

HOW DOES THE MEMORY OF SYNESTHETES WORK?

Cretien van Campen

Synesthetics Netherlands (www.synesthesie.nl)
Rubicondreef 20, 3561 JC Utrecht, The Netherlands
E-mail: cretien at synesthesie.nl

Abstract: People with strong synesthetic perceptions of e.g. colored letters or digits (so-called 'synesthetes') seem to have good memory abilities. Synesthetes report they use their colored letters to memorize names and use their colored time lines to plan their diaries. Does the memory of synesthetes work different from that of nonsynesthetes? To answer this question three sources of information on synesthesia and memory were reviewed: 1) laboratory experiments, 2) in-depth interviews, and 3) autobiographical novels.

Laboratory experiments with synesthetes (individuals and groups) show that some synesthetes have an extraordinary recall but, on the average, synesthetes and non-synesthetes perform equally on recall tests. In-depth interviews show that synesthetic perceptions can enhance the emotional charge of childhood memories, help in evoking vivid, empathic memories that sometimes are therapeutic, and are influential on constructing the memory picture (e.g. its colors).

The novelists Proust and Nabokov show, in their long-term analyses of their childhood memories, that these are physically very vivid evocations of the past, but in no way factual like photographs. Memorizing is a way of mentally and physically reliving and reconstructing the past from the present perspective. The self-declared synesthete Nabokov did not differ much from the nonsynesthete Proust in this respect.

It is concluded that the memory of synesthetes in general does not work very differently from nonsynesthetes, but some individuals have developed an extraordinary memory by using their synesthetic perception as mnemonic tool, as an anthropological resource for orientation to navigate through the past, and as a sensibility to empathize and understand it.

Keywords: synesthesia, memory, psychological experiments, in-depth interviews, autobiographical novels.

¿Cómo funciona la memoria de los sinestésicos?

Resumen: La gente con fuertes percepciones sinestésicas de, por ejemplo, letras o dígitos coloreados (llamada 'sinestésica') parece tener buenas capacidades de memoria. Los sinestésicos refieren que utilizan sus letras coloreadas para memorizar nombres y usan sus líneas del tiempo coloreadas para planificar sus agendas.

¿Funciona la memoria de los sinestésicos de manera diferente a la de los no sinestésicos? Para responder a esta pregunta se han revisado tres fuentes de información sobre la sinestesia y la memoria: 1) experimentos de laboratorio, 2) entrevistas exhaustivas, y 3) novelas autobiográficas.

Los experimentos de laboratorio con sinestésicos (individuos y grupos) muestran que algunos sinestésicos tienen una memoria extraordinaria, pero que, como promedio, los sinestésicos y los no sinestésicos responden igual en los tests de memoria.

Las entrevistas exhaustivas muestran que las percepciones sinestésicas pueden elevar la carga emocional de las memorias infantiles, ayudar a evocar memorias vívidas y empáticas que en ocasiones resultan terapéuticas, y que son determinantes a la hora de construir la imagen de la memoria (p. ej., sus colores).

Los novelistas Proust y Nabokov muestran, en los prolongados análisis de sus memorias infantiles, que éstas son evocaciones físicamente muy vívidas de su pasado, pero de ninguna manera fieles como las fotografías. Memorizar es una manera de revivir mental y físicamente, y de reconstruir el pasado desde la perspectiva presente. El autodeclarado sinestésico Nabokov no se diferenciaba mucho del no sinestésico Proust en este aspecto.

Se concluye que la memoria de los sinestésicos en general no funciona de manera muy diferente a la de los no sinestésicos, pero que algunos individuos han desarrollado una memoria extraordinaria usando su percepción sinestésica como una herramienta mnemotécnica, como un recurso antropológico de orientación para navegar por el pasado, y como una sensibilidad para empatizar y comprenderlo.

1. INTRODUCTION

People with strong synesthetic perceptions of e.g. colored letters, digits or sounds, can sometimes amaze others with their extraordinary memory skills. Stories are told of how they impress friends and family at gatherings with the exact recall of details of events in the past that all the other attendants had practically forgotten about. Some people with strong synesthetic perceptions, labelled as 'synesthetes' (which sounds like an exotic category) have become real entertainers, and impress their audience with their tricks. Recently, the British synesthete Daniel Tammet has been travelling the world as a memory artist who recalls 20,000 decimals of the number pi (Tammet 2006).

Audiences ranging from family gatherings to television shows, are often surprised by two abilities of synesthetes: 1) their ability to recall apparently any event from the past in great detail, and 2) their ability to describe the events very vividly, as if they had just been physically present in the past.

This raises questions about the source of their seemingly extraordinary memory abilities. Do they just happen to have good memories? Or are their memory abilities related to their synesthetic perceptions? And, if that is the case, is their synesthesia the cause or the result of their memory abilities?

Some synesthetes report a superior memory in comparison to so-called 'nonsynesthetes' (i. e., who lack strong synesthetic perceptions). Other synesthetes report that their memory abilities are not very different from others; they forget dates and anniversaries as well, and now and then they have difficulties in memorizing grocery lists.

Some synesthetes can describe their childhood experiences in all colors, sounds and smells, as if they were physically stepping into history and tapping from their bodily experiences. Other synesthetes do not, and generally report that their vivid memories are restricted to shorter periods (i. e., the last weeks).

The question I would like to address here is: does the memory of synesthetes work differently from that of nonsynesthetes? In finding answers, I have used three sources of information on synesthesia and memory:

- laboratory experiments
- in-depth interviews
- autobiographical novels

2. LABORATORY EXPERIMENTS

The memory of synesthetes has been tested in psychological laboratories for decades, and in particular the last years show an upheaval in the number of studies. I will restrict myself to a bird's eye view of the main results. The larger number are case studies of synesthetes, but recently group studies have come to the fore. I have reviewed the results of the case studies and group studies separately.

2.1 Case studies

- Grapheme/digit/tone → color/taste/touch synesthete S. recalled number and word sequences perfectly (100%), even after years (Luria 1962).
- Digit → color/form/texture synesthete D. recalled matrices of digits perfectly (100%) after 3 days (controls < 7%). D. performed worse when digits were colored 'wrong' according to him (Azoulay, Hubbard & Ramachandran 2005).
- Digit → color synesthete C. recalled number sequences perfectly after two months (controls almost none). Poor performance by C. when numbers were colored 'wrong' (Smilek, Dixon, Cudahy & Merikle 2002).
- Grapheme → color synesthete MLS recalled names much better than controls after six months. She also performed better on verbal recall than controls (Mills, Innis, Westendorf & Owsianiecki 2006).

2.2 Group studies

- A group of 46 grapheme/digit → color synesthetes performed on the average better on verbal and color memory tests than a group of 46 controls, but not on memory tests for figures and matrices of digits. The best performances were directly related to their type of synesthesia (words, colors). Only 5 synesthetes (11%) showed superior memory abilities (Yaro & Ward 2007).
- A group of 13 grapheme-color synesthetes did not perform better than a group of 13 controls on memory tasks (Rothen & Meier 2008).

Reviewing these results from case studies and group studies, they show that some individual synesthetes have superior memory abilities, but that, on the average, synesthetes do not have a better memory than nonsynesthetes, except for specific mnemonic abilities that build on their synesthetic ability.

The methods used in laboratory experiments have some limitations:

- They test only the memory of recall of new stimuli.
- They do not test other types of memories, such as autobiographical memories or implicit memories for emotions, motor and bodily actions.
- Subjects were not tested on the vividness, emotion and sensory-bodily aspects of their memories.

3. IN-DEPTH INTERVIEWS

To study the real daily life experiences of the memory of synesthetes, I conducted 8 in-depth interviews with synesthetes. I interviewed them on their synesthetic perceptions, memory abilities and autobiographical memories, in particular of their childhood. The duration of the interviews ranged from 45 to 90 minutes.

The object was to explore the interactions of synesthetic experiences and autobiographical memories. The interviews should be considered as case studies and definitely not as a sample of synesthetes. Therefore, the results are presented as quotations and not as group means. They are meant as a supplement to the laboratory studies reviewed before. The quotations from interviews provide additional characteristics of how synesthetic perceptions interact with autobiographical memories. For this short presentation, I have organized the interview results under five headings, including a statement and only one example from an interview (subjects provided more examples).¹

Emotion

Synesthetic colors sometimes convey emotional meanings in childhood memories.

“At that horrible night of the floods, I remember the presence of my mother and the absence of my father in the house as the presence of a brown-pinkish orange and the absence of a light blue. The colors refer to the letters of their names. I was 8 years old then.”

(grapheme → color synesthete J.)

Organization of the past

Synesthetic percepts give unity and coherence to elements of childhood memories.

“The smell of wheat can take me back to my youth and evokes colors, sounds, etc. Without my synesthesia, the experience would be less complete.”

(grapheme → color synesthete J.)

Empathic vividness

Synesthetic stimuli evoke vivid percepts in other sensory modalities as well, when remembering events in the past. This results in a vivid and physically empathic apprehension of the past (feeling to be physically present in the past).

“I have an extraordinary memory for touch feelings during my youth, including feelings of chilblains, scabs on scraped knees, swollen and itching gums, etc. I can move around in my childhood memory and feel my body move to the left or right, bend, stand up, etc.”

(touch → color/form synesthete E.)

¹ The elaborate analyses and results from the interviews will be published in a forthcoming book on memory and synesthesia.

Construction of the past

Synesthetic colors can overrule factual colors in autobiographical memories (since memories are constructions, not pictures of the past).

“Touching the cold surface of a terracotta-colored marble evokes a whitish color, which brings me back to the marble banisters in my parents’ house, which are in my mind’s eye also white and emotionally cold. The memory is emotionally colored whitish cold, while the factual colors of the interior were probably very different.”

(bi-directional color/touch/sound synesthete C.)

Therapeutic

Some synesthetes use their synesthetic colors to come to terms with emotional events in the past.

“As a child I could ‘be’ in a color and isolate myself from others. Looking at these colors now, I am easily transported in time. [...] I have learned to interpret the colors and their emotions.”

(grapheme/time units → color synesthete N.)

The method of in-depth interviews has its limitations:

- The analysis of childhood memories takes normally more than one interview in, for instance, therapies.
- Respondents showed difficulty in verbalizing the occasionally very emotional memories, and could not always get a grip on them. It took a lot of effort to organize and verbalize their childhood memories.

4. AUTOBIOGRAPHICAL NOVELS

Even gifted writers have taken years of introspection and many drafts to grasp the dynamics of their autobiographical memories. So one cannot expect from chance-chosen synesthetes to produce a full account of the interactions of synesthesia and memory.

Therefore, I selected two famous novelists of the twentieth century who have both analyzed their childhood memories. One is a self-declared synesthete and the other not. The first is the Russian-American novelist Vladimir Nabokov (1899-1977), and the second is the French novelist Marcel Proust (1871-1922). I have analyzed their main autobiographical works:

- *Speak, Memory: An Autobiography Revisited* (1966). In this autobiographical novel, Nabokov evokes his childhood memories and analyzes their sensory vividness.
- *In Search of Lost Time* (1913-1927). Proust dedicated many years of his life to write a novel in seven volumes, entitled *À la recherche du temps perdu*. He analyzed the dynamics of autobiographical memory and, in particular, sensory-induced memories, one of which has become famous as the Proust experience or the Madeleine fairy cake memory.

I have read and analyzed their observations and descriptions with a focus on differences between the synesthete Nabokov and the nonsynesthete Proust with regard to the vividness of childhood memories, the dynamics of sensory-induced memories and the role of emotions. Here I present a selection of my findings, and have illustrated each with a quote from the authors.²

4.1 Nabokov

Childhood memories are a construction and integration of sensory elements.

“In probing my childhood [...] I see the awakening of consciousness as a series of spaced flashes, with intervals between them gradually diminishing until bright blocks of perception are formed, affording memory a slippery hold.” (Nabokov 1966)

Vividness in childhood memories is a product of fact and fiction.

“*In Search of Lost Time* is an evocation, not a description of the past.” (Nabokov 2002)

4.2 Proust

The vividness of childhood memories is the result of a cooperation of the senses. A stimulus in one sense modality evokes a multisensory vivid memory of the past.³

“And like in the Japanese game when you throw little balls of paper in a porcelain bowl of water; as soon as they are immersed, they unfold, warp, take color, differentiate themselves and become flowers, houses and clear recognizable figures. In the same way all flowers of our garden and from the park of M. Swann, the water lilies on the Vivonne, the good people of the village and their little houses and the church and whole Combray and its environment, all that has form and solidity, the city and the parks, come out my cup of tea.” (Proust 1913)

The vividness of memories goes hand in hand with emotions, sometimes feelings of bliss.

“...disappeared all my despondency in that same bliss that had blessed me in several periods of my life, with the trees that I had seen on a drive around Balbec, at the sight of the bell towers of Martinville, at the taste of the in blossom tea sopped Madeleine cake, and many other sensations that I mentioned before.” (Proust 1927)

Memory is not a photographic archive, but an active way of reliving the past. Childhood memories are constructions, even though they look real and vivid. Memory is an art (a creation, a construction) to understand your past.

² The full analyses will be published in a forthcoming book. See note 1.

³ Compare to definitions of synesthesia by Baron Cohen (1997) and Ward & Mattingley (2006).

“What we call the reality is a certain association between such sensations and memories that surround us simultaneously –an association that is lost in a simple cinematographic view.” (Proust 1927)

“And art is a means to know this reality of multiple sensory meaningful memories [...] the work of art is the only means to regain the time lost [...]” (Proust 1927)

5 DISCUSSION

Do synesthetes have a different memory? Generally, the answer is: no.

Laboratory tests show little differences in average memory abilities of groups of synesthetes compared to nonsynesthetes. In-depth interviews show dynamics that are not necessarily synesthetic in character. The synesthetic novelist Nabokov does not come to other conclusions than his nonsynesthetic colleague Proust after their analyses of sensory-induced memories of their childhoods.

If I rephrase the question into: do *some* synesthetes have a different memory?, the answer would be: yes.

Synesthetes in general do not differ in their memory abilities from nonsynesthetes, but some synesthetes use interesting memory tools that are based in their synesthetic perceptions. From the analyzed material, I distinguish three types of tools:

1. Mnemonic cues

Some persons use their synesthetic colors to remember dates, names, telephone numbers.

2. Orientation

Synesthetes not only use their synesthetic perceptions as cues or codes but, more generally, they use them as an orientation or way to ‘navigate through life’, as Alexandra Dittmar (2007) explained on the basis of personal accounts by synesthetes. My interviews also show that these people use their synesthesia as ‘way’ to understand their past.

3. Sensibility

Some synesthetes have developed a special sensibility for colors or tastes or touch (cf. Duffy 2007, Van Campen 2007). They use this sensibility and their synesthetic co-perceptions to ‘construct’ a vivid and almost physically present past. This sensibility affords an increase in the emotional or empathic ability to relive past experiences. In some cases, this empathic understanding of present and past in the same moment can be therapeutic.

The synesthetes J., C. and N., whom I interviewed, not only constructed ‘colored memories’ of events in the past, but they also used the colors to understand and even ‘reconstruct’ the emotions of those events. They remembered how certain situations in their childhood were synesthetically colored and how the colors guided them to understand the difficult emotions of that moment. They reported that the synesthetic reliving of the past had a therapeutic power.

To end, Proust, Nabokov, and many psychologists after them (e.g. Schacter 1996; Greenberg & Rubin 2003) have shown that sensory-induced memories are

'constructions' of the past (not even *reconstructions*, since that would claim that one can puzzle the bricks of a teared photograph). Memories are constructed out of very diverse elements such smells, colors, sounds, thoughts, imaginations, motor actions, emotions, and other past and present experiences. It is amazing that our memories look so consistent and even 'true' (which they seldom are!) See for instance the reseach on false memories (e.g. Loftus & Ketcham 1996)

We use whatever abilities we have to construct meaning from memories. Synesthetes have the advantage of possessing a personal system which they can learn to use in the service of memory. I may compare it to an artistic ability to create order from chaos. On a more down-to-earth level, some synesthetes use their ability to construct new meanings from past and present experiences that appear to be emotionally significant in their lives.

Cretien van Campen is scientific researcher, author and editor in social science and fine arts. He is affiliated as a senior researcher at the Netherlands Institute for Social Research and moderator of Synesthetics Netherlands, the web community of synesthetes in the Netherlands. He is editor of the Leonardo online bibliography Synesthesia in Art and Science. His latest book is *The Hidden Sense: Synesthesia in Art and Science* (MIT Press 2007). He has published in the fields of the senses, perception & art and health, happines & well-being.

REFERENCES

- AZOULAI, S., HUBBARD, E., & RAMACHANDRAN, V. S. (2005). «Does synesthesia contribute to mathematical savant skills?», in *Journal of Cognitive Neuroscience*, supplement, vol. 69.
- BARON-COHEN S. & HARRISON J.E. (eds.) (1997), *Synaesthesia: Classic and contemporary reading*. Cambridge: Blackwell.
- DITTMAR, A. (ed.) (2007) *Synästhesien. Roter Faden durchs Leben?* Essen, Verlag Die Blaue Eule.
- DUFFY, P.L. (2007) "Gibt es eine "Sensibility" bei Synästhetikern", in: Dittmar, A. (ed.) *Synästhesien. Roter Faden durchs Leben?* Essen, Verlag Die Blaue Eule. pp. 341-348.
- GREENBERG, D.L. & RUBIN, D.C. (2003) "The neuropsychology of autobiographical memory", in *Cortex*, vol. 39, pp. 687-728.
- LOFTUS, E. F. & KETCHAM, K. (1996), *The myth of repressed memory: false memories and allegations of sexual abuse*. New York: St. Martin's Griffin.
- LURIA, A.R. (1968), *The Mind of a Mnemonist*. NewYork: Basic Books.
- MILLS, C.B., J. INNIS, T. WESTENDORF, L. OWSIANIECKI, & A. McDONALD (2006), "Effect of a synesthete's photisms on name recall", in *Cortex*, vol. 42, pp. 155-163.

- NABOKOV, V. (2002) "The Walk by Swann's Way", in: V. Nabokov. *Lectures on Literature*. Harvest Books.
- NABOKOV, V. (1966). *Speak, Memory: An Autobiography Revised*. New York: Putnam.
- PROUST, M. (1913-1927). *A la recherche du temps perdu*. Paris: Gallimard.
- ROTHEN, N. & MEIER, B. (2008) "Do synaesthetes have a general advantage in visual search and episodic memory?" Paper presented at *UKSA conference*, Edinburgh 2008.
- SCHACTER, D.L. (1996) *Searching for memory: The brain, the mind and the past*. New York: Basic Books.
- SMILEK, D., DIXON, M. J., CUDAHY, C., & MERIKLE, P. M. (2002). "Synaesthetic color experiences influence memory", in *Psychological Science*, vol. 13, pp. 548–552.
- TAMMET, D. (2006). *Born on a blue day*. London: Hodder & Stoughton.
- VAN CAMPEN, C. (2007) *The Hidden Sense: Synesthesia in Art and Science*. Cambridge: MIT Press.
- WARD, J. & MATTINGLEY, J.B. (2006). "Synaesthesia: an overview of contemporary findings and controversies", in *Cortex*, vol 42, pp. 129-36.
- YARO, C. & WARD, J. (2007) "Searching for Shereshevskii: What is superior about the memory of synaesthetes?", in *The Quarterly Journal of Experimental Psychology*, vol. 60, nr. 5, pp. 681 – 695