MULTIDIMENSIONALITY AND HUMAN PERCEPTION OF SPACE AND TIME

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Abstract: *If the muffin bits in Proustian tea seemed, at the time of writing and appearance of the novel "In Search of Lost Time", just a writing artifice, until today neuroscience has constantly evolved showing us that the triggering of involuntary memories does not depend, as Proust believed, only on stimuli such as smell and taste, but also on other, more complex stimuli and especially language, believes psychologist and author Emily T. Troscianko .*[1]

Indeed, the constant concern of neuroscience researchers has been to determine exactly where the human brain stores memories and how they are evoked.

Here too we are on the way to finding the truth, without necessarily contradicting Proust: new discoveries confirm that it is perception that defines reality. And time and space coordinates are no exception to this rule. Neuroscience proves that time and space are human perceptions and that there are many dimensions inside our brains.

Keywords: *neuroscience, stimuli, perception, space, time*

1. Voluntary vs. involuntary memory

Drawing on the Proustian experience, psychologist Emily T Troscianko examines, based on newer neuroscientific confirmations, the mechanism of stimuli in evoking memories and the veracity of the "muffin epididymis".

One of the reasons that smells and tastes can be so evocative is that they are often repeatedly (and unconsciously) associated with a particular situation, and then not experienced for many years. This is consistent with the fact that the Proustian narrator tasted a cake steeped in tea that he

[1] Troscianko, E. T. (2013), *Cognitive realism and memory in Proust's madeleine episod*e. Memory Studies, 6(4), 437-456.

used to enjoy regularly at his aunt's house in Combray as a child, but had not tasted for a long time.

Another thing about flashbacks is that they tend to occur when we are tired or distracted. Again, this is in keeping with the muffin episode, in which the narrator is "dejected after a dull day".

Troscianko also acknowledges that the muffin episode provides a realistic illustration of the unusual emotional power of memories triggered by smells. Unlike the other senses, olfaction bypasses the thalamus and goes directly to the hippocampus and amygdala, brain regions involved in emotional memory, as Troscianko explains.

In line with Proust's illustration, there is also research showing that memories triggered by smell tend to originate from moments further back in time than those triggered by other means, and that they tend to be emotionally charged but difficult to express. This fits with the narrator's description of how tasting the muffin triggered an 'almighty joy', along with a constant difficulty in identifying the source of the memory.

There are, however, according to Troscianko, some areas where Proustian theories are contradicted by modern science. If in his narrative, Proust believes that taste and smell are the only ones that have evocative capacity. But Troscianko points out that this contradicts research on involuntary memories, which shows that far more of them are triggered by verbal cues and the other senses.

Another would be that the detail and accuracy of Proust's memories far exceed what we experience in real life. In fact, research shows that smell triggers vivid emotional memories that are not, however, particularly detailed or specific.

So, all in all, can we say or not that the muffin episode is an accurate description of involuntary memory? This is where things get more complicated. According to Troscianko, the muffin episode is not, in fact, an example of an involuntary memory. In psychology, involuntary memories are thought of as those situations in which a trigger immediately brings a memory to mind without the need for conscious reflection or interpretation. On the contrary, the Proustian character tries again and again, ten times, to retrieve the memories responsible for the emotion aroused by the taste of the cake. It's a process that takes "at least many seconds," if not "many minutes," Troscianko estimates.

Moreover, all the scientific considerations of psychologist Emily T Troscianko lead to some legitimate questions:

- Where does the human brain store memories?
- What is the mechanism by which they are evoked?
- How long does it take to evoke a memory and what stimuli are involved?

But above all, the overarching question: "Are there more spatio-temporal dimensions inside the human brain?"

2. The multidimensionality of the human brain has been scientifically confirmed

Researchers involved in the Blue Brain project have published a study in the journal Frontiers in Computational Neuroscience about the fact that up to 11 dimensions operate in the structures of the human brain.

Blue Brain is a research project aimed at reconstructing the functioning of the human brain on a computer. The aim of the project is not to create a replica of human intelligence, as represented by artificial intelligence, but to discover the fundamental structures and principles underlying the functioning of the human brain using a detailed digital reconstruction of biological data. The project was initiated by IBM in May 2005 in collaboration with Henry Markram, a researcher at the Swiss Federal Institute of Technology Lausanne, Switzerland and l'École Polytechnique, Lausanne, Switzerland.

Researchers have now completed the virtual reconstruction of the human brain and, using their own mathematical method, have re-created the faithful toponymy of this structure. Applying innovative mathematical formulas and exploring a new branch of mathematics was necessary because traditional mathematical points were not applicable and inefficient. Scientists realised that structures inside the brain are created when a group of neurons (cells that transmit signals in the brain) form geometric structures, called 'cliques', similar to sandcastles, when stimuli are applied. Each neuron is connected to every other neuron in the group in a unique way, creating a new object. The more neurons in a clique, the larger the 'size' of the object.

Could we speculate about these objects, imagining that they are "reconstructions" of reality? Why not? Especially if we take into account that

as the complexity of stimuli increases, so does the complexity of click structures.

"We have found a world we never imagined," explained neurologist Henry Markram, director of the Blue Brain Project and professor at EPF, Lausanne, Switzerland. "There are tens of millions of such objects, even in the small shapes of the brain; in some networks, we even found structures with up to 11 dimensions."

Returning to Proust, we can speculate on the complexity of the stimuli: the more complex the stimulus, i.e. involving the engagement of more senses (in the case of the Proustian hero, the gustatory, olfactory and visual senses), the more intense the reality experienced is, and in this case we wonder how the cliché structures will look and whether they are interconnected with those constructed in the present. Where is the information stored that reconstructs past experiences?

Algebraic topography has allowed scientists to model the structures in a virtual brain created by computers and then replicate the same experiments on real brain tissue to verify the results. By adding stimuli to the virtual brain, the researchers found that several larger 'cliques' were assembled. Thus, the direct proportional relationship between stimulus complexity and neural structure complexity is scientifically confirmed.

As for the storage space for the information needed to erect neural constructs, it could be identified within the cavities that are created in the vicinity of the clicker constructs. These could be representations of the storage of materials on a construction site, which, incidentally, disappear when the information is processed. Neural structures also have the same fate, i.e. they disappear when information is processed. However, sticking to the comparison between castles, be they sandcastles, although perhaps the complexity of the structure would lead to a comparison with other building materials and neural structures of the clicque type, we wonder, when the constructions crumble, or when they are self-destroyed to create space, where the materials, i.e. the information, remain stored. We are certain that a structure as complex as the human brain has the ability to recycle materials, i.e. useless information is probably deleted, but that which is useful for further constructions is retained, or, cavities being deleted, we can speculate that the information is just covered, "buried" by the brain and returned to the cavities, to be later used vertically, i.e. "pushed" to the upper area.

We then have to ask whether links are established between the information stored in the form of brain stores, or whether they are simply stored in categories or chaotically.

The fact that they are not stored chaotically is proven to us by the human ability to voluntarily evoke certain information, but if links are established between this stored information, we can think of a layered structure within which information is processed.

If this layered structure exists, does each level depend on the space-time dimension, or on the human preception of them? And in this sense, is the multidimensionality of the human brain also a valence of space-time perception?

What is missing then to fully reconstruct the reality of the past or to predict the future? The information the brain did not consider necessary? In this case, there would be the solution of supplementing information or recycling all the information already held, because just as there is voluntary memory, there will no doubt also be the possibility of voluntarily storing more information about present reality, to be used later for recall. But doesn't this phenomenon already exist? Haven't we already noticed that in moments with a high emotional charge, especially positive ones, our brain makes reserves for later, when it will evoke that moment, practically in detail?

3. Conclusions

It is clear, at least to the optimist camp, to which I subscribe, that we are endowed with the ability to control the storage of information, which is nothing more than our memories or our projections about the future. It is also clear that, through this ability, we have a fairly large autonomy over our perception of space and time that we do not yet know how to use. On the other hand, it is becoming more and more obvious that we are moving towards an era in which it will no longer be "thought" that will involuntarily carry us to other times and space, but we will be the ones who will learn to control these dimensions, and neuroscience helps us considerably in this respect.

Bibliography

Marcel Proust and Unintentional Memories, www.scientia.ro

https://www.freeastroscience.com/2022/09/the-human-brain-builds-structures-in-11.html#:~:text=A%20huge%20number%20of%20neurons,the%20brain%20processed%20the%20information.

www. troscianko.com

www.frontiersin.org

Trenado, C., González-Ramírez, A., Lizárraga-Cortés, V., Pedroarena Leal, N., Manjarrez, E., and Ruge, D. (2019). The potential of trial-by-trial variabilities of ongoing-EEG, evoked potentials, event-related potentials and fMRI as diagnostic markers for neuropsychiatric disorders. Front. Neurosci. 12, 850. doi: 10.3389/fnins.2018.00850