

Memory, environment, and the brain

A memória, o ambiente e o cérebro

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Abstract

In recent decades, investigation of brain injuries associated with amnesia allowed progress in the philosophy and science of memory, but it also paved the way for the hubris of assuming that memory is an exclusively neural phenomenon. Nonetheless, there are methodological and conceptual reasons preventing a reduction of the ecological and contextual phenomenon of memory to a neural phenomenon, since memory is the observed action of an individual before being the simple output of a brain (or, at least, so we will argue), and there is no good reason to suppose that it is necessary to postulate a more basic reality to memory lying behind the mere individual actions.

Key words: memory, brain, action, person.

Resumo

Nas últimas décadas, a investigação de lesões cerebrais relacionadas à amnésia permitiu um enorme progresso na filosofia e na ciência da memória, mas abriu o caminho para a *hybris* de se supor que a memória é um fenômeno exclusivamente neural. Há razões metodológicas e conceituais que impedem a redução do fenômeno ecológico e contextual da memória a um fenômeno neural, uma vez que toda memória é ação de uma pessoa antes de ser simples *output* de um cérebro (ou, ao menos, isso é o que pretendemos mostrar), e não há nenhuma boa razão para supor que seja necessário postular uma realidade da memória mais básica por detrás das ações de uma pessoa.

Palavras-chave: memória, cérebro, ação, pessoa.

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Skeptics aside, everybody agrees that the existence of a brain is a *necessary* condition for the existence of individual memory. But is it a sufficient condition? I mean, of course the brain is not enough for the *acquisition* of empirical memories, since the encoding of new information requires the stimulation of other organs of the body, such as the eyes or the skin, and the brain is not enough for the *retrieval* of empirical memory, since a perception of some environmental cue usually is a fundamental memory trigger. The question is: Is the brain both *necessary and sufficient* for the *storage* of token memories? For the sake of our exposition, suppose

Individualism: a token state of the brain is sufficient for the storage of a token memory.

If such is the case, then whenever a brain were set in the neural configuration N1, it would store the memory M1. But that cannot be, for very well-known externalist reasons:

Any given token physical neural event that is a candidate for being identical with a mental event could have been associated with different causal antecedents in the distal environment from those it in fact had. The different causal history could be part of a pattern of physical or social environment relations that constitutively determined a different kind of mental event, with different representational content. Mental events are different events if they have different representational contents. Such differences in distal causal history are not constitutively determinative of the identity and kind of the neural event. The same type and token neural event could have derived from various causal histories, of the sort that determine different mental events, type and token. So the given neural event could exist in a situation in which the mental event with which it is supposed to be identified did not occur, and in which some other mental event (with a different representational content) occurs instead. So the neural event is not identical with the original mental event (Burge, 2013 [2010], p. 472; see also Putnam, 1975; Burge, 2007a [1979]).

The same brain, in the same neural configuration N1, would store a different memory M2 in an adequately imagined twin-environment with different causal histories. So we reach the ground for a *reductio of Individualism*: a token state of a brain is not sufficient for the storage of a token memory.

That is, since the very identity of a token memory is constituted relatively to a certain natural or social environment, externalist reasons give us grounds for the conclusion that a neural configuration of the brain is not enough for the individuation of a singular memory. Thus memory cannot be identical to a particular configuration of the brain.

If memory is not identical to engram (the trigger of memory “stored” in the brain, the “trace” in the brain; see Schacter, 1996), then memory is not in the brain. But, if a recollection is not stored in the brain, *where* would it be? This question is badly conceived. “Storage of information” is just a metaphor. It is a mistake to *assume* that a recollection has to be *in some place*. When we are talking about memory, “storage” is the name of a step in a process, not the description of a kind of place. To say that an individual “stores” information is to say that she can perform a task in the present because she had a particular (conscious or unconscious) experience in the past (see Malcolm, 1977; Toth and Hunt, 1999; Moyal-Sharrock, 2009). Memory is the outcome of a three stage process: encoding, storage and retrieval of information. Part of this process is personal, part is subpersonal. The retrieval process is personal where a person strives to recover voluntary memories, subpersonal in the case of involuntary memories such as traumas. The encoding or acquisition itself is a subpersonal process that can be improved by personal actions and mnemonics.

“Storage” is a fully subpersonal or modular process, which means that parts of the body of the individual are in charge, but it would be an amphiboly to infer the (literal) storage of information or even knowledge inside the individual’s body.

If memories are not *in* the brain, are they *outside* the skull? To say “Yes” would be to make the same mistake, because memory is the output of a process, not necessarily a product placed in space. Positron emission tomography (PET) and functional magnetic resonance imaging (fMRI) cannot portray memory, not because memory is outside the skull, as some extended cognition theorists would say, accepting the storage metaphor as a literal truth (see Sutton *et al.*, 2010, p. 524), but because memory is a dynamic activity:

[...] memory is best viewed as a dynamic activity that is not stored in the person or brain, but rather emerges from interaction of the person (and their brain) with the surrounding environment. This view recommends against taking the concept of representation to mean an ontologically “real” thing existing in either the mind or brain, because to see memory in a representation is to freeze in time and space what is in essence a fluid activity that is spread across both. It is to see rotation “in” the wheel, or flight “in” the wing, instead of seeing that rotation and flight are but one function that can be performed by wheels and wings (Toth and Hunt, 1999, p. 264).

To say that someone has a memory is to say that such a person is doing something. With this clarification in view, there is no obstacle to the application of the usual (but problematic, as we will see) conceptual distinction between kinds of memory. If a person visualizes a thing of her past, she is engaging in *episodic memory*. If a person is using a concept, she is using *semantic memory*. These are two kinds of *explicit memory*. If a person is moving her body in a skillful way, she’s using her *implicit memory*. The same – i.e., that memory is action – can be said about other kinds of memory.

Since memory is an activity, there is no memory when there is no performance. Ryle said that someone who has a memory “*can* do certain things” (Ryle, 2009 [1949], p. 248), but we can go further and claim that a person engaging in memory *is doing* certain things. Memory is always in act, never mere potentiality or capacity (against Toth and Hunt, 1999, p. 257): “[...] one could say that when we are not experiencing (e.g. recollecting) a prior event, or otherwise (‘implicitly’) influenced by that event, memory is, ‘strictly speaking, non-existent’” (Toth and Hunt, 1999, p. 257). As an activity, memory can’t be stored anywhere. Activities are not the kind of things that you can store (see Bennett and Hacker, 1993, p. 164-165). Consider this analogy: you can use your legs to walk, but the walking is not stored in the legs. By analogy, when remembering, you rely on your brain, your notebook or even your friends (Halbwachs, 1992); notwithstanding, your remembrance is not stored in your neural cells, in your writings or in your pals’ brains, because (literally speaking) there is no such thing as the storage of a memory.

A memory emerges from the interaction between the person and her environment, just as a walk emerges from the interaction between the person and her surroundings. Without an interaction with the environment there is no memory, or walking. That is what it means to say that a token memory is an activity.

As an activity, a token memory has its “place.” Just as the place of a token walk is the park or the treadmill, the “place” of a token memory is a conversation with friends, the writing of a paper, the skillful backhand shot in a tennis match etc. Except for neurosurgeons, forensic doctors or anatomists, in other words people that manipulate *another* people’s brains, the brain for most of us is not the place in which we usually recognize the activity of memory happening.

Enough is enough

It is the person who remembers, not the brain. Apart from the active features of memory, a brain is necessary for memory, but it is not sufficient, as we know from externalism. I emphasize, the constitution of a memory is a three-staged process:

- (i) acquisition or encoding of information,
- (ii) "storage" of information and
- (iii) retrieval of information.

None of these stages relies solely on the brain. The brain is not enough for acquisition and retrieval; these stages require other parts of the body of the animal, such as eyes or skin, and it is not enough for storage since this stage requires a world outside the skull, as the current externalist wisdom teaches us. So, brains are not populated by memories. In short, we are claiming that a memory cannot be in the brain, since

- (a) a memory is not the kind of thing that can be anywhere, and
- (b) social externalism (anti-individualism) shows that the neural is not sufficient for the mental (intentional, representational).

What does the existence of memory require? The question about the sufficient conditions for the existence of a particular memory can receive both empirical and *a posteriori* answers, but we philosophers have to follow the Leibnizian path, searching for a persuasive answer on *a priori* or conceptual grounds, using the distinction between necessary and sufficient conditions as heuristics, for instance.² So, our question is: what are the necessary and sufficient conditions for the existence of a (token) memory?

For the sake of exposition, we can imagine that the dispute involves two positions, the *neurocentric* and the *ecological* ones. On the one hand, a neurocentric philosopher thinks that PET and fMRI images reveal memory itself, since to see a particular memory would be to see a configuration of brain cells. Thus the neurocentric philosopher says the brain is both necessary and sufficient for there to be some memory, since without a brain one cannot remember, and some configuration of the brain appears to be a particular memory. On the other hand, the ecological philosopher sees the claims of the neurocentric philosopher as narrow, and agrees only partially. The ecological philosopher agrees with the neurocentric philosopher that without a brain one cannot remember, but she disagrees that a particular configuration of the brain would be *identical* to a particular memory. The disagreement happens for three reasons. First, the neurocentric philosopher makes the unfounded assumption that a psychological function is identical to a neural configuration. Second, it is not clear what kind of configuration of the brain the neurocentric philosopher is presuming, algorithmic or biologic. Third, through externalism, the identity of a memory relates to an environment.

It is not self-evident that a particular memory state would be the same as a particular neural state, and the identity between memory and brain cannot be just frivolously assumed, particularly since the performing of a memory task by the person or organism as a whole, as a being embedded in an environment, is a crucial integral step for the identification of a neural configuration as "memory" (see Moyal-Sharrock, 2009, p. 220). If a particular memory were identical to a particular

² In a meditation about the identity of a person across time, Leibniz writes: "Il est vrai que mon expérience intérieure m'a convaincu *a posteriori* de cette identité, mais il faut qu'il y en ait une aussi *a priori*" (Leibniz, 1993 [1686], p. 189). The Leibnizian style is not out of fashion, as we can see in Hacking (2012).

neural configuration, then the identification of the neural configuration would be sufficient for a memory to be recognized as such. But the externalism of Putnam and Burge shows that this is not enough. And thus the neurocentric philosopher has a problem.

But let us try to understand the neurocentric stance. What does it mean to say that a token memory is identical to a token configuration of the brain? Perhaps it means something like this: imagine, to keep things simple, that there is a brain with just two neuron cells, the cell N1 and the cell N2 (that is a simplification of a model by Gluck and Myers, 2001). Every memory stored in this brain would be a different association between N1 and N2. The distinction between memories would be differences in the strength of the synaptic associations between N1 and N2. For instance, in the case of the memory of last Christmas, the cell N1 would send a signal with full force, 1.0, to the cell N2, which would react with half force, 0.5. This relationship between these neural cells would be the memory of last Christmas for the owner of this brain. But if the identity between a neural state and a memory state were something like this, then we would be talking about the identity between a system's algorithmic state and a memory, which is a very different thing from identity between a physiological or carnal state and a psychological state. If such were the case, the physiological state would be, by our best bet, just a concrete implementation of the algorithmic state. An algorithmic state is mathematical, abstract, i.e., a thing very different from the concrete configuration of neural cells in a brain. And if the memory perchance were truly identical to the algorithmic state, then any brain implementing this mathematical state would be a brain in which this memory exists, regardless of the configuration of the cells in such a brain. If this were the case, there would be no identity between the biological state of a brain and memory, just plain identity between algorithmic state and memory. And that would not be enough, for the same externalist reasons that plague the identification between the physiological state and the psychological state. For if the identification of this algorithmic state of a brain were enough for the identification of a memory, the embedding of this brain in another environment would not change that memory. But the memory would indeed change, if a twin Christmas event in a Twin Earth caused the same configuration in the brain. So, the algorithmic configuration of the brain is not enough to individuate a memory. We need something else, the environment.

Kinds of memory

There are lots of psychological happenings we call "memories," and there is no hope in the search for a basic or seminal sense for the term "memory." All we can say is that if a present occurrence happens to be a token memory, then the organism had some relevant conscious or unconscious experience in its ontogenetic past (see Malcolm, 1977). "Memory" is a fuzzy concept, thus we have to limit our exposition to some kinds of memory in order to reach some depth. For the sake of simplicity, let's focus just on *long-term memory*.

The name "long-term memory" is relatively new, but the thing named has been known at least since the end of the 19th century. In his *Principles of psychology* (1908 [1890]), William James made the distinction between primary and secondary memory, and almost the same distinction can be found in the works of the phenomenologist Edmund Husserl at the beginning of the 20th century (see Ricoeur, 2007 [2000], p. 40-60). A person has a primary memory when she has had a conscious experience a few moments before and still remembers the experience continuously, without the need of a recall. In turn, secondary memory requires: (i) an experience in

the past; (ii) after the experience, the shift of the focus of attention to other things, causing the experience to be forgotten; (iii) the recall of the experience.

Roughly, the secondary memory of James and Husserl is the long-term memory of the psychologists of our days (and James' primary memory is today's working or short-term memory), except for a very important difference: our psychologists have empirical evidence of different roles for different neural structures in the constitution of different kinds of long-term memory (see Atkinson and Shiffrin, 1968; Foster and Jelicic, 1999, p. 2). In 1972, Tulving (1972) suggested that the conceptual distinction between short- and long-term memory applies to different anatomical systems of memory in the brain. The evidence for this claim comes from the case of some amnesic patients, such as Henry Molaison, the famous patient HM, victim of anterograde amnesia after a brain surgery. Molaison lost the power to generate or preserve new memories of post-surgery happenings, but kept the power to acquire new fleeting working memories and new lasting motor abilities, that is, new explicit memories that James would call "primary memories" and new implicit memories. Based on this evidence, the conclusion is that the neural structures that enable short-term memory (or working memory) and implicit memory are at least partially different from the structures that enable long-term memory (see Schacter, 1996, p. 137-139). If this is right, then the *a priori* distinction between primary and secondary memory couples with the *a posteriori* (and anatomical) distinction between short- and long-term memory.

Let's assume that there is, in the brain, an enabling anatomical system for every kind of memory. Would that prove that a token memory is just a neural configuration? No. Just as the muscles in the legs are different from the gait of people, structures in the brain are different from token memories. No activity is the same as its own enabling instruments. Legs are instruments for walking, and brains are instruments for memories, but leg structures are not gaits, and brain structures are not memories.

The only way to demonstrate that a memory is a configuration of the brain would be to directly observe the memory in the brain. Leibnizian problems apart (see Leibniz, 1989 [1714], § 17), you can never see a psychological function in a physiological structure because you can't isolate the role of the brain from the role of other parts of the body in a memory task:

There is [...] only one way of securing isolation of response, and that is by the extirpation or paralysis of accompanying functions. This is one of the perfectly legitimate methods of the physiologist. It can be argued that the psychologist, who is always claiming to deal with the intact or integrated organism, is either precluded from using this method, or at least must employ it with the very greatest caution (Bartlett, 1995 [1932], p. 5-6).

Bartlett is describing a methodological constraint for the investigation of memory. The only way to observe psychological functions such as perception, memory or reasoning is by the observation of the performance of a person or organism (see Toth and Hunt, 1999, p. 247). The analysis of PET or fMRI images is not enough. As a general rule, an isolated physiological organ of the body cannot be a psychological product. So, by instantiation, a neural structure cannot be a memory.

To summarize, with respect to psychological phenomena, it is always doubtful to take an isolated organ as the full enabler of some psychological performance. All we can see is the performance of the body as a whole. All the psychological performances, including the achievements of memory tasks, are observable at the level of an organism embedded in an environment, not at the level of subpersonal

happenings. We can do a lot of biological research through the dissection of bodily organs, including the investigation of the biology of memory, but through this we won't find memories in the brain (see Toth and Hunt, 1999, p. 235).

The neural is not the psychological

Tokens of long-term memory occur when a person retrieves an event of her past (episodic memory) or uses a concept (semantic memory). On the one hand, the neurocentric philosopher is saying that the architecture of memory includes only neural structures. On the other hand, the ecological philosopher would say that this architecture also includes personal actions (in the public environment, of course) that we recognize as memory tokens (see Foster and Jelicic, 1999, p. 1). The neurocentric philosopher cannot be right, since memory cannot be in the brain. So here the ecological philosopher has some advantage in the debate.

The distinction between the psychological and the neural features of memory is a key element for the ecological view (see Toth and Hunt, 1999). Neural structures *enable* the memory tasks for persons, and memories are products of a person as a whole, not just of the isolated brain, which is a (very important) part of any animal, including humans. In concrete terms, a brain has proteins, cells, blood, etc. Abstractly, a brain implements some algorithmic functions. But the actions that we identify as memory tasks are not cells or algorithms. The actions are performances (in a world, that is, public performances). Since to remember is to address an ecological task, only the complete person remembers when her present action is attuned to her past history (see Foster and Jelicic, 1999, p. 3-4). Thus the mere localization of the memory in the brain can't explain a token memory: a crucial ecological factor would remain unexplained.

The explanation of a psychological event must connect a person's action with the environment around her body. Animal kinds inherit their own habitats, just as they inherit their genomes: "Organisms inherit their environments as much as they inherit their genomes—this cannot be stressed too much" (Tomasello, 1999, p. 78). We cannot investigate the operation of the lungs and skip the atmosphere surrounding the animal bodies at the same time (see Toth and Hunt, 1999, p. 251). By analogy, we cannot investigate psychological tokens, including memory tokens, and at the same time skip the natural or cultural environments surrounding the animal bodies. The same is true of the identity of a body organ, be it a brain or a heart:

The identity of a heart depends on its function in the whole body – on its relations to parts of the body outside the heart. In a crudely analogous way, the identities of some mental kinds depend on those kinds' relations to entities beyond the individual's body. They depend on cognitive function, on obtaining information, in an environment in something like the way the kind heart depends for its individuation on the function of the heart in the body that contains it (Burge, 2007b [1989], p. 278).

The general point is that, if a biological issue is at stake, the individuation of an organic feature must relate it to a surrounding environment. Otherwise, there is no appropriate individuation.

Great expectations

The localization of the memory in the brain, typical bid of the neurocentric philosopher, is a byproduct of the successful localization of neural structures that *enable*

different kinds of memory. There are kinds of wounds in the brain that prevent episodic memory without preventing implicit memory, as neuroscientists learned through the study of the patient HM and others. The observation of cases like that is the ground for the current day's conclusion that there are different kinds of memory enabled by different structures of the brain. Yet this kind of research tends to multiply indefinitely the kinds of memories (see Parkin, 1999, p. 276). Would we be compelled to say, with unparsimonious hubris, that there are 256 kinds of memory (see Tulving, 2007)?

Any postulated kind of memory has to pass the "double dissociation test". This is the claim that a memory of the kind *A* would only have an ontological (or even a conceptual) weight if evidence that it's independent from a memory of the kind *B* exists, and vice versa (see Parkin, 1999, p. 276). But the complexity of any (ecological) memory task is an obstacle for the distinction of brain structures as places for the storage of different memory kinds. For example, other problems aside, you cannot see an episodic memory in the brain without going through a lot of semantic memories: the retrieval of any autobiographical event triggers many concepts, and concepts are semantic memories. Thus, since the very exercise of episodic memory requires the exercise of semantic memory, episodic memory cannot be dissociated from it (see Parkin, 1999, p. 280). As a result, it is difficult to find the kinds of memory postulated by Tulving in the brain.

Suppose (as a thought experiment) there is a Brazilian called Carla. She arrives for the first time in Buenos Aires, Argentina, a city she is not familiar with either by photo or description. (As the Pierre of Kripke (2011 [1979]), she does not know anything about the city she is going to). On a Wednesday she goes for the very first time to the center of the city, where she learns the location of the obelisk. She will return to the obelisk the next Thursday, but before she sets forth again, let's imagine five different scenarios (as in Toth and Hunt, 1999, p. 232). In the first scenario, her friend Joana asks where the obelisk is, and Carla says "It is three blocks ahead" (the concept *block* is retrieved from her semantic memory). In the second scenario, Carla says "It is three streets ahead" (the concept *street* is retrieved from her semantic memory). In the third scenario, Carla says "I can't remember, but take a look three blocks ahead" (no episodic memory, some semantic memory). In the fourth scenario, Carla says "I can't remember", but then repeats her last day's motions and finds the monument (implicit memory). In the fifth scenario, Carla just points in the direction of the obelisk (explicit or implicit memory).

All five scenarios engage memory, since each one of these situations involves some complex process of encoding, storage and retrieval of information. But the answer to the question "What are these processes?" is very different according to a neurocentric or an ecological philosopher. The neurocentric philosopher would say that in every scenario there is a different neural structure dealing with the information, *ergo* there is a different storage. We do not know whether there is episodic memory in any of the scenarios, since there is no explicit reference to mental time travel in the description of any of them (see Toth and Hunt, 1999, p. 232-233). But in some of the scenarios we can suppose that there is episodic memory, since some sort of retrieval of an episode, namely the visit to the obelisk on the day before, may have occurred. We know that there is semantic memory in the first and second scenarios, as there is a retrieval of general information about the world. But Carla uses different words in the first two scenarios. Does this mean that she stored two different semantic memories related to two different pieces of information? This supposition would be an invitation to the use of Ockham's old and sharp razor, it would simply be an unnecessary multiplication of things. It is far more parsimonious to suppose that the "stored" item is the same in the two scenarios and that one and the same "storage" can be retrieved in several ways.

In the third scenario there is no episodic memory, since Carla cannot retrieve the relevant happenings consciously. The hints that Carla shares with Joana suggest the retrieval of some semantic memory. But, since episodic memory presupposes semantic memory, the conceptual distinction between episodic and semantic memory is not enough to distinguish the firing of different neural structures. So here the distinction between different kinds of explicit or declarative memory cannot help the neurocentric philosopher.

The distinction between explicit (declarative) and implicit (procedural or non-declarative) memory is blurred in the last two scenarios. It seems clear that in the first three scenarios there is some sort of explicit memory, even if it is hard to distinguish between the episodic and semantic varieties. In the fourth scenario, Carla declares that she does not remember, so she does not have an explicit memory. But Carla is able to find the monument by reenacting the moves of yesterday, showing that she has an implicit memory. Would that be the same implicit memory of the fifth scenario, where it is not clear whether she really has an explicit memory? The parsimonious answer is "Yes". *Ceteris paribus*, there is no reason to imagine that the implicit memories of these scenarios are different.

The point of these scenarios is that the neurocentric explanations do not clarify much of the nature of the memory. There is a lot of problems in the application of the usual taxonomy of memory to the actions identified as performances of memory tasks. Small differences in a particular performance are enough to demand the postulation of the engagement of a different kind of memory, and it seems that a slight difference in the description of the performance may result in very different postulations. This shows that the ontological soundness of these explanations is at stake, since any action identified as a memory performance subdetermines the identification of the operation of a neural system.

Can an ecological explanation do better? In the ecological view, "memory [...] is [...] a transaction between a person and what we might call a retrieval environment" (Toth and Hunt, 1999, p. 256). In this view, the neural structure – the engram or "trace" – is not the memory itself. Instead, it is a present enabling condition for a performance in the present that counts as memory inasmuch as it is modified by a past experience. The memory *is* the performance, not the trace. "In testing someone's claim that they have an excellent memory, we do not observe anything which could be called a memory, but watch the person as he *does* something" (Moyal-Sharrock, 2009, p. 220). To see a memory is to see a performance, and even the observation of neural configurations must be related to the performances in order for them to be meaningful as neural traces.

The ecological view of memory says that a memory is a present action modulated by some past experience. Why is there neurocentric resistance to this view? We conjecture that the resistance is a by-product of a certain expectation. The view of a memory as a performance is refused because the neurocentric philosopher expects the mind to be something hidden or concealed. But "[...] nothing is concealed. [...] nothing is hidden" (Wittgenstein, 1997 [1953], § 453). The problem is not the theory that sees the mind in the surface, but the hope that the mind would be in a place distant from our eyes. In a kind of psychological circle, the neurocentric philosopher digs the brain for memories because she expects the memories to be buried in such a kind of dark and secret place.

But memories are not inside persons. Memories happen in some interactions between persons and their respective environments (see Toth and Hunt, 1999, p. 257). It is certain that an investigation of memory disregarding the brain is blind, but it is undoubted that an investigation of memory disregarding the environment is empty. Knowledge of the brain is necessary for the knowledge of memory, but it

is not sufficient. A memory is not a copy, it is a set of present operations enabled by some past experience, and there is nothing to be found beyond, behind or inside these operations (see Toth and Hunt, 1999, p. 263). The crucial thing to watch is the retrieval in its context, and it is the ecological or contextual setting that elucidates the questions we usually ask neuroscientists. A neural configuration can never be a memory, yet in some contexts a smile to someone is a sign of recognition, just as in other situations it may well be a mere sign of cordiality to strangers (see Malcolm, 1977, p. 53).

To summarize, the object of the investigator of memory is, in some contexts, a smile, just as in other situations it might be a walk home, and that is not because these actions are correlated to neural events, but because there are contexts such that smiles or strolls *are* memories.

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