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# True and false memories, a journey into parallel realities

A UNIGE and HUG professor offers a fascinating journey into memory and perception of reality disorders, as well as into false memories.

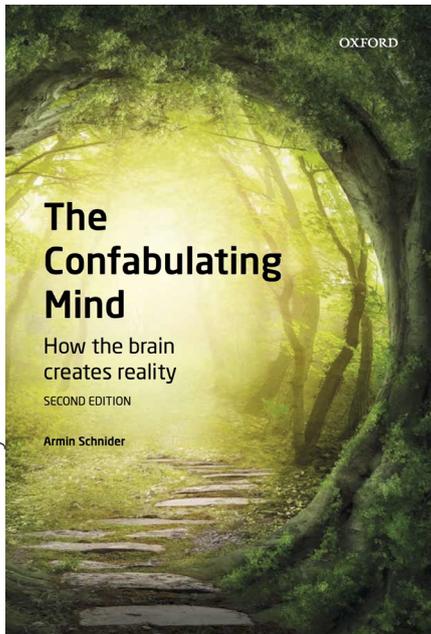
**What is reality? How does our brain distinguish it from imagination? And what happens when it does not? For nearly twenty years, a professor at the University of Geneva (UNIGE) and the University Hospitals of Geneva (HUG) has been working on these issues. His book, “The Confabulating Mind”, published by the Oxford University Press, offers an astonishing account of confabulation - the recollection of events that never happened - and of people living in “parallel realities”. This book summarizes the history of confabulation and presents patients suffering from this strange disorder. Beyond these pathologies, it also deals with another aspect: false memories, which can affect us all, and the manipulation, voluntary or not, of memory. While it is no big deal to embellish one’s childhood memories, it becomes much more serious when the conviction in court depends on a testimony.**

After brain damage, some rare patients begin to live in a false reality, which typically takes the form of a distorted reconstruction of real memories. Ms. B., a cerebral stroke victim, was thus convinced that she was a psychiatrist in the ward where she was hospitalized. It had indeed been her job, but she never worked in that hospital and had retired more than 15 years before. However, she spent her days looking for patients and planning the details of a reception that she thought was taking place in the evening; a reception that had taken place more than a decade earlier. In another case, a lawyer suffering from a brain inflammation prepared day and night for a trial that would never take place. What do these patients - who suddenly seem incapable of knowing if a memory relates to the present or not - have in common? The location of their brain lesions, in the orbito-frontal region, just above the eyes.

### Present, past or imaginary? A few milliseconds decide

“Using high-resolution electroencephalography in healthy subjects, we measured the speed of information processing by the brain”, explains Professor Armin Schnider, neurologist, director of the Department of Clinical Neuroscience at UNIGE Faculty of Medicine and head of HUG Neurorehabilitation Division. “Our studies show that the process of filtering reality takes place 200 to 300 milliseconds after the evocation of a memory or thought. In comparison, recognition of stimuli takes place after 400 to 600 milliseconds. In other words, the brain decides whether a thought refers to the present or not before we even realize the content of that thought. And everything seems to depend on a specific brain region, the orbito-frontal cortex, and its connections, including parts of the reward system. Indeed, this cerebral region ensures that our thoughts and actions remain in synchronization with reality, even when our minds stroll through fantasies.”

In the event of damage in this brain zone, patients may lose the ability to distinguish real from fake, the past from the present. They have no way



Armin Schnider, *The Confabulating Mind*. How the brain creates reality, 2nd edition. Oxford University Press 2018.

### High definition pictures

of realizing that their reality is false. “Our recent work has shown that thoughts are simultaneously encoded as the undergo reality filtering. Thus, the brain stores thoughts that refer to the present - reality – in a different format than thoughts that do not refer to it - imaginary or whimsical. This sequence later allows us to distinguish the memory of a real event from that of an imagination,” says Armin Schnider.

What mechanism underlies this loss of consciousness of reality? The Geneva researchers observed that, curiously, patients who confuse reality do not notice that the events they are waiting for never happen, just as the lawyer continued to believe that she had to prepare her pleadings, although external elements contradict this idea. The patients fail in their extinction capacity. This interpretation is compatible with the results of older studies that have identified neurons in the orbito-frontal region that only activate themselves when an expected reward does not materialize. If these neurons no longer function properly, patients no longer check their thoughts against true reality.

Particularly present in the middle orbito-frontal region, these neurons are also found in neighbouring areas. It is possible that these redundant cellular networks get activated when the main networks are damaged, explaining that only 5% of patients who have suffered brain damage in this region - vascular accident, trauma or other - develop a confusion of reality with confabulations. Armin Schnider points out that “almost all of our confabulation patients have regained the sense of reality, although amnesia mostly persists. We assume their backup network eventually activated.”

### **Victims of our memory?**

Armin Schnider’s book also deals with other memory and thought disorders, such as “*déjà vu*”, confusion of people and places or unconsciousness of neurological impairment. But false memories are not reserved for people with brain damage: in all of us, reconstructing memories can lead to mistakes. Indeed, when asked about our experiences, we tend, in case of doubt, to unconsciously invent answers. Our brain then integrates these responses into our memory as a true memory. In addition, memory can be manipulated. For example, the way a question is asked will influence the answer. In a well-known experiment, the question “How long was the movie?» provoked 30% longer estimates than the question “How short was the movie?»; a marked difference, which will subsequently be recorded in memory as the true length of the film.

Thus, being convinced of the truth of a memory does not guarantee its accuracy. “I remember someone who was convinced that it was on the morning of September 11, 2001 that we learned, here in Geneva, of the news of the World Trade Center attacks. She had integrated into her memory the television footage that showed New York City in the morning, at the time of the bombings, while in Europe we were already in the afternoon.” Amazingly, unsure witnesses, who receive confirmation of their response (“yes, he was the burglar”), will particularly inflate their conviction about the truthfulness of their memories. In the judicial world, such manipulations and transformations of memories are of particular importance.

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