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# What's Your Definition of *Synaesthesia*: A Matter of Language or Thought?

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## Abstract

Synaesthesia takes place when ordinary stimuli elicit extraordinary conscious experiences. As a rhetorical figure, synaesthesia consists on giving a thing a quality that in fact it cannot have because the thing and the quality are perceived by different senses (e.g. “white noises”). But the physiological and the conceptual or linguistic realities are in fact part of a whole that can be approached from different perspectives. This paper shows them and tries to analyze the main thought processes hiding behind this intriguing phenomenon, hoping to rise a new current of discussion and stressing the importance of an interdisciplinary approach to the study of synaesthesia.

**Keywords:** Cognition; linguistics; neuroscience, psychology, perception, synaesthesia.

## Introduction

Synaesthesia [also spelled synesthesia], from Greek *syn* (*with* or *joined together*) and *aesthesis* (*sensation*), means ‘the union of senses’. This word possesses the same root as the word anesthesia, which means ‘with no sensation’ or ‘without the use of the senses’. It has been widely established that synaesthesia occurs when an individual receives a stimulus in one sensory modality and experiences a sensation in another (Bretones 2005). However synaesthesia usually occurs within the same modality; e.g. color-grapheme synaesthesia where individuals perceive colors when presented with achromatic digits or letters (Baron-Cohen et al., 1996, Elias et al., 2003). Thus, in a broad sense we could say that synaesthesia takes place when ordinary stimuli elicit extraordinary conscious experiences.

Synaesthesia has been interpreted by many as different things (Galeyev, 1999). It has been consigned to abnormality, philosophy or metaphor for centuries, but on the other hand as a physiological fact because for some individuals certain stimuli cause “real” synaesthetic responses or synaesthetic perception. The challenge, thus, seems to find at what level synaesthesia is taking place: as (1) inter-sensorial connections or bonds [being the term ‘synaesthesia’ used to describe the result of its manifestations in specific fields such as arts]; or as (2) phonetic tropes and stylistic figures, relative to semantic inter-sensorial transfers. These two levels are, in fact, deeply linked showing proof of the inseparability of categories,

concepts and experience (Lakoff and Johnson, 1999:19, Bretones, 2001).

## Approaches to Synaesthesia

As a rhetoric figure, synaesthesia consists on giving a thing a quality that in fact it cannot have because both, the thing and the quality, are perceived by different senses. For instance: ‘white voices’. In the case of *literary synaesthesia*, three types of study could be considered (Erzsébet, 1974):

- The analysis of sensorial combinations in the rhetoric of a single poet, within the framework of characterization of his/her individual style. For example, works on Oscar Wilde by Ullman, on Heine by Silz, on Baudelaire by Roeding, on Montale by Rosiello, and on Ungaretti by Gutia.
- The study of synaesthesia parallels in the style of different poets. For example, in the work on Keats and Byron by Ullmann, or on Eminescu, Arghezi and Sadovaenu by Mancas.
- The elaboration of a comprehensive view about the synaesthetic characteristic of a literary school or a certain period: The Renaissance and Baroque, or the Romanticism, for instance.

Under the *linguistic approach to synaesthesia*, we must first distinguish the psycho-physiological process and its linguistic projection. The opinions of linguists concerning the concept of synaesthesia can be contradictory too:

1. Taking interest in the acoustic synaesthesia, conferring sensorial properties to the sounds of speech, to the names of the days and the months and so on (Slawson, 1968, 1985).
2. Considering synaesthesia as a linguistic category, or according to a more restricted interpretation, the sphere of synaesthesia is limited only to sensorial fields (e.g. White stillness, velvet warmth. This sphere can be widened to the sensorial combinations proper, but also the associations between abstract notion and a sensorial impression (e.g. Sweet desire, blue slyness) (Erzsébet, 1974).
3. Synaesthesia semantically incompatible components are subordinated to a common dominant notion: the notion of the sensorial field, introducing not only the notion of combinations of different sensations but also some oxymorons whose elements belong to the same sensorial

field (eg. Blind light, dumb song) those combinations which traditionally have never been considered as synaesthetic (Erzsébet, 1974).

Some consider that if the elements of the combination are semantically compatible (1) we cannot speak about synaesthesia (e.g. Silent night, the rustle of the red poppy), so for (2) and (3) synaesthesia is the syntactic relation between elements semantically incompatible, denoting sensations from different sensorial spheres (Ward & Simner 2003). Likewise, the conventional semantic viewpoint narrows its definition and the traditional syntactic one widens it. According to a widespread view, synaesthesia appears through semantic transfer, the transfer of a feature, based on similarity of two concepts. Some consider it completely subordinated to metaphor. Others postulate that it is produced by the transfer of the name based on simultaneous contiguity of the sensations, thus pointing out the relationship of synaesthesia with metonymy. Different researchers have reached different models of this intersensorial phenomenon. Some through a diachronic perspective such as Williams (1976), Classen (1993) or Evans & Wilkins (2000), and others through a synchronic perspective such as Ullmann (1964), Day (1996), Cacciari (1998) or Bretones (2001). In Ullmann's view synaesthesia is at the border line of synaesthesia proper, i.e., the category of direct name-transfer based on synaesthetic similarity, and of pseudosynaesthesia, i.e., the association of a concrete sensation with an abstract notion), name-transfer based on simultaneous sense-contiguity.

Ullmann (1964) claimed the possibility of a basic pattern of performance for synaesthesia:

"[...] further investigations might also reveal that the movement of synaesthetic metaphors is not haphazard but conforms to a basic pattern. I have collected data for the sources and destinations of such images in a dozen nineteenth-century poets, French, English and American, and have found three tendencies which stood out very clearly: (1) transfers from the lower to the more differentiated senses were more frequent than those in the opposite direction: over 80 per cent of a total of 2000 examples showed this 'upward' trend; (2) touch was in each case the largest single source, and (3) sound the largest recipient [...]" (Ullmann, 1964: 86).

According to Ullmann (1964), the less differentiated senses would be smell and taste, and the most differentiated ones hearing and vision. He proposes the following model of synaesthesia:

smell/taste → hearing/vision → touch

This model is followed by Day (1996), but some others do not agree with his ranking (Cacciari 1998, Bretones 2001), which can be interpreted by talking of smell or taste in terms of hearing or vision and so, of hearing or vision in terms of touch. Classen (1993), in a study fundamentally based on observations, determines the following synaesthetic-metaphoric rank in English:

hearing → vision → smell → taste → touch

Day investigates this pattern and tries to determine the synaesthetic metaphors used in English through corpus analysis (1996) and the study of human subjects (2000). He obtained data from the language in written texts and electronic sources such as The World Library's Greatest Books Collection, The Oxford Text Archive, and Project Gutenberg, which include texts by Chaucer, Shakespeare, Merville or even Michael Crichton (Day, 1996). Using the percentages of concurrency of each synaesthetic metaphor, Day (1996:8) obtained the following patter:

hearing → vision → smell → temperature → taste → touch

*Synaesthetic transfer* is, thus, considered one of the most common types of metaphoric transfer, i.e., the transmission of information from one sensory modality to another (Williams, 1976: 463). Recent working metaphorical analysis makes it clear that many of our most basic concepts (and our reasoning via those concepts) are embodied: Lived experiences in our bodies inspire and constrain the way we conceive and articulate many of our other experiences (Lakoff & Johnson, 1999). That is exactly what metaphor does if we base metaphor on experiential, body-linked, physical core of reasoning abilities (Bretones, 2001). "Metaphor, with its capacity to introduce a sensory logic at the semantic level is a way to fill this gap[...] since metaphors allude to a more complex scenario of interrelated meanings and experiences of the world" (Cacciari, 1998: 128).

One should not come away with the impression that all our knowledge about our sensory and perceptual experiences can be captured in a set of independent - or even interrelated - verbal categories; nor that sensory/perceptual experiences themselves reduce in any simple manner to a list of attributes. Still, the study of synaesthetic metaphor may serve as a useful model system (Marks, 1978). By being amenable to psychophysical analysis, synaesthetic metaphors not only permit ready quantification, but enable us to assess development trends in the ways that at least certain aspects of such metaphors are interpreted. A psychophysics of synaesthetic metaphor may eventually reveal much about perception and language; but to appreciate the depth and extent of human metaphorical capacity will demand a psychological analysis that is as yet hardly found in our philosophy (Marks, 1983, 2000).

The study of synaesthesia could also be divided in two general groups that in a way overlap: First, *synaesthesia proper* as the stimulus of a sensorial *input* induce sensation in a different sensory module. Second, *cognitive synaesthesia or categorial synaesthesia*, which entails synaesthetic addition to the categorial systems of each culture or individual. Synaesthesia makes an interesting topic of investigation in that the subject matter is an internal, mental state whose existence we can infer from the findings of behavioral testing (Harris & Baron-Cohen, 1995). The growing interest in synaesthesia has led to numerous experimental studies that rely upon self-reports given by

subjects with synaesthesia, or upon objective quantification of data according to traditional methods of experimental psychology or neuroscience. Varying criteria have been applied to the diagnosis of synaesthesia although in general scientists have always differentiated clinical synaesthesia from metaphor, literary tropes, sound symbolism, and deliberate artistic contrivances that sometimes employ the term 'synaesthesia' to describe their multi-sensory joinings.

*Synaesthesia proper* has some define neurological components (Grossenbacher et al., 1999, 2001) and it is believed to pass on genetically through X-chromosomes (Cytowic, 1995; Harrison, 2001). The percentage of synaesthetic human beings varies according to the kind of synaesthesia we are referring to (Day, 2000). It is estimated that we can find 1 "basic cognitive synaesthete" (colored letters) in every 500 people, 1 "proper synaesthete" (colored musical sounds or colored tastes) in 3,000, and 1 "multiple synaesthete" (multiple synaesthetic experiences) in 15,000. It is possible that more than half of the human beings are "basic synaesthetes" in which one considers high sounds as bright and low sounds as dark (Day, 2000). And it might be possible that all human beings are synaesthetic at birth (Baron-Cohen, 1993, Harrison, 2001). Cytowic (1995) proposed five criteria for the diagnosis of a type of clinical synesthesia called ideopathic or developmental synesthesia as opposed to acquired forms of clinical synesthesia such as drug induced synesthesia, epileptic synesthesia, and synesthesia due to acquired brain lesions:

- Synesthesia is involuntary but elicited.
- Synesthesia is projected. If visual, a photism will appear outside the body in the region close to the face.
- Synesthetic percepts are durable and discrete. The associations for an individual Synesthete are stable over their lifetime. If a sound is blue, it will always be blue.
- Synesthetic experience is memorable. Many synesthetes exhibit hypermnesia.
- Synesthesia is emotional in nature. A synesthetic experience is accompanied by a sense of noetic certitude.

Synaesthesia, according to Cytowic (1995), is the involuntary physical experience of a cross-modal association, because the stimulation of one sensory modality causes a perception in one or more different senses.

Within *cognitive synaesthesia*, certain groups of things that our individual cultures teach us to set together or categorize in certain or specific way –such as the letters, the numbers, or the names of persons– also have some kind of sensorial addition, such as a smell, a color or a flavor. The most common forms of cognitive synaesthesia entail elements such as characters written in color (graphemes), numbers, time units, and notes or harpsichords. For example, a person could perceive different colors with different spoken vowels or different consonant sounds. Synaesthesia is a conscious experience of systematically induced sensory attributes that

are not experienced by most people under comparable conditions (only by those considered synesthetes). It is considered by many as a normal brain process that is prematurely displayed to consciousness in a minority of individuals. In the other extreme, we find *Maurice Merleau-Ponty's* belief (1962) that synaesthetic perception is the rule that we unlearn (probably through pruning effect), though we are unaware of it because scientific knowledge shifts the center of gravity of experience so that we unlearn how to see, hear, and generally speaking, feel. Ramachandran and Hubbard (2001) see synaesthesia as a window into perception, thought and language. Rich & Mattingley (2002) show that synaesthesia has been considered as a reaction to a physical stimulus, but they also prove that it can be activated with the mere thought of a particular stimulus or **concept**.

The pairings between eliciting stimuli and the resulting synaesthetic experiences differ widely between synaesthetes, for any given synaesthete, there appears to be high consistency of the pairings between eliciting stimuli and synaesthetic experiences over time (e.g., Baron-Cohen et al., 1987, 1993; Dixon et al., 2000; Mattingley et al., 2001; Odgaard et al., 1999 ; Svartdal & Iversen, 1989). There are different studies that locate this phenomenon on the brain. Synaesthesia appears to be a left-hemisphere function that is not cortical in the conventional sense, and the hippocampus is critical for its experience (Cytowic, 1995). Functional imaging studies (Robertson, 2003; 2005) have shown that areas within the ventral pathway that normally register shape, color and words are activated in synaesthetes, but in addition, there is also parietal activity, which for the most part has been downplayed. Some have argued that the automaticity and consistency of the synaesthetic experience represent direct connections between cortical feature maps, perhaps through synaptic connections that fail to undergo normal synaptic pruning during development. This explanation of synaesthesia has been favored by various investigators and is consistent with findings from behavioral experiments suggesting that synaesthetic binding occurs before attention.

## Conclusions

Synaesthesia takes place when ordinary stimuli elicit extraordinary conscious experiences, and as a conceptual feature synaesthesia consists on giving a thing a quality that in fact it cannot have, because the thing and the quality are perceived by different senses. This is reflected in thought and in common linguistic expressions such as "*white voices*" or in idiomatic expressions such as "*to strike a sour note*".

There is, thus, a different perspective to consider the study of Synaesthesia. The proposed approach brings together classically separated realms: the linguistic and the neuroscientific and cognitive ones. But both the physiological and the conceptual or linguistic realities could be considered as part of a whole.

Further research should be done using such interdisciplinary approach, taking into account all the elements mentioned in this paper which hopes to rise a new current of discussion.

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## References

- Baron-Cohen, S. & Harrison, J. (1996). *Synesthesia: Classic and Contemporary Readings*. Oxford: Blackwell.
- Baron-Cohen, S., Harrison, J., Goldstein, J.H. & Wyke, M. (1993). "Coloured speech perception: Is synaesthesia what happens when modularity breaks down?" *Perception*, 22: 419-426.
- Bretones-Callejas, C. M. (2001). "Synaesthetic Metaphors in English." *ICSI Technical Report*, 8. September 2001. At <http://www.icsi.berkeley.edu/techreports>.
- Bretones-Callejas, C.M. (2005). "Synesthesia". In Keith Brown(Ed.). *Language and Linguistics Encyclopedia*. Cambridge: Elsevier.
- Cacciari, C. (1998). "Why Do We Speak Metaphorically? Reflections on the Functions of Metaphor in Discourse and Reasoning". In Katz, Albert N.; Cacciari, Cristina; Gibbs, Raymond W. Jr.; Turner, Mark. 1998. *Figurative Language and Thought*. New York & Oxford: O.U.P. Pp. 119-157.
- Campen, C. van. (1997). "Synesthesia and Artistic Experimentation". *Psyche*, 3(6), (November 1997). At <http://psyche.cs.monash.edu.au/psyche-index-v6.html>, 6/18/00.
- Classen, C. (1993). *Worlds of Sense. Exploring the Senses in History and across Cultures*. London/New York: Longman.
- Cytowic, R. E. (1995). "Synesthesia: Phenomenology and Neuropsychology. A Review of Current Knowledge". *Psyche*, 2(10), July 1995. At <http://psyche.cs.monash.edu.au/v2/psyche-2-10-cytowic.html>, 6/18/00.
- Cytowic, R. E. (2002). "Touching tastes, seeing smells - and shaking up brain science." *Cerebrum*, 4(3): 7-26.
- Day, S. (1996). "Synaesthesia and Synaesthetic Metaphors". *Psyche*, 2(32), July 1996. At <http://psyche.cs.monash.edu.au/v2/psyche-2-32-day.html>, 6/5/00.
- Day, S. A. (2004). "Trends in Synesthetically Colored Graphemes and Phonemes -2004 revision." At <http://home.comcast.net/~sean.day/Trends2004.htm>, 6/1/04.
- Elias, L. J., Saucier, D.M., Hardie, C. & Sarty, G.E. (2003). "Dissociating semantic and perceptual components of synaesthesia: behavioural and functional neuroanatomical investigations." *Cognitive Brain Research*, 16: 232-237.
- Erzcébet, P. D. (1974). "Synaesthesia and Poetry." *Poetics*, 11: 23-44.
- Evans, N. & Wilkins, D. (2000). "In the Mind's Ear: The Semantic Extensions of Perception Verbs in Australian Languages". *Language*, 3(76): 547-592.
- Galeyev, B. M. (1999). "What is Synaesthesia: Myths and Reality." *Leonardo Electronic Almanac*, 7(6). At [http://prometheus.kai.ru/mif\\_e.htm](http://prometheus.kai.ru/mif_e.htm), 6/18/00.
- Grossenbacher, P. G. & Lovelace, C. T. (2001). "Mechanisms of Synaesthesia: Cognitive and Physiological Constraints." *Trends in Cognitive Sciences*, 5: 36-41.
- Harrison, J. E. (2001). *Synaesthesia - the strangest thing*. Oxford: O.U.P.
- Ione, A. & Tyler, C. (2004). "Neuroscience, History and Arts Synesthesia: Is F-Sharp Colored Violet?" *Journal of History of the Neurosciences*, 13(1): 58-65.
- Lakoff, G. & Johnson, M. (1999). *Philosophy in the Flesh*. New York: Basic Books.
- Lovelace, Grossenbacher, & Crane. (1999). "Theories." At <http://www.ncu.edu.tw/~daysa/theories.html>, 6/18/00
- Lyons, A. D. (2000). "Synaesthesia-A Cognitive Model of Cross Modal Association". At <http://www.users.bigpond.com/tstex/synaesthesia.htm>, 6/18/00.
- Luria, A. R. (1969). *The Mind of a Mnemonist*. London: Basic Books.
- Marks, L. E. (1978). *The Unity of the Senses: Interrelations among the Modalities*. New York: Academic Press.
- Marks, L. E. (1983). "Categories of Perceptual Experience: A Psychophysicist Peruses Synesthetic Metaphors." In Geissler, H.G. (Ed.). *Modern issues in perception*. Amsterdam: Elsevier Science Publishers B.V. Pp. 351-352.
- Marks, L. E. (2000). "Synesthesia." In Cardena, E., Lynn, S. J.& Krippner, S. (Eds.) *Varieties of anomalous experiences*. American Psychological Association, Washington, DC. Pp.121-149.
- Mattingley, J. B. et al. (2001). "Unconscious priming eliminates automatic binding of colour and alphanumeric form in synaesthesia." *Nature*, 410: 580-582.
- Merleau-Ponty, M. (1962). *Phenomenology of Perception*. London: Routledge.
- Ogdaard, E. C., Flowers, J. H., & Bradman, H. L. (1999). An investigation of the cognitive and perceptual dynamics of a colour-digit synaesthete. *Perception*, 28: 651-664.
- Ramachandran, V. S. & Hubbard, E. M. (2001). "Synaesthesia: A Window into Perception, Thought and Language." *Journal of Consciousness Studies*, 8(12):3-34.
- Rich, A. N. & Mattingley, J. B. (2002). "Anomalous Perception in Synaesthesia: A cognitive Neuroscience Perspective". *Nature Reviews*, 3: 43-52.
- Robertson, L. C. (2003). "Binding, Spatial Attention And Perceptual Awareness." *Nature Reviews Neuroscience*, 4: 93-102.
- Robertson, L. C. & Sagiv, N. (Eds). (2005). *Synaesthesia: Perspectives from Cognitive Neuroscience*. New York: Oxford University Press.
- Slawson, W. (1968). "Vowel quality and musical timbre as functions of spectrum envelope and fundamental frequency." *Journal of Acoustical Society of America* 43: 87-101.

- Slawson, W. (1985). *Sound Color*. University of California Press.
- Ullmann, S. (1964). *Language and style*. Oxford: Basil Blackwell.
- Ward, J. & Simner, J. (2003). "Lexical-gustatory synaesthesia: linguistic and conceptual factors." *Cognition*, 89: 237-261.
- Williams, J. M. (1976). "Synaesthetic Adjectives: A possible Law of Semantic Change". *Language*, 52(2): 461-478.