

Chichele Essay Prize 2021

Memory

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Humans are some of the most complex pieces of machinery on the planet and we are powered by one of the most powerful computers that we know of – the brain. The brain, like a computer, has a data storage system: this is commonly known as ‘memory’, but instead of binary code it is stored as electrical signals firing through synapses. Like a computer, our brain must be programmed, not by code but by memories and experiences.

However, some functions are automatic, for example breathing and homeostasis. The ability to perform these functions without learning indicates some genetic memory of bodily processes passed on through the generations. This idea of genetic memory can be seen through epigenetics: what is commonly referred to as ‘muscle memory’, epigenetic memory in the muscles, shows that memories are not just stored in the brain but in other bodily systems.

Sigmund Freud studied the brain and commented on three layers within the mind: the first is the consciousness, then the memory layer and finally the unconscious mind. In the second layer lie memories that are easier to access, functioning almost as a search engine to bring facts and clear memories to the surface, such as what a person had for breakfast or where they left their keys. However, joined with this is the third layer, the unconscious mind, and together they store all of our programming and the memories of experiences that shape each person, making us who we are today. A simple example of the unconscious mind taking over is the feeling of running on auto-pilot, such as going through your morning routine but not consciously engaging with it. This is fuelled by thousands of hours of practice at this task, ingraining each movement into the unconscious memory, allowing auto-pilot to take over. It becomes more complex as memories shape personalities: it becomes hard to pin-point one thing that makes up a person. We are a mosaic built up of every memory buried away inside us.

Throughout this essay I have compared the brain to a computer, almost the

perfect computer but the brain isn't always perfect. It plays tricks on us, a common one being *deja vu*. Amnesia is another glitch that can sometimes happen, and whether caused by toxins (such as drugs or alcohol) or by a head injury it is always worrying and panic-inducing, as for a period of time you have lost yourself: having no recollection of your actions, it is almost as if it was someone else. While amnesia can be brief and is not always permanent, there are other things which are much more sinister. Alzheimer's is a condition affecting the memory, causing severe memory loss. To know someone suffering with Alzheimer's is to watch someone fade away, to visit and see that they don't remember your name, who you are, that you exist. It is to watch them disappear while their body remains, because as each memory goes so does their personality. It changes them: they no longer have the memories that made them who they are, and they have become a shell of what they once were.

Not every memory is good: some are bad, and some are so painful it hurts to think about them. Our brain sometimes takes this into its own hands and we unconsciously block memories. The brain hasn't deleted the file, more like put a password on it. This is a protective measure, so that as we are shaped by experience it is not for the worse. It is not uncommon for this response to come from trauma so that the memory is still there to be accessed later in life when a person is ready.

I have made musings about memory programming an individual but memory also helps society progress and innovate. Memories of both the distant and the close past are useful, as they allow us not to make the same mistakes as the past and allow us to know what didn't work so we can change and improve. One of the most important steps in the scientific method is the last one – to iterate. It is to take what was learnt from the last experiment and try new tests to find what went wrong and improve it. Without this memory of what happened before, innovation would be impossible and society could not progress. Similarly the same is true with human learning.

So I invite you to think of yourself. If you are the sum of your experiences and memories, are there defining memories that shape your programming? Is every piece in the mosaic, that makes up you, a good one? And, if you could remove the bad ones, would you do so, or would that just ruin the bigger picture?