluctant to leave the eight key piano for a bigger one. All of the keys were a white or black color. How was I going to be able to figure out which key was which? But once I figured out the eight color-coded keys on my child piano corresponded to the seven keys (plus an extra C) on the “big person” piano, I was lost to whatever the teacher was trying tell me as I played all the songs I knew. My colored piano was not in front of me, but by now, I was focused more on the colors I could see on the white keys in front of me. I didn’t need that aid anymore; by then, my synesthesia had formed. I remember my piano teacher calling somebody on the phone to tell them how amazed she was that I could play “Colors of the Wind” from Pocahontas on the piano during my first-ever piano lesson.

I struggled with technique during my early years of piano study. I could see how the notes related in front of me with the colors; why did I need lines and staffs? I remember how C seemed red to me, how G seemed yellow and F seemed green. When I wrote songs, it was all about the color that went into the song, not the notes themselves. I knew what order the bass colors went in to make a song — often, F first, then D, then Bb, then C, and then repeated. I figured out how the colors of the bass and melody went together, and while at that point I knew the note names, it didn’t matter to me if D and C looked good together on paper. What mattered to me was that the colors went together in a way that sounded fine to my perfect pitch.

This also helps explain why I hardly ever transcribed my songs to staff paper. I understood which colors went where, but it was hard for me to tell other people what to do or how to play my songs. It took so long for me to write it out on staff paper, as well. As someone who could grasp a song concept instantly, this frustrated me. Why did I have to put it down on paper for others to read? I figured that everybody else saw and heard music the same way I did, so if I told them how to play it, they would understand. I had a feeling that other people didn’t have my exact skill in music — after all, there must be something up if my pi-
an teacher is freaking out during my first lesson. However, I figured it would easily come to them with practice, as I had done before. Music was just something I liked doing, and I figured if everybody else practiced, they could see things the way I did. Oh, how wrong I was.

I took lessons from a different piano teacher during my last few months in Indiana, and she would have group lessons at her house. It was at one of these group lessons that I was lounging around on her carpet, playing a game with other students, when another one of the students started playing notes on the piano nearby. Unable to see the piano, I rattled off which notes were which, and when the students figured out what I was doing, they continued to play more notes, determined to stump me. The piano teacher came by, amazed that I had perfect pitch and that I had never told her. Confused, I asked, “Perfect pitch? What’s that?” She then told me about how people with perfect pitch could pick out notes and tell what they were without any help. “I thought everybody could do that!” I told my teacher. And when she shook her head and told me I had been wrong, I found myself suddenly thrust into the label of “special.”

Consequently, I discovered I had synesthesia at the beginning of my college career. Because nobody ever told me about the colors, I simply assumed they were normal, and never paid any attention to them. In time, I realized that all along I had assumed that everybody else had their own set of colors that they paired with notes, letters, and numbers. For me, my color synesthesia is not directly physical but instead gives a color over top of the letters; since I don’t have to focus on it, my mind has attempted to ignore it. This could be what Dunn was talking about in his book, when he says that children have a greater perception to synesthesia, but lose it as they get older. For whatever reason, I kept part of my synesthesia, but it is not as strong as someone who, say, sees it physically in front of them.

I believe, in some way, my music-color synesthesia could have been affected by my mechanism of learning; however, this is simply speculation, as Dunn and others make it clear that as synesthetes, we are born with our colors either already programmed or formed by eternal stimuli, and nothing can change these colors. I did a lot of my early play on my sister’s piano, but I do remember having another eight-key colored piano when I was much younger. Since I started playing piano on two different eight key colored pianos, my perfect pitch could have matched the colors on the piano with the notes in my head, and for a long time, it did. Even today, some of the notes on the piano match my synesthesia; F is green, as G is yellow. Yet others, however, do not match up. A clear example is D, which has no color at all and is instead like a plastic bag; I can see right through it. On my second colored piano, the one that I played on the most, D is blue. Therefore, the colors on my piano don’t match up with my synesthesia.
I had another colored piano before the one I did my primary playing on, but I do not remember what the keys looked like. Perhaps it might hold a key to my synesthesia coloring, but of that I will never know. It is highly unlikely, however; I was most likely born with my synesthetic coloring, interacting with it as an infant. There is no way I would have control over it even as a three year old. By then, each color would be formed on its own.

Regardless as to where my synesthesia came from, it has interacted with my perfect pitch even before I knew what it was doing. It continues to this very day; I will often hear a composition, see a color, and know what key the composition is being played in before I test my perfect pitch. Is it possible that other students with perfect pitch have synesthesia because it interacted with their pitch? Or, that students with synesthesia could develop perfect pitch easier?

But one can’t just simply look at one account of synesthesia or perfect pitch. In order to understand it better and to get the full story, one has to look at the bigger picture of these phenomena.

**Others**

Both synesthesia and perfect pitch are rare, although nobody really knows how rare these can be. The numbers for synesthesia can range from “one in 20 persons to one in 20,000” (van Campen 128). The media and its perception can affect this number; when a new media outlet comes out with a new study or story on synesthesia, more people read it and then step forward, realizing they have had this experience as well.

If perfect pitch can be taught, as so many claim it to be, then one would reason that it would become more common. People (especially musicians) would want to have perfect pitch, and they would shell out whatever amount of money to learn how. Perfect pitch would no longer be a phenomenon, but a business. However, as of this writing it is still a “rare phenomenon.” The mystery surrounding perfect pitch remains, despite some people thinking they have cracked the code. An unofficial statistic states that “one out of every thousand people has perfect pitch, one out of ten thousand know they do, and one out of a hundred thousand know how to use it.” It’s just a saying, but it provides some insight into the generally accepted view of perfect pitch.

For this project, I have interviewed as many people as possible, to get a feel of different synesthesias, different perceptions of pitch, and how they could possibly interact. I’ve interviewed those who have synesthesia, as well as those who have perfect pitch.

**Jon**
Jon is a graduate student at Miami University, focusing on piano. I found him through friends; when I told them about my thesis, they referred me to him, saying he saw the same colors I did.

Do you know anything about synesthesia or the mixing of senses?

Not really.

You just know it happens to you.

Yeah.

What's the range of what you experience?

It's very much in the background. My perfect pitch is...far more in the foreground, and I’m always aware of that. The colors are just something that's kind of there. I could always say what color is there, if you ask me, but I’m usually not all that conscious of it.

You mentioned that you have perfect pitch, too. Since when have you known that you have perfect pitch?

I was told. When I started, and I was developing my pitch...I just thought everybody could do that. It was sophomore or junior year of high school. I was at a festival and one of the teachers figured it out.

Where do you personally think your pitch came from? Were you born with it, or was it something you acquired later?

Um...I think I was born with it, but it didn't start developing until I had been playing for a while. I didn't start playing until I was ten. I was a pretty late beginner...but it started happening within a year or two, just picking out random notes. And it was just on the piano that I could recognize them.

When did you first start to notice the colors?

That was college...I think. I had never really thought about it. It was college when I first started realizing it. It was very back of my mind, back of consciousness there.

So you would say that your perfect pitch factors in more than your colors do?

Far more. The colors are just kind of there. Like, the default is to have them off. It’s no problem to turn it on, but it’s usually just off, where the pitch is always on. It wasn't actually until about a year ago that I noticed that my colors for pitches go in the order of the spectrum...beginning with A. A is red.
**What are some ways that you’ve been able to use your perfect pitch? Do you think it’s helped more or hindered more?**

I actually feel like it hasn't been that much of a help. It's almost like some sort of a cool party joke. Sometimes it's useful during sightreading, because I can be staring at the page and I can know if my hand's playing the right note without looking at it. Also, sometimes, it's helpful when performing from memory. If my fingers don't know where to go next, if I can hear what pitch is next, sometimes I can find it. But I don't use it that often as a tool, and the chance to use it doesn't occur that often. It was useful in sightsinging, dictation, singing in choir. But as far as piano playing goes, not in every day life.

**Do the colors help you in any way, or are they just there?**

No. They're just there.

**If you turned on your colors right before you performed, what would that look like?**

I'm not even really sure. I'd definitely be getting more in touch with my artists' side. The colors are large and very general in scope. If I focused on the color...I don't know if it would help my musicianship at all, or if it would impact the way I play, if I brought that awareness to the forefront of my mind.

**Andy**

Andy is a music major at Miami University. He has synesthesia, but it is letter-color synesthesia, ‘supplemented’ with areas of music-color synesthesia. I interviewed him after he described A as a green color, and C as a blue color, knowing that possibly, as a music major, he might have something of interest to talk about.

**Me: Now, when did you...have you realized before now that you had this “color thing,” or...**

Andy: Yeah, I noticed it as kind of a strange thing, that...I just thought was kind of strange. Kind of a weird...it just happened. I didn't really understand why, or have any reason to pay attention to it. But...yeah, I've noticed it before.

**Did you have any sense of knowing that...you perceived the world in a way that others didn’t?**

I had a suspicion of that.

**So you just assumed that everybody else saw colors, too? Or...**
Well, no, I just...I mean, I guess so because I wasn't really thinking about how other people saw the world as. I mean, back when I noticed -- it was a while ago, really -- I don't remember exactly when, but...I'd say I was around ten.

**And you noticed it with letters, especially?**

Numbers. And it's only if I think about it, actually. Like, looking at your keyboard here I don't see a bunch of numbers and colorful-ness all over. But if I look at one number and think about it individually, I see it as a color.

**When you see a bunch of individual numbers together, do you see different colors for each one?**

If I think about it like that.

**Do you get it at all with letters?**

Yeah.

**So it's something that you see only when you focus on it. Have you figured out how to utilize it somehow?**

No. I'm guessing I could probably memorize numbers better that way -- like maybe a phone number, just by thinking of the colors associated with the numbers in it. Maybe that would help. I've never actually tried it, put it in a test at all...but possibly.

**Explain more about how you see color with music.**

Okay, well, if I'm playing in a key that I'm very familiar with, like C or A-flat, the tonic chord often carries a color association with it. C is usually light blue, and A-flat is usually green. But again, it doesn't pop out in front of me or anything, but if I actually stop and think about it, then it's definitely there.

**Where do you think your synesthesia comes from?**

I don't know. I kind of thought it was something I was making up at first, totally arbitrary. Just kind of a random thing my brain did. But now that I know that other people do it too, and to a different degree, a different extent, I think maybe there's more to it. Maybe it's, I don't know, actually related somehow, scientifically. Or maybe a hereditary trait.

I suddenly got an idea while I was interviewing Andy. Andy had told me that his A was green and his C was blue. To him, also, in music, A-flat was green and C was light blue; I happened to notice that the colors matched. I asked him if he could think of any other matches between his letter-color synesthesia and his music-color synesthesia; he couldn't
come up with any right away, but noticed he didn't specifically have colors for sharps or flats, instead letting them be influenced by the white note around them. That explains how he saw A-flat as green, since the name for the key A-flat has the letter A in it. Andy's key of regular A, as well, is a green color.

After asking him to think about the letter B, then giving him a pitch to work with on the color B (by humming it), he noticed the colors were very similar. We tried a few more notes but were able to discover that Andy didn't solely rely on pitches alone to tell him what a note was. (He couldn't -- he didn't have perfect pitch.) When I would hum certain pitches, sometimes he would get them wrong, or guess a different color. For him, the idea was very directional, as if there had to be a keyboard either in his head or in front of him helping him out. If Andy knew that he was playing A, and he could see that he was playing A, then that key would be identified as green. The same happened with the rest of the keys. He had to have that visual in front of him in one form or another.

Catherine

Catherine has what she refers to as "quasi-perfect pitch," or a sense of pitch that is close to perfect pitch but actually isn't.

Me: When did you notice you had this quasi perfect pitch?

Catherine: I don't know. Like, I know how my mom was always talking about how she had it, and so she'd always be playing notes on the keyboard. And she'd be, like, 'I know what these notes are.' And so it kind of made me pay attention to it. It probably had something to do with...I'd try to think of different (notes), and if I heard (notes) enough times, that I wasn't even thinking about it, like, I could figure it out. It was like I wasn't even working at it. I'd sit down and I'd just play something, and I'd be like, 'oh, that's just the way it sounds.'

So your mom had perfect pitch. How early were you around music? When did you start figuring out you had (something resembling) perfect pitch?

I was somewhere between three and five (years old).

In your opinion, is perfect pitch hereditary or is it something that can be learned?

I think it's both. You can have very good relative pitch if you learn a couple of notes, if you can just pull them out of your head. The orchestra tunes to an A. If you know what an A sounds like, and you hear an A, you should be able to say, 'oh.' Pretty obvious. But in my case, I think a lot of it is hereditary. I've always attributed it to -- my dad has no musical knowledge, what-so-ever, and my mom does, and her whole family is musically oriented. Her mom and her dad were both very involved in music, and her brother...So, it kind of
made sense, you know.

**But is it a hereditary predisposition to perfect pitch or was it a predisposition because you were around all of those people?**

I wasn’t necessarily around them, like my mom didn’t sit down and play piano every single night. It wasn’t a nightly thing. It was more, she would pull out her flute when I would ask her to once or twice a week and she would play the same thing every time, over and over and over again. And I didn’t learn to read music -- I refused to learn how to read music until the last possible minute. I just memorized everything...so it wasn’t like I could read the music and associate the pitches with notes until I was ten. Because I refused to learn it.

**And when did you start playing music?**

When I was eight. (My mom) was like, I can teach you flute, I can’t teach you other instruments, and I was like, great, guess I’m playing flute.

**Describe your quasi-perfect pitch.**

If I hear notes on the piano, I can tell what they are...I call it “quasi” because...my mom once asked me when I was listening to a song on the radio. She was like, ‘what key is this in,’ and she started grilling me about it. And I was like, “oh, I think it sounds like it’s in G-flat,” and she was like, “no, it’s in C-sharp” or something, so I was off...so (my mom) was like, “yeah, you don’t have perfect pitch.” I’m like, “you ask me a song that I’ve basically never heard on the radio before.” So that’s what makes me think that I don’t have perfect pitch. I can do it with a piano, I can do it with a flute.

**So you can do it with one note, but you can’t do it with all the other notes together?**

It has to be like...even if you just bang out a note, I can tell you what it is. Or sustain (the note.)

**But chords are bad.**

...chords are pretty bad.

I hum notes for her; with varying degrees of success (we did our interview at two in the morning) she named all of the notes.

**How has having quasi-perfect pitch benefited you?**

Sight-singing is awesome...(my professor) loves that I have perfect pitch. He’ll be like, “what key are we in,” and he goes around the entire room. I always get it, and he’s like, “you don’t
You have perfect pitch.” I’m like, “Yeah. Whatever.” So it’s definitely helped in that class. Not so much in theory (class), maybe in counterpoint just a little bit to hear the different melodies. But in normal theory, when you’re just writing Bach and stuff, that’s more like math. That doesn’t really have anything to do with pitches. It’s mostly sight-singing. And orchestra – which, it drives me crazy, because I can’t tell people that I know they’re out of tune, because I go out of tune, because of my piccolo (the instrument she plays). And it sucks!

**So that would be one of the bad things about having quasi-perfect pitch?**

Yeah. You really tell when something’s out of tune, or when…I don’t know. I think it’s easy to tell what key you’re in. Usually, when there’s a piano, it’s pretty easy. People are just like, “I don’t know what that is.” And I’m like, “how can you not? How can you not hear that? It’s a B-flat. Band plays in B-flat all the time. That’s a home key for band. You tune to an A, but when you’re in high school (band) you tune to a B-flat. That’s ingrained in my memory. It’s B-flat! Come on!

**I can hear evidence of you utilizing your perfect pitch.**

I try. I might as well. I mean, if it can benefit you, why not use it? The only place I really can use it is orchestra and sight-singing. Like, music history…can’t really utilize it then unless you’re given a key. “This in F Major” versus “This in A Major” and you can study it, you can kind of listen and say, “Okay, I know it’s in A Major.” So you can pick that, but, you know, very rarely has that been the case.

Based on what I’ve discovered about Catherine, I can detect that she has perfect pitch; just not the confidence in it that she would need to fully utilize it. She even mentions further in the interview that she has ‘perfect pitch,’ forgetting her ‘quasi’ label. (I even stop giving it the label.) I think Catherine’s biggest fear is being wrong; I could detect this during our interview. There is enough evidence that perfect pitch is both genetic and learned; Catherine would have gotten the genetics from her mom, but the learning part was on her own. Since her closest teacher — her mother — discouraged her training from the beginning, her perfect pitch only partly formed. I have a theory that if Catherine refined her training and listened closely, she would not only realize she has perfect pitch but be able to fully use it.

**Synesthetic Representation**

Translating the synesthetic and perfect pitch experiences into something that another person can easily grasp is a task in itself. Those on the search for transcendence in synesthesia were constantly looking for ways to bring this mystical phenomenon upon themselves, and how to show it to others. This resulted, even early on, in attempts to accomplish this.
Some people even succeeded. They could not bring synesthesia itself upon themselves (un-guided by drugs), but they could give an actual physical representation. The most ideal way to do this was through making an instrument that could simulate synesthesia. Many called it the *clavecin oculaire*.

Many different musicians/inventors created their own *clavecin oculaire* throughout the years, including Père Louis Bertrand Castel, Bainbridge Bishop, and A. Wallace Rimington. These instruments range from the modern day to the Baroque; Castel invented what he called a *clavecin oculaire* in 1741. These keyboard instruments could show colors when a musical pitch was played. The colors were displayed on a screen, using the then-current technology of candles.

However, the *clavecin oculaire* had nothing directly to do with synesthesia. At most, it was a fantastic invention that showed colors and music matching up. It was also troublesome to operate, since the machine made extra noise on top of the music being played and the chance of malfunction or even fire considerably high. Since peoples’ synesthesia is all different, the *clavecin oculaire* could not effectively give all people the same experience. A synesthetic person would have most likely complained that the *clavecin oculaire* was wrong in its color choice. It also, of course, could not transport them to another dreamy world where one could actually see color and hear music at the same time, unhindered.

Individuals today, with modern technology, can create *clavecin oculaire*-like experiments that can attempt to show what it is like to have synesthesia to other people. It is with this intention that I have built my own “clavecin oculaire,” of which I will talk about shortly.

**Conclusion**

Do perfect pitch and synesthesia have some sort of connection? Are their genes related at all? Synesthesia is mostly purely genetic; perfect pitch has roots in genetics, but a child must also be nurtured in a prime environment for his or her ears to be trained from an early age.

In order to sync, either synesthesia or perfect pitch must be changeable, to relate to the other. Synesthesia, built into the brain early on, cannot change once formed. Pitches, once taught, cannot be changed in perfect pitch, and a better ear can't be taught. Once harnessed at a young age, a person can't change either their synesthesia or their ability to have a better ear. The learning of which pitch is which in perfect pitch can be choreographed to each note, however. If a note is really D, yet it is learned as E, the person will always identify D as E until taught otherwise. Therefore, someone with both synesthesia and perfect pitch can match the two up, but it is the perfect pitch identifiers that must ultimately match up with
the synesthesia, not the other way around.

Furthermore, synesthesia and perfect pitch develop separate from each other. The gene for perfect pitch is not related for those who have gene-specific synesthesia. While it is researched that both synesthesia and perfect pitch can be genetic, it is unknown whether these genes are related, and both perfect pitch and synesthesia can be non-genetic as well (albeit in small amounts). However, if presented in the same environment, perfect pitch and synesthesia can inter-relate.

When researching synesthesia for this thesis, I found an interesting paragraph on page 68 of Jamie Ward’s book “The Frog Who Croaked Blue: Synesthesia and the Mixing of Senses.” This passage talked about music-color synesthesia and how it could work similarly to letter-color synesthesia:

“I have studied several letter-color synesthetes who have learned to read music fluently. In English, musical notes are named after the letters A to G and the synesthesia migrated across to musical notes based on the established colors of letters. Thus, all A-notes would be the color of the letter A irrespective of how the note was written...or the clef it was written in.”

Sachs had this issue as well — his synesthesia transferred from the letter-color synesthesia to the music-color synesthesia. The colors transferred from letters into a different type of reading altogether. This also happened with Andy, my interviewee. His letters for A through G matched the colors he had for his notes. But as I compared my different sets of letter colors and music colors, I found that my letter colors had, somehow, not transferred to my musical colors. My letter A, which was a pinkish-red, did not match up with my musical A, which was orange. None of the other colors matched up as well. If this was so frequent in people who had letter-color synesthesia, then why hadn't it happened in me? Why were my color maps so different?

I suddenly realized the reason — because my synesthesia for music was not dependent on note names. Sure, it had learned how to relate to note names in order to distinguish between them — knowing which note was A and which note was G, to conform to society and to interact with others and the musical alphabet they knew. But my music-color synesthesia had not depended on letters in its formation. My letter-color synesthesia had developed on its own, separate from my music-color synesthesia. Instead, my music-color synesthesia had found its basis not in letters but in the actual musical pitches themselves. Since I had perfect pitch, and I knew what the musical pitches were before I had note names for them, my colors matched up with the pitches and not the note names. At the beginning of my piano study, I didn't see notes as letters so much as I saw them in colors. I didn't care if red was C or not; it was red. Therefore, the synesthesias developed independently. G can be a light grey-purple in my letter alphabet and a yellow in my musical alphabet. They are fully differ-
ent types of synesthesia; I have letter-color synesthesia, but I also have sound-color synesthesia. The music-color synesthesia, for me, is made possible not by recognizing letters, but by recognizing pitches; this is possible for me to do as I have perfect pitch. It is because of this that I have a slightly different type of music-color synesthesia, one not based on reading music but on listening to it.

This also proves that I have had perfect pitch since a young age; since synesthesia forms when a child is young, it must depend on what is already there to form. Pat Duffy, a letter-color synesthete and the author of *Blue Cats and Chartreuse Kittens*, talks in her book about seeing colors on book pages even before she could read letters. She would draw pictures of the colors she saw in the letters she couldn't even read. She also notes that when she learned to write, she saw how she could turn one colored letter (P) into another color (R) by adding a line.

Therefore, perfect pitch and synesthesia can make a connection, but the perfect pitch must be present first in whatever form it takes. Then, the music-color synesthesia, as it forms, builds off of that. Those with letter-color synesthesia can see colors with music as well, but they have formed in a different way. Could it be possible that all people with perfect pitch could be synesthetes? Not necessarily, as current research agrees that synesthesia is probably caused by some genetic change. However, if a person is genetically sensitive to synesthesia, and they have perfect pitch, according to my research I strongly believe that they would develop music-color synesthesia based on their perfect pitch. It is still fully unknown where both perfect pitch and synesthesia come from, but if they are both present, they should interact. The only example I have for this phenomenon is, unfortunately, me, but as research continues, I predict scientists will find others who have both perfect pitch and synesthesia that interact with each other.

**Application**

No amount of study or research can mean anything if it is not put into practice. While writing this thesis, I have tried to search for a way to show, in a physical way, what I have learned. Building off of the idea of the *clavecin oculaire*, I have created an experience that attempts to show what perfect pitch and synesthesia are like, to those who do not have either of these phenomena.

This experience is built directly into my senior recital, but it can also be viewed/listened to on its own. The idea behind the *clavecin oculaire* is that an instrument is played and a color is shown; one can see colors when the keys are pressed because they are being displayed on a wall by a projector (then, a candle). It is not exactly synesthesia, but it can attempt to duplicate that experience. I do not have the time or money or resources to completely recreate a
clavecin oculaire; this is not an oversight but rather practical, as I do not want to burn a building down by using candles. A modern-day clavecin oculaire could be possible, with wires and light bulbs, but again, the device would be too heavy to move back and forth. Therefore, my clavecin oculaire isn’t exactly one, but instead, a representation of one. This will take careful consideration when performing my recital, as the notes I play won’t trigger the lights being shown. I must time them correctly.

The piece I have chosen to demonstrate my synesthesia and perfect pitch with is a short piece for piano: Melodie Op. 4 No. 2 by Fanny Mendelssohn-Hensel (Felix Mendelssohn-Bartholdy’s composer sister). The piece itself has an average play time of two minutes. Since it is a shorter piece, I will be able to demonstrate the synesthesias and pitches of the piece without taking away from the actual performance or overloading the audience. (I fear the audience will not be able to follow my thesis if they are faced with a long explanation followed by a long piece.)

The synesthesia will be demonstrated by my computer and a projector in the recital hall (the projections will be seen in the video for those who cannot come to the recital). Using my computer, I will be able to show the audience which color is which, and demonstrate the matching of pitches and color appropriately.

Perfect pitch will be even simpler to demonstrate: as I am a pianist, I play an instrument that is generally in tune with itself. I will make sure that the instrument is in tune before my recital begins, which is a crucial task. In addition, I will be having guests on my recital; one of them will be playing the violin, and during my discussion, I will ask her to help me demonstrate the concept of being out of tune. I will play a note on the piano (in tune), and she will match it on her violin. I will ask her before the recital, however, to purposely miss and then tune to the right note. The audience will then, free of distraction, be able to hear the violin out of tune next to the piano.

A note on pianos: while it takes forever to tune one, with careful steps and the right amount of attention, a piano can stay in tune for a long time without going out. (Regardless, the pianos at Miami University, where I am having my recital, are tuned upon request by a piano tuner who is hired out by the university. Being out of tune will not be a problem at any point during my recital.)

During my presentation, to help distinguish this perception of perfect pitch, I will also explain the difference between different pitches that are labeled by notes, and play them on the piano. I will, for example, play a high A and help to distinguish the difference between that high A and a lower A, and then against a lower G, which is a different note in itself. Once I feel that distinction has been made, I will add the colors on top of that explanation. This will be done with a timed video; when I play high A, I will have the video show a light
orange (the color for high A), a more medium orange, and a medium yellow, and so on for other pitches to further demonstrate. The climax of this performance will be playing the Melodie, on an instrument that is perfectly in tune, with a video on a screen showing the colors I see when I play the piece. (Technical difficulties will be sorted out, as well as preventive measures that would keep me from misplaying a note and therefore messing up the synesthetic experience.)

The only problem with this would be that the colors people will be seeing will be my own sets of colors for the notes, not colors that they could possibly have for themselves. If another color synesthete watched my presentation, chances are very high that they would tell me the colors are all wrong (as all color synestheses have different color combinations). I would have to compensate by telling everybody that this is my perception; I cannot actually alter somebody else’s perception of their world. Science is not at that point yet, and why would somebody want his or her world view changed?

This experience would also be available on its own; for those who miss the recital or never get to go (it is, after all, a one-time event), I will make a video of the experience that will go on record with my thesis. This video will contain the portion of my recital in which I talk about synesthesia and perfect pitch, as well as the performance of the Melodie.

No representation of perfect pitch or synesthesia can be perfect, as these are both perception-based phenomenon. They are something each person has to experience for themselves in order to fully understand. In this case, not everybody will be able to fully understand these phenomena, but perhaps they can learn something about it and be more willing to accept the “world” that others see.
Synesthetic Color Maps

In the following spaces, I have provided two separate color maps: one for my letter-color synesthesia (for reference) and one for my music-color synesthesia. These two synesthesias are different both in composition and color. Here is my map for my letter-color synesthesia.

In addition, with my music-color synesthesia map, I have provided the basic keys on the piano. D for me does not have a color, as I have described before; I have given my best description for what the color looks like. As for the colors on top of the black keys, they represent the sharp (first) and the flat (second) for each black key. I only have one octave on the diagram; other octaves are the same, but lighter in color if they are higher in pitch and darker in color if they are lower in pitch. Notice how my letter-color synesthesia and music-color synesthesia do not match:
The other synesthetes I have interviewed have also provided me with color maps for their own synesthesias, to the best of their ability:
Jon

Jon also has a note that doesn't have a color; his note is G. The other notes revolve around the spectrum. For Jon, all of the notes are the same; it doesn't matter if a note is high or low; it has the same color across the board. Notes also have a different color depending on if it's the single key, or if the note is seen as a key signature, such as C Major or E minor.

For the white (bigger) keys, the color of the key is the color of the note itself. The first dot is the major key; the second dot is the minor key. On the black keys, the first dot is the minor key, then the major key, then the actual color of the note.
Andy

The first seven letters in Andy’s alphabet (A through G) correspond with his musical colors.

A B C D E F G H I J K
L M N O P Q R S T U
V W X Y Z

0 1 2 3 4 5 6 7 8 9

Script for Video

What follows is the script for the attached video, which was originally shown at my senior recital. The script has been included to clarify what is being said in the video, and also for those with impaired hearing so that they may understand.

“We all have five senses. Sight, hearing, touch, smell, and taste. Well, at least that’s what we’ve been told ever since we were kids. What if there could be more senses? Some people suggest that there are more senses...intuition, or even ESP. There are more ways to perceive the world than just through our five senses. Or maybe one sense could get evolved into a super-sense, where you could see the littlest details in a picture or feel minute differences between things.

This is a reality for me. When I hear music, I see color. Not just any color. These are specific colors, one for each note. When the music gets lower, the colors get darker. When the music gets higher,
the colors get brighter. Other people have this, too, but it’s extremely rare, and they don’t see the colors I see. Each set of colors is different.

What would it be like if everybody could see these colors? You know, see into my world? Instead of keeping this all to myself, I figured I’d show you all.

Fanny Mendelssohn-Hensel is best known for being a vocal composer -- and the sister of Felix Mendelssohn -- but she also wrote piano music. It’s one of her Melodies that I’ll be playing next -- and when I play it, I’ll be showing you just what I see when I play it. For once, you’ll be able to see music through my eyes.”

**Video**

The video, with the talk on synesthesia/perfect pitch and my performance of the Melodie, should be included with this copy of my thesis. If it is not, please contact the person or place you got this thesis from. The video is on a DVD-R and should play in most standard DVD players.
BIBLIOGRAPHY

Works Referenced:


Other Works Read:


