



## The Hidden Sense: On Becoming Aware of Synesthesia<sup>1</sup>

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### Synesthetic perception in science and art

Synesthesia has received much attention in science, art and in particular in the overlapping fields of digital art and multimedia in the last decade (cf. Collopy 2000, Brougher et al. 2005, Ward 2008). Artists and scientists in these fields share a common interest in human perception. In the arts, synesthesia refers to a range of phenomena of simultaneous perception of two or more stimuli as one gestalt experience (van Campen 2007). In neuroscience, synesthesia is more strictly defined as “the elicitation of perceptual experiences in the absence of the normal sensory stimulation” (Ward & Mattingley 2006: 130).

About one in twenty-three persons has a type of ‘neurological’ synesthesia (Simner et al. 2006). Over 50 types have been reported (Day 2008), and people differ in intensity of the experience (cf. Dixon et al. 2004). The most common type of synesthesia is colored weekdays, while the type of perceiving colored letters and numbers is most studied by scientists, and the type of colored sound and music is most explored by artists (van Campen 2007).

The neuroscientific definition of synesthesia limits the number of so-called ‘synesthetes’ to 4% in the population. This number contrasts with the large amount of people who are interested in art forms that present synesthetic experiences to the public.

This raises questions like: is synesthesia genetically fixed at birth? Or is there a range of types of synesthetic perceptions in which a genetical disposition for synesthesia can be developed? How wide is that range? How do biological, social and cultural factors interact in this process? How do people develop different synesthetic sensibilities?

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<sup>1</sup> This article is an adapted and elaborated version of parts of the final chapter of my book [The Hidden Sense: Synesthesia in Art and Science](#) (Cambridge MA: MIT Press 2007).

Slightly different from the current neuroscientific view on 'neurological synesthesia', I will propose in this article a new view on synesthesia that also includes social and cultural interactions, which I assume will account better for individual differences in the awareness of synesthesia.<sup>2</sup>

### Synesthesia in philosophical perspective

The ancient Greek philosophers observed that humans have separate sense organs –eyes, ears, nose– but at the same time also have one undivided experience. This raised the question of how sensory experiences are unified. The ancient philosophers did not define synesthesia in our current neurological and psychological terms, but they expressed a notion of synesthesia in posing the philosophical question: How can human beings perceive a unity in the multitude of sensory impressions (i.e. the unity of experience)?

The answer offered by the Greek philosopher Aristotle (384 BC–322 BC) was not only original then, but has stayed valid to our day. Behind the exterior senses, he assumed the existence of what came to be called a *sensus communis*, which perceives the common qualities (or qualia) in the different exterior senses (Ferwerda & Struycken 2001). For instance, we perceive brightness, rhythm, and intensity in images, sounds, smells, odors, and tactile sensations (By the way, our notion of *common sense*, though the modern definition is slightly different, nonetheless is derived from this concept.)

Aristotle's ideas had a great influence on medieval thought at the time when a theory of the working of human perception was established known as the 'three-chamber theory'. The medieval Italian theologian Thomas Aquinas (1225–1274) posited the existence of three chambers in the human brain. In the first chamber, the sensory impressions, sent by the exterior senses, were perceived by the common sense (*sensus communis*), which stimulated imagination (*imaginativa* and *fantasia*). In the second chamber, cognition (*cogitativa*), reason (*ratio*), and judgment (*aestimativa*) determined value with the help of former perceptions from memories (*memorativa*), which were housed in the third chamber (Adler & Zeuch 2002). This theory, which retained its power for centuries, entered Renaissance

<sup>2</sup> Due to media attention, the people awareness of 'neurological synesthesia' has increased tremendously in the last decades. The estimated prevalence of colored-letter synesthesia in the mid 1990s was 1 in 2,000 (Baron-Cohen et al. 1996), and has recently increased to 1 in 100 (Simner et al. 2006).

thought with only slight changes. The Italian renaissance artist Leonardo da Vinci shared the Thomist principles, but he located the *sensus communis* in a more central position, within the second chamber.

The idea of a common sense explains a large part of human multisensory perceptions, but it does not explain synesthetic perceptions nor their variety among individuals. One, it is not common to perceive sounds in color; and two, the disagreement of synesthetes on, say, the 'right' color of a musical tone, cannot exactly derive from common sense.

During the Enlightenment and, later, the Romantic period, a number of philosophers acknowledged individual differences in the common sensory perception of the physical environment. The eighteenth-century German philosopher Alexander Gottlieb Baumgarten (1714–1762), who was the founder of aesthetics as a philosophical discipline, stated that not only the human intellect but also the human senses have the ability to know (van Campen 1994). The cognition of the senses, however, differs from rational cognition by the human intellect because whereas the intellect uses rational principles such as logic, the senses immediately perceive aesthetic qualities in sensory impressions.

One example is the ability to perceive a melody in a series of sounds. A melody is a form that is perceived by common sense as a meaningful unity, or *Gestalt*, as it would later be named by German philosophers. In France, the philosopher Jean-Jacques Rousseau made a similar distinction between the *raison sensitive* and the *raison intellectuelle* (Adler & Zeuch 2002).

For the first time in history, philosophers regarded the senses as active, creative organs of human perception. And it was recognized that humans differed in their abilities to use common sense. Some people are more gifted, more creative, and more susceptible to qualities of nature than others.

In the late eighteenth century, the German philosopher Immanuel Kant (1724–1804) made an important distinction between the *sensus communis*, which he said was equal for all humans, and the *sensus communis aestheticus*, which he said showed individual differences (Kant 1790). All people have the common sense to perceive the rhythm in a dance, or in the percussion in a musical piece, and even that these rhythms may match. Fewer people, however, have the aesthetic sense to perceive color nuances in the sound of a cello. Though these examples are taken from the present, the conceptual distinction by Kant gave room to categorize what I have called 'synchronesthetic' and synesthetic perceptions (van Campen 2007, chapter 9). The *sensus communis* is a common gift to perceive matching qualities in different sensory domains. The *sensus communis aestheticus* is a personal gift of



perceiving special aesthetic qualities in multisensory domains. The German poet and naturalist Johann Wolfgang von Goethe (1749–1832) drew on Kant's idea of the *sensus communis aestheticus* and considered it an autonomous creative force of the human imagination (van Campen 1994).

These theories were developed in the field of aesthetics. Synesthetic perceptions are not always beautiful or aesthetic, according to numerous reports by synesthetes. In the beginning of the twentieth century, the aesthetic theory of gestalt perception (after the German "Gestalt") was reformulated as a more general theory of human perception (van Campen 1994). In this view, not the idea of universal beauty was considered central to gestalt perception, but rather the inner necessity of the perception. For instance, the perception of a melody is a fundamental component of anyone's perception, whether one likes the melody or not (Arnheim 1954).

Gestalt psychologists such as Max Wertheimer, Wolfgang Köhler, Erich von Hornbostel and others, proposed a radical new view of human perception in the first decades of the twentieth century (Arnheim 1954, van Campen 1994). According to this new view, when one looks out of an open window, one does not compose a view as from a mosaic of optical, auditory, olfactory, and tactile little precious stones, but rather one immediately perceives the view as an integral image or a gestalt, of, say, horses, trees, and flowers. Only when one focusses on a detail –distinct colors, figures, sounds, and smells– one notices the component elements.

Still, this gestalt theory does not yet satisfy all the questions raised by synesthetic perceptions. Some people are more sentient than others in perceiving gestalts in the environment, but how does one explain that one synesthete perceives it as the sound of a piano as a purple haze, while another perceives it as the taste of a strawberry-flavored ice cream?

Around the 1950s, the French philosopher Maurice Merleau-Ponty elaborated on the individual differences in gestalt perceptions. According to his view, all human experiences are based in the human body, which explains the unity of the senses. The body is not only a physical thing, but is rather a subjective sense organ for each person. All kinds of stimulation of one's body create responses that mingle in a flux of impressions before one becomes aware of them. In fact, the body shapes sensory experiences on an unconscious level ('under sea level', so to speak) and one is aware only of the tip of the iceberg. Unconscious body experience is essentially synesthetic, according to Merleau-Ponty (1945). All sensory impressions correspond and talk to each other on a preconscious level. Out of this preconscious flux of impressions, some gestalts emerge. And since everybody's body experience



is personal, the emerging gestalts are similarly personal, and thus different from each other.

These gestalts are 'givens' in human experience –experiential facts. Only when you start to consider them do you become aware that they are different from others', according to Merleau-Ponty. A synesthete may perceive a deep blue *K*, but only when he abstracts from this experience does he observe separately the color blue and the letter *K*, and can think of the fact of their correspondence. In his initial experience, the color-and-letter combination is a gestalt, a necessary unity.

Several contemporary thinkers have articulated this philosophy of the unity of the senses in light of self-reports by synesthetes and results of scientific experiments. The American psychologist Lawrence Marks (1978) has adopted the Aristotelian idea of common sensualities, such as brightness, in his matching studies. He adheres to the theory that all sensory systems have evolved from the skin and are in fact still interconnected with this large sense organ that forms the basis for the unity of the senses. The American neurologist Richard Cytowic (2002) has searched for a brain equivalent of this bodily unity of the senses and suggested to look at the limbic system, a part of the brain which has evolved as a function of general bodily functions such as nurturing, caring and fighting.

Finally, as heirs of Goethe's theory of the organic creative power of human perception, the German neuropsychologist Hinderk Emrich (2002) and the American neuropsychologist Vilayanur Ramachandran (2004) have pointed to the plasticity of the brain as responsible for making possible the autonomous organization and reorganization of sensory information.

### **A New View**

Continuing this line of philosophical thought, I have reached for a new view on synesthesia, or, more accurately, a new perspective on a field of synesthesias, as I think that the plural form suits the variety in descriptions by synesthetes better. Not only in my interviews, but also in the discussion lists on the Internet, one can observe the great variety in synesthetic descriptions (Day 2008, van Campen 2007). Lists of types of synesthesia contain over fifty categories (Day 2008). And even if one asks synesthetes within one category to describe their experience of, say, colored letters, the responses may differ greatly in intensity, form, and location (Hubbard et al. 2005). For instance, some synesthetes will say that colored letters appear before their inner eye, whereas others report projections

of color that lie as shadows on printed letters (Dixon et al. 2004). The perceived colors differ in form, spatial arrangement, transparency, solidity, intensity, and nuance. Instead of being a well-defined area of perception, synesthesia appears in these reports as a set of related perceptual phenomena that show a great variety in form and intensity.


Nonetheless, the wide variety in types of reported synesthesia shows a cultural bias. As far as I know, no synesthete has reported odored-taste synesthesia, since that is common experience in Western culture. Westerners normally do not distinguish sharply between smells and tastes. But Western synesthetes would report colored-smell synesthesia, which is generally uncommon in Western culture. Conversely, the Desana in the Amazon area commonly experience smell in color ('color energies'), and so they would not report that as an uncommon synesthesia (Classen 1993). This example shows that reports of synesthesia may be partly biased by the culture one lives in (Howes 2005).

Not all synesthetes are equally aware of their synesthetic perceptions. We rely on the reports by self-conscious synesthetes. Obviously, one needs to be aware of one's synesthetic perceptions to report them. Many synesthetes only become aware of their synesthesia when, in the course of social intercourse with family and peers at an early age –when they are about five or six years old–, they realize that it is a perceptual oddity. After this first sudden discovery, synesthetes become aware of more aspects of their synesthesias, often in social exchange with other synesthetes. Some grown-up synesthetes report that they still discover new layers in their synesthetic perception of the physical environment (van Campen 2007).

Inspired by the theory of Merleau-Ponty, I picture the wide variety of synesthesias as conscious or semiconscious sustainable, solid, perceivable gestalts that emerge like shapes in the stream of a river. They are layered, come clear to the surface, or lie just beneath it. When they make sense, they are solidified, fixated as gestalts in daily perception, like a familiar melody. Once one has perceived a melody in separate notes, each time one hears this sequence of notes, one perceives the melody forever as a unity instead of its constituent parts.

In general, people are not aware of all their perceptions. And synesthetes are not aware of all their synesthetic perceptions, either. When you get older you become more aware of the layeredness of the tangible world. As a child you perceive, say, red and blue. As you get older you learn to distinguish many kinds of blues and reds. Your awareness of the perceptible world is deepened and refined. In this way, not all synesthesias will be perceptible from childhood. Not that one were not able to see them as a child, but as one grows up one is more aware of





their existence. Many synesthetes remember their synesthesias in childhood, but only became aware of them as such when they, say, read a newspaper article on synesthesia.

Our awareness of the number of sensory organs might serve as an analogy. Most people are aware of five senses: vision, hearing, taste, smell, and touch. When additional senses –such as movement and balance – are mentioned, people easily become aware of more sense organs. They have always used these sense organs, but they were not really aware of them.

The same holds for synesthesia and other multisensory perceptions. To a certain extent, people can become aware of the 'darkness' of sounds or of the musical rhythm in visual animations. To a limited extent, people are simply not aware of many synesthesias because they have never paid serious attention to them. Most people are only familiar with a small number of provinces of the empire of the senses. It is as though one's conscious perception was limited to a little garden in the middle of a jungle. One tasted the five types of vegetables that grow in the garden and overlooked the exotic fruits in the surrounding jungle.

I do not think that every person can become aware of all types of synesthesia. There are obviously brain constraints on that. But I do think that many persons are not aware of their synesthetic potential, simply because they use only a portion of their senses.

In general people link their sensory perceptions to exterior senses; color perceptions to their eyes, or sound perception to their ears. Synesthesia is not connected to an exterior sense organ. Synesthetic experiences do not enter the body at one point, whence they flow to consciousness. Synesthesia is not grounded in an external sense organ. It is not an ordinary sensory function. Synesthesia operates in the area between the senses. Its etymology –*syn*: together; *esthesia*: perceiving– refers to this function. The sense of synesthesia is not observable at the exterior human body, but lies hidden beneath the senses. It remains hidden in most people who do not have synesthetic perceptions. But in some it stands up, and they perceive synesthesia consciously.

Finally, these and other observations served me as steps to a new view on the wide panorama of personal reports of synesthesias. I have come to see them as personally developed abilities to perceive uncommon multisensory gestalts in the physical environment. I would compare this ability to a hidden sense. It may take a person a lifetime to unveil the hidden sense that allows her to perceive synesthesias in the physical environment.

## Awareness of synesthesia

Can you become aware of synesthesia? Yes indeed, though it may take a long time and a lot of concentration. You have to learn without examples, because synesthesia is personal, and there is no educational program available to help you. You will have to find it all by yourself. You cannot imitate another synesthete or follow his or her suggestions, either.

One way to begin is to become aware of common sensual correspondences like those in the rhythms in music and film, or the correspondences in the 'brightness' of the sound of vowels and colors. Once you have trained yourself to be aware of these common sensualities, you can start to explore your personal sensualities and perhaps discover your synesthesias, though no guarantees can be given, of course.


It may sound strange to hear that you can become aware of a neurological phenomenon that seems fixed and hard-wired. On the contrary, the brain is flexible and will develop multisensory connections that are meaningful (Pascual-Leone & Hamilton 2001, Sur et al. 1990). Synesthesia is hidden in the senses. To experience it consciously, you will have to explore and go looking for it.

Though the awareness of synesthesia most commonly emerges in childhood, I believe one can become aware of it and start to use it at any age. Synesthetes report that they have become aware of their synesthesias in all stages of life. Some discover their synesthetic gifts as preschool children, some in the years when they learn language and math in school, and some as grown-ups. Nonetheless, when adults become aware of it, they report that it was already existent in their childhood (van Campen 2007).

Presumably everyone is born with a kind of synesthesia. During the first year of life, this general synesthesia apparently is cut back or pruned to fewer intersensory connections (Maurer & Mondloch 2004). In the second year and later, the synesthetic connections will only survive when they probably are useful to the child; otherwise they are pruned away. So at a young school age everybody will have a number of neural synesthetic connections, some more than others, and some people are more aware of it than others. Several children know already at the age of seven that their numbers are colored, whereas other children only realize it decades later, when they are tested with a consistency test for colored numbers, for instance.







For a number of children in the ages of about three to six, it is quite normal for music to have colors, tastes, or smells (Werner 1934). You can ask young children and perhaps they will tell you about it. When children go to primary school and start to learn cognitive skills such as writing and calculating, their synesthetic gifts seem to subside into the background. The cognitive training asks much of their concentration and energy. Little energy is left to explore their sensory skills. Take, for example, the decrease in drawing skills and imagination at that age, which is reported by teachers and child psychologists alike (Werner 1934, Eisner 1979).


Learning the letters of the alphabet and counting numbers is an important moment in the development of children and in particular of synesthetes, because at this phase the symbols get their solidified colors. It is the earliest age synesthetes can remember consciously when numbers and letters have their particular colors and shapes.

During the school years and adolescence, socialization becomes a factor in the awareness of synesthesia. Children do not like to be different from their peers. They do not want to be ridiculed. Announcing that you perceive letters and numbers in color may seem rather deviant in the eyes of the other children of your age. Little is known of the social processes that influence the awareness of synesthesia. So far, scientists have been more interested in the neurological and perceptual aspects and less in the social development of young synesthetes.

Even among adults, the reactions of others play an important role in the way synesthetes deal with their perceptual gifts. Only a few decades ago, synesthetes would regularly consult neurologists for medical advice concerning their 'deviant perceptions'. In this medical setting, synesthesia was often considered a neurological deviance or a rare disease by nonsynesthetes. The neurological label that has been attached to synesthesia might still inhibit a number of synesthetes from speaking freely about their synesthetic perceptions. In this light, it is revealing that relatively more synesthetes in liberal and artistic communities report in public on their synesthetic abilities.

In general, people's reactions to the confessions by synesthetes are still stigmatizing. Do not underestimate the number of people who think that synesthesia is a mental handicap. Moreover, because synesthesia is not visible, people often doubt the veracity of what synesthetes report: "Behave normally" is a common reaction.

The fact is that synesthetes do behave normally. It is people in their social surroundings who react strangely to their confessions. Hopefully, once synesthetes get recognition, they may eventually be compared to late medieval artists who




started to see and use linear perspective in their paintings, and who were stigmatized and ridiculed at that time. Now, we honor them as innovators who taught us to see the sensory world in new ways.

Awakening to the multisensory perceptions is one key to synesthesia, but other keys are exposing oneself to new sensations, not being ashamed, expressing one's synesthesia, communicating it to others, being able to experiment with it – all are important in the learning process that starts somewhere in childhood with the neurological development of multisensory connections and continues as a lifelong journey in becoming aware of all synesthesia's sensory aspects.

### **The role of synesthetic art in education**

Young children look at the world differently than adults do. For preschool children, the boundaries between themselves and their surroundings are less sharp than for grown-ups. As we know, preschool children and even some children of the primary school age perceive their environment as a magical world where puppets and castles come alive (Werner 1934). The same holds for their bodies and the incorporated senses. Compared to grown-ups, children are less aware of their body as an entity separate from the environment. In their perception, an 'angry castle' may move forward and make growling sounds when it smells the dragon in the mountains. This is an example of a perception that can be very vivid for a young child. I do not say that children cannot distinguish between images and sounds, but only that the boundaries between the senses, their bodies, and the outside world can be more or less sharp from day to day, and from one mood to another. The child can even act out being the 'angry castle'.

Grown-ups are more analytical. If they sense their synesthesias, they will analyze their perceptions into the well-known sensory categories. Saying that you perceive colored sounds implicitly contains the analysis of the original perception into two abstract categories: colors and sounds (Merleau-Ponty 1945). Young children do not yet perceive in an analytical way, and an adult might have great difficulty explaining to a young child that his or her perceptions consist of separate elements like colors and sounds. For the child, the color and sound form an indivisible whole, a gestalt that cannot be separated into elements without losing its meaning and sense. And I must say, the child is right. The adult sticks to a theory of synesthesia, while the child sticks to the original perception. Young children do



not often distinguish between sensory domains in their perceptions: a smelling sound may be as real for a child as a green rectangle –who knows?

Once children go to school, their sensory development is squeezed between the main lessons in cognitive development and the less-valued lessons in physical development. In the end, children are judged in school on their cognitive skills, not on physical and sensory skills. Most schools pay little attention to the sensory development of their children. The ability of children to know the world not only by means of words and numbers but also by their own senses, let alone the awareness of their synesthetic abilities, is hardly developed at school. Consequently, multisensory development is in effect halted by neglect. I believe that children would profit from a rebalancing of cognitive and physical-sensory skills in the school program. They would have more opportunities to preserve their synesthetic talents and develop them.

For a long time we have taught our children at school that sensory experiences are separated into five senses according to the Western division, which is based on the exterior characteristics of eyes, ears, mouth, nose, and skin. We do not teach children to follow their own senses and we do not encourage them to explore their multisensory experiences of the environment. How different is the case for the children of the Desana, who grow up in a culture where they are familiarized from the cradle with the multisensory color energies of objects? It is this difference that makes the Desana children more aware of the 'synesthetic' color energies of sounds, tastes, and odors than their North American and European peers.


When Western children enter adolescence they start looking for new stimuli, to explore and test their environments. New and experimental art forms are challenges for their brains. Experimental art forms challenge the regular ways of perceiving via the five sensory domains that they have learned in school, and open ways to multisensory perceptions in audiovisual art forms, for example. It is easier for them to discover colored patterns in a new piece of electronic music than in the well-known *Four Seasons* by Vivaldi because they have learned from their parents and teachers how to listen to the Italian composer, but not how they should listen to new electronic music or an audiovisual digital work of art. Experimental art forms have a viable function in helping people find new ways of experiencing and perceiving, including synesthesia.

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