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Opening address

Thirty-nine years before this Interim Meeting, the first Congress of the International Color Association was held here in Stockholm. It was June 1969. The AIC had been created two years earlier, precisely on the 21st of June of 1967, and Sweden, represented by Gunnar Tonnquist, was one of the eight founding members, together with the USA, France, Great Britain, Spain, Switzerland, Japan, and The Netherlands.

Thirty-five meetings and congresses have been organized to date in 21 different countries of the five continents. Together with the USA, Sweden is now in the preeminent position of having organized four meetings to date, and this is the second meeting in the same city: Stockholm. The other ones were held in Kungälv, 1983, and Gothenburg, 1996.

Also, Gunnar Tonnquist, who will deliver the opening lecture of this meeting, was the first vice-president of the AIC, and the first person that wrote a history of this association, which can be found in the AIC website. For some reason (at that moment the AIC statutes were different), he did not become AIC president, but now, in 2010, Sweden will have an AIC president with Berit Bergström. So, the brilliant circle of Swedish accomplishments within the AIC seems to have reached a peak. Sweden was pioneering the activities of the AIC in various different ways.

It is for this reason a great honor for me to have the opportunity of opening this Interim Meeting on “Color - Effects & Affects”. I declare the congress open, and I am sure that we will have a very fruitful conference. Thank you.



José Luis Caivano, AIC President
June 2008



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Chromatic Synesthesias: Effects of Color on the Perception of Different Sensorial Continua

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ABSTRACT

The associations among different senses are known as synesthesia. This is produced when stimuli received through a certain sensory channel are perceived and interpreted as sensations of another kind. The most usual transpositions involve vision and hearing, but also taste, smell and touch. A good deal of theoreticians from the fields of psychology of perception and psychophysics have developed order systems for the stimuli or sensations affecting the five basic channels through which humans perceive and process information from the environment. Among these, color order systems are the best known. There are also models that organize visual textures, spatial shapes, and non-visual sensory continua: sounds, tactile sensations, tastes and odors. The aim of this paper is to address the concept of synesthesia, to present a survey of some models that organize sensory continua and, from their comparison, speculate about the way synesthetic transpositions that involve vision are produced.

1. SYNESTHESIA

Synesthesia is a phenomenon by which associations among different sensorial continua are produced. This phenomenon appears when stimuli received through one of the senses are perceived and interpreted as other kind of sensations. The study of synesthesia can be approached from psychology of perception, as well as from neurology, but it has also interested or affected plastic artists, musicians, poets, linguists, semioticians, and others (Kandinsky 1912; Sanz 1985, 1993: 180-194; van Campen and Froger 1999, 2001, 2003).

Two classes of synesthesia are usually distinguished: *genuine synesthesia* and *pseudo-synesthesia*. Genuine synesthesia appears as a neurological abnormality in a minority of persons (Cytowic 1995). Pseudo-synesthesia is considered a normal phenomenon of association produced by similitude of qualities between sensations.

There is a hypothesis that sensoriality in babies is typically synesthetic, and that when they grow their senses undergo a progressive separation, becoming more specific and tuned to certain kind of stimuli (Baron-Cohen 1996). If this were true, then an adult genuine synesthete would be a person whose sensorial channels, instead of having evolved, remained as in the initial stage. But it seems logical to think that in normal persons some vestiges from this stage could remain. The most usual synesthetic associations involve vision and hearing, but taste, smell and touch appear as well. However, vision seems to be present in most of the cases.

2. ORDER SYSTEMS OF SENSORIAL CONTINUA

Many theoreticians from the fields of psychology of perception, psychophysics, physiology, arts, architecture, and others, have developed order systems for the stimuli or sensations that affect the five basic channels through which humans perceive and process information from the environment: sight, hearing, taste, olfaction, and touch. Among these, color order systems

are the best known and have been developed along the whole history of color research. But there are also models that organize other perceptual variables: visual textures, spatial shapes, cesias, and non-visual sensory continua such as tactile sensations, tastes, odors, sounds, etc. (Figure 1).

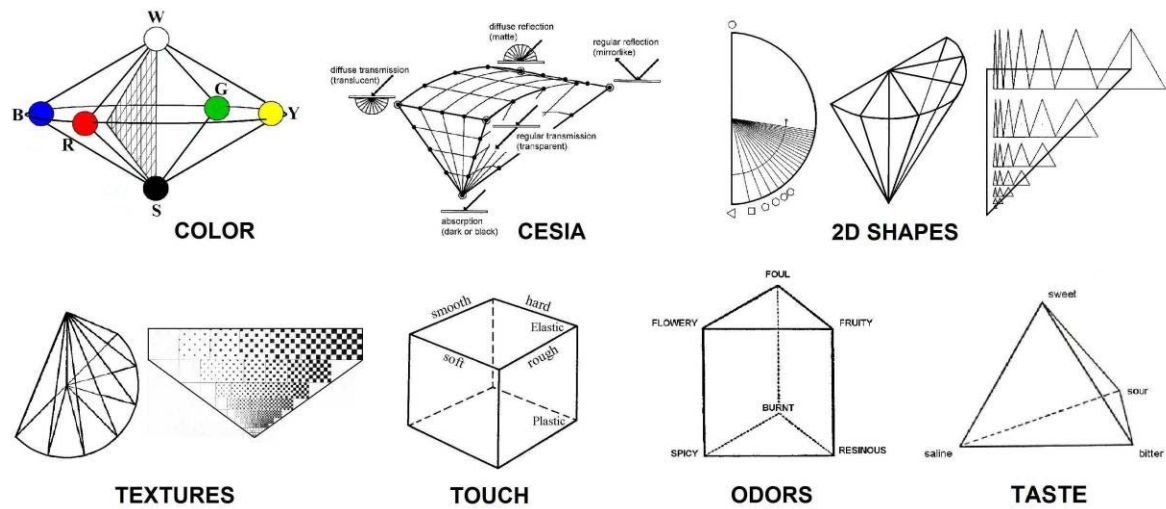


Figure 1. Order systems for different sensory continua: color (Natural Color System), cesia (Caivano), two-dimensional shapes (Jannello), visual textures (Caivano), touch sensations (Katz), odors (Henning), and taste sensations (Henning).

3. POSSIBLE CORRESPONDENCES

Let's now present the following hypothesis:

- ∄ If we understand synesthesia in a wide sense, as similarities among sensations of different kind that all persons can perceive (not as a neurological anomaly);
- ∄ and if the order systems for the sensory continua represent how humans perceive and organize the corresponding sensations;
- ∄ it seems plausible to find some kind of relationship between synesthesia and order systems. We could imagine particular cases of association, and verify whether they appear at a high rate in normal persons (not in clinical cases of synesthetes) or not.

After the comparison of the models, their opposite sensations and their variables, it is possible to detect certain axes of coincidence. Most of the models have a vertical axis with an opposition pair that could be associated to the “heaviness” of the sensations, a quantitative aspect:

	light - heavy
<i>color</i>	light - dark
<i>cesia</i>	light - dark
<i>sound</i>	high - low
<i>shape</i>	small - big
<i>visual texture</i>	small - big
<i>odor</i>	fruity - resinous
<i>taste</i>	sweet - bitter
<i>touch sensation</i>	soft - hard

Perpendicular to this axis, another axis often appears, which has to do with the saturation of the sensations, a quali-quantitative aspect:

	saturated - unsaturated
<i>color</i>	chromatic - achromatic
<i>cesia</i>	regular - diffuse
<i>sound</i>	pure sound - noise
<i>shape</i>	surface - line
<i>visual texture</i>	dense - sparse
<i>taste</i>	tasteful - tasteless
<i>touch sensation</i>	rough - smooth

The third variable is usually of a more qualitative nature. In some cases, instead of being a continuum between two opposite poles, it adopts a circular way, as in the chromatic circle:

<i>color</i>	<i>hue</i> (chromatic circle: yellow, red, blue, green, yellow...) (oppositions: yellow-blue; red-green)
<i>cesia</i>	<i>permeability</i> (transparent - opaque)
<i>shape</i>	<i>form-matrix</i> (triangle - circle)
<i>visual texture</i>	<i>directionality</i> (directional - non-directional)

These are just some hypothesis of the similarities that could be recognized between qualities of different sensory nature. There is probably more than this. Is it possible to verify these correspondences?

4. VERIFICATION BY SURVEYS

By means of surveys or experiences with normal persons (not clinical synesthetes), we could verify whether those correspondences are shared by most people in a natural way, or change (and then new hypothesis would be needed), or are affected by other factors (sex, age, education, profession). No doubt, this is a long-term research program. Particularly, I have carried out two experiences in this direction: with color and sound, and color and shape.

In an article published in *DeSignis* (Caivano 2003) I develop the associations between color and sound, and present the results of a survey with normal persons (not genuine synesthetes) about the associations among the variables of color (hue, lightness, saturation, and spatial extension) and the variables of sound (pitch, loudness, timbre, and duration). Most of the people relate:

- pitch of sound with lightness of color,
- loudness with spatial extension of color,
- timbre of sound with hue of color,
- duration of sound with spatial extension of color.

In addition, the associations were markedly pointed out in this direction:

- low sounds with dark colors, high sounds with light colors;
- quiet sounds with small color extensions, loud sounds with big color extensions;
- noise with violet (one of the extremes of the spectrum), pure sounds with red (the other extreme of the spectrum);
- short sounds with small color extensions, long sounds with big color extensions.

In color seminars I usually test the color-shape associations supported in the Bauhaus by Kandinsky and Itten (see Itten 1970: 75-76). They asserted that:

- yellow is associated with the triangle,
- red, with the square,

- blue, with the circle.

In surveys with 155 students, I asked them to relate these colors to these shapes. I showed them black outlines of the three shapes and long stripes with the three colors. The results are:

- **67% relate yellow with the triangle**
(25% relate yellow with the circle, and 8%, yellow with the square),
- **52% relate red with the circle**
(29% relate red with the square, and 19%, red with the triangle),
- **63% relate blue with the square**
(23% relate blue with the circle, and 14%, blue with the triangle).

As we can see, there is no doubt about the yellow-triangle association. But the other results contradict Kandinsky-Itten's presuppositions about red being related to the square, and blue, to the circle.

5. CONCLUSION

This kind of surveys could be extended to the other associations that we hypothesized for different sensory continua. If we can verify that those associations are not fortuitous but that there is a consistent tendency to associate certain specific qualities of a sensory continuum to certain specific qualities of another, then this would suggest that:

- ∄ either the associations through similarity among perceptions of different sensorial nature are rather universal and shared by the majority of humans;
- ∄ or the neurological connections that provoke synesthesia are not contingent or a privilege of a very few and rare individuals, but are shared by most humans (Ramachandran and Hubbard 2003), perhaps as a trace from that initial stage of sensoriality peculiar of the first months of life.

REFERENCES

- Baron-Cohen, S. 1996. Is there a normal phase of synaesthesia in development? *Psyche* 2 (27). In: http://psyche.cs.monash.edu.au/v2/psyche-2-27-baron_cohen.html.
- Caivano, J. 2003. Sinestesia visual y auditiva: la relación entre color y sonido desde un enfoque semiótico. *DeSignis* 4: 175-186.
- Cytowic, R. 1995. Synesthesia: phenomenology and neuropsychology. A review of current knowledge. *Psyche* 2 (10). In: <http://psyche.cs.monash.edu.au/v2/psyche-2-10-cytowic.html>.
- Itten, J. 1970. *The elements of color*, ed. F. Birren. New York: Van Nostrand Reinhold.
- Kandinsky, W. 1912. *Über das Geistige in der Kunst*. Munich: R. Piper.
- Ramachandran, V., and E. Hubbard. 2003. Hearing colors, tasting shapes. *Scientific American*, May: 52-59.
- Sanz, J. 1985. *El lenguaje del color*. Madrid: Hermann Blume.
- . 1993. *El libro del color*. Madrid: Alianza Editorial.
- van Campen, C. 1999. Artistic and psychological experiments with synesthesia. *Leonardo* 32 (1): 9-14.
- van Campen, C., and C. Froger. 2001. Assessing the strength of color synesthesia in words, music, taste and odor perception: Development of the NeCoSyn method. In: <http://synesthesie.nl/>.
- . 2003. Personal profiles of color synesthesia: Developing a testing method for artists and scientists. *Leonardo* 36 (4): 291-294.

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