

PIECES OF LIGHT

The New Science of Memory

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CASTING A LINE

‘Can you remember?’

It starts with a question from my 7-year-old son. We are in the grounds of our rented cottage in the Baixa Alentejo, killing time before we head to the Algarve coast for a boat trip. With his holiday money, Isaac has bought himself a hand-held toy that fires little foam rockets prodigious distances up into the air, and he has lost one of them on the gravelled ground behind the swimming pool. As we search, he has been chattering away about how he wants to go fishing with me when we get home from Portugal. I have told him that I used to go fishing, as a child of about his age, with my uncle in the lake in the grounds of my grandparents’ house in Essex. Then, out of the blue, he asks the question:

‘Can you remember the first fish you ever caught?’

I stand straight and look out at the farmland that slopes away from our hillside vantage point. I have not been fishing in thirty-five years, but my thoughts have occasionally

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returned to my outings with my uncle. When they do, certain images rise out of the past. I can picture the greenish lake with its little island in the middle, how mysterious and unreachable that weeping-willowed outcrop looked to my small-scale imaginings. I can sense my jocular young uncle next to me, his stretches of silence punctuated with kindly teasing. I remember the feel of the crustless bits of white bread soaked in pond water that we used to squidge on to the fish-hooks as bait, and the excitement (for a keen young amateur naturalist) of an afternoon visitation from a stoat, scurrying along by the bullrushes with its black-tipped tail bobbing. I remember the weird, faintly gruesome exercise of extracting the hook from a rudd's mouth and then throwing the muscular sliver back into the lake to restart its perforated life. But I have never thought about the moment of feeling the tug on the line, the thrill that prefigured the landing of a fish. And I have certainly not had the question framed like this, narrowing my remembering down to the first time it ever happened.

'I don't know,' I reply. 'I *think* so.'

What accounts for my uncertainty? The image of lifting a fish from the water was not there in my collection of ready-made fishing memories. Because I have never (as far as I can remember) been asked this question, I have never had to come up with a corresponding memory. But I try. I ask myself: What would that first-catch moment look like? Into the well-remembered scene of the lake I insert the detail of an extended fishing rod, seen from the perspective of my childhood self, with something silvery dangling from the end of the line. I feel a pang of recognition, and then a shiver of boyish excitement. And then I ask myself: Did it happen? I *feel* that it did. It seems to me that the event really took place; it feels as though it belongs in the past; it comes with

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appropriate corresponding emotions; and it feels as though it happened to *me* rather than to anyone else. When I think of the memory now, a month or two after our conversation in Portugal, it has taken on an independent existence. I no longer agonise about whether it was a product of imagination, generated on demand to satisfy a small child's curiosity.

What is it like to have a memory? What *is* a memory? How is it possible to have 'new' memories, like this one of catching my first fish? Have I always 'had' the memory, but only just unearthed it, or have I somehow created it out of something else? What about all the other potential memories I could conjure up from that period of my life – those that are not in my consciousness right now, but which could become so, with the appropriate cues? Do I 'have' them or not? What status do they have, before and after they come into my mind?

The list of questions goes on. Why did I remember this particular event and not some other? Presumably it was because my memory was clearly cued. I remembered the first fish I caught because I was specifically asked about it. But what about when a memory simply pops into my head for no apparent reason? Yesterday, for example, I suddenly had an exasperatingly random memory of the little blue-and-white-striped plastic carrier bags that were common when I was a child. We are often struck by the randomness of what we remember, and dismayed by our forgetfulness for the really important stuff. In the words of the American writer Austin O'Malley, memory is 'a crazy woman that hoards coloured rags and throws away food'. This randomness determines what information we choose to encode about an experience, how we recall what we do actually store, and the triggers that can elicit such memories. Memories that are resistant to the ordinary processes of cueing might nevertheless be

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flushed out by trivial, apparently disconnected cues. Even spontaneous memories, which flash into our heads for no apparent reason, may be triggered by some subtle internal or external connections.

For all these reasons, it's impossible to answer the question of whether I 'had' my first-catch memory before Isaac asked me about it. In this book, I want to show that the question is impossible because it relies on a mistaken view of what memories are.

Here's a memory, from an accomplished writer with a special interest in the topic:

It is seen from the point of view of a small person just seeing over the wall of a playground in East Hardwick Elementary School. The stone is hot, and is that kind that flakes into gold slivers. The sun is very bright. There is a tree overhead, and the leaves catch the light and are golden, and in the shade they are blue-green. Over the wall, and across the road, is a field full of daisies and buttercups and speedwell and shepherds'-purse. On the horizon are trees with thick trunks and solid branches. The sky is very blue and the sun is huge. The child thinks: I am always going to remember this. Then she thinks: why this and not another thing? Then she thinks: what is remembering? This is the point where my self then and my self now confuse themselves into one. I know I have added to this Memory every time I have thought about it, or brought it out to look at it ... It has got both further away and brighter, more and less 'real'.

The writer is the novelist A. S. Byatt. 'The Memory', as she dubs it, is an example of an *autobiographical memory*,

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which psychologists define as those acts of remembering that relate to events and details from our own lives. You could call on anyone to recount a memory from their childhood, and they would come up with something like this. At one level, Byatt's account illustrates the predominant view of what a memory is: a more or less stable depiction of a past event. Memories are not always as accessible as we might like – they don't always come when they are called – but they are essentially enduring representations which you carry with you, claim as your own and guard jealously. Some remember their first day at school, first kiss or first wedding day, and some don't. No one would doubt, though, that the question of whether you 'possess' a particular memory makes sense.

It could surely not be otherwise. Without our memories, we would be lost to ourselves, amnesiacs flailing around in a constant, unrelenting present. It is hard to imagine being able to hang on to your personal identity without a store of autobiographical memories. To attain the kind of consciousness we all enjoy, we probably rely on a capacity to make links between our past, present and future selves. Memory shapes everything that our minds do. Our perceptions are funnelled by information that we laid down in the past. Our thinking relies on short-term and long-term storage of information. As many artists have noted, memory underpins imagination. Creating new artistic and intellectual works depends critically on the reshaping of what has gone before. We need our memories, and we find ways of hanging on to them. According to the conventional 'possession' view of memory, we do that by filing them away in a kind of internal library, ready to be retrieved as soon as they are needed.

This view is everywhere in popular culture. In *Harry Potter and the Chamber of Secrets*, the second book of J. K. Rowling's world-famous series, Harry is threatened

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with having his memories ‘stolen’, as if they were items of mental property. (If that happens, we know that Harry will stop being the person he is.) In the sixth, *Harry Potter and the Half-Blood Prince*, Voldemort’s memories are capable of being accessed, distilled and transferred by Professor Dumbledore. In the hit 2009 movie *Avatar*, the hero Sully and his Na’vi comrades are able to look into Grace’s memories before she dies, as though they are diary entries at which one can sneak a peek. The internet is frequently a-buzz with news stories about how scientists are coming close to targeting individual memories, confirming the impression that individual moments of experience are distributed around the brain like books in a library. Metaphors of memory are overwhelmingly physical: we talk of filing cabinets, labyrinths and photographic plates, and we use verbs such as *impress*, *burn* and *imprint* to describe the processes by which memories are formed.

This view of memories as physical things is guaranteed to mislead. The truth is that autobiographical memories are not possessions that you either have or do not have. They are mental constructions, created in the present moment, according to the demands of the present. Scientists try to understand this process at the cognitive level (that is, at the level of thoughts, emotions, beliefs and perceptions) and at the neural level (in terms of activations in the brain). Cognitively and neurologically speaking, Byatt does not ‘bring her memory out to look at it’; she constructs it anew each time she is required to do so. That is quite a different concept to the idea that a memory is a static, indivisible entity, an heirloom from the past. Rather, the view that I want to explore in this book is that a memory is more like a *habit*, a process of constructing something from its parts, in similar but subtly changing ways each time, whenever the occasion arises.

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This reconstructive nature of memory can make it unreliable. The information from which an autobiographical memory is constructed may be more or less accurately stored, but it needs to be integrated according to the demands of the present moment, and errors and distortions can creep in at every stage. The end result may be vivid and convincing, but vividness does not guarantee accuracy. A coherent story about the past can sometimes only be won at the expense of the memory's correspondence to reality. Our memories of childhood, in particular, can be highly unreliable. Thinking differently about memory requires us to think differently about some of the 'truths' that are closest to the core of our selves.

Novelists give us a sophisticated view of what psychologist Daniel Schacter has called the 'fragile power' of memory. In her description of 'The Memory', Byatt is careful to acknowledge its unreliability, malleability and deceitfulness, and the fact that it is vulnerable to a constant process of telling and retelling. She describes her awareness, even as a child, of the effort needed to construct a memory in such a way that it will not be allowed to fade: 'The child thinks: I am always going to remember this.' Fiction writers have much to tell us about memory, and I will be relying on their insights as I go. When they steer too close to a 'possession' view of memory, however, I will look to the science of memory to set them straight.

This new, reconstructive account of memory is my real focus in this book. It is one that is largely accepted by memory scientists (with, of course, plenty of rumbling disagreements) but not yet, I think, the general population. I want to argue against the view of memories as mental DVDs stored away in some library of the mind. In fact, I would like to suggest that this mistaken 'possessions' view is itself

Pieces of Light is utterly fascinating and superbly written. I learned more about memory from this book than any other. There are few science books around of this class. The winner of the 2013 Royal Society Winton Prize for Science Books will be announced on Monday 25 November. Topics. Royal Society. Science Book Club. Pieces of Light by Charles Fernyhough, published by Profile Books. The new science of memory. The judges said: "Our memories of reading this book are exceptionally good ones! It challenges much of what we think we know about memory. It's a bit like reading a novel, personal and compulsive!" The Book of Barely Imagined Beings by Caspar Henderson, published by Granta. A 21st century bestiary.