Memory after Charcot: Paul Sollier's visionary work

At the end of the 19th century, memory was more a topic for philosophers than for neurologists. Charcot wrote only one lesson addressing memory dysfunction, but he asked his pupil Paul Sollier to study this topic in greater depth. Today, Paul Sollier seems better known by Marcel Proust's scholars than by neurologists, because in December 1905, Proust entered a sanatorium to follow a 6 week treatment for "neurasthenia" under his care. According to Léon Daudet, Sollier, along with Babinski, was considered at that time the cleverest pupil of Charcot. Sollier used his knowledge on memory to provoke emotional surges of involuntary memories in his patients. Proust's novel contains over 1200 allusions to memory, with a specific emphasis on involuntary memory, which appeared largely inspired by Sollier's theories. Beyond that, Sollier highlighted several other concepts which make him a major and early explorer of memory: learning is based on cellular changes and plasticity, memory is a universal phenomenon of the nervous system, memory and perception centres differ anatomically and neurophysiologically, memory organisation is controlled by the frontal lobe. The rediscovery of Sollier's extraordinary work on memory should rehabilitate a forgotten, atypical neurologist whose critical interest in psychology may, in retrospect, make him one of the first modern neuropsychologists.

In 1905–1906, the author of "*À la recherche du temps perdu*" ("*In search of lost time*")¹ Marcel Proust (1871–1922) spent 6 weeks in a sanatorium under the care of a now forgotten neurologist, Dr Paul Sollier (1861–1938). Sollier was a pupil of Charcot, who had asked him to work on the topic of memory.² Sollier subsequently published two major works on memory^{3,4} and emotions.⁵ It is striking that in Proust's major novel,¹ many of the developments on memory appear to take their roots in Sollier's work.⁶

Who was Paul Sollier?

Without his famous patient, Sollier's name would be forgotten. His name appears only in connection with idiocy.⁷ Charcot's biographies do not quote Sollier,^{8,9} although he was reported by Léon Daudet to be the cleverest collaborator of Charcot during rounds, along with Babinski.¹⁰ His main honorific appointment was his election as president of the "*Société de Psychologie*".

After training with Bourneville at Bicêtre, Sollier was appointed at Boulogne-Billancourt and started lectures in Brussels.¹¹ Apart from memory, his main work was in mental retardation,¹² where he led to the creation of the IQ.⁷ While he does not appear to have had direct pupils, his fame was considerable, as shown by many translations of his books. Unfortunately, little is known on Sollier as a man.

Sollier's work on memory

At Sollier's time, memory was not considered a major neurological topic, despite occasional reports.^{7,13–16} Sollier attempted to complement Charcot's teaching, which had been scarce on memory (only one of his "lessons" dealt with memory).⁸

He asked simple questions: What are the cellular modifications underlying the process of memory? Which brain regions are active in memory? What are the components of memories? What are the mechanisms of remembering? How do invariant and variable features of memories match with each other? As early as page 1 he emphasised Richet's formula that memory is "the critical key to the whole intellectual building", an opinion

which has recently been revived.¹⁷ Several of Sollier's concepts are very close to contemporary thought on memory.

(1) Conditions for memory stabilisation

Sollier delineated six factors for memory stabilisation: stimulus intensity, duration, repetition, attention, coexisting emotion and will.

(2) Cellular changes and plasticity during learning

Sollier underscored the constant changes which take place in nerve cells following incoming stimuli (pp59–84): "An excitation (...) determines (...) a special molecular arrangement", where new stimuli transform the cell from a "static" to a "dynamic" state. Since a cell cannot provide a simultaneous "perception of the present" and a "representation of the past", it is likely that "a cell, not only does not maintain a permanent modification under activating excitations, but cannot be differentiated and adapted to a special stimulation", while "the molecular arrangement is not definitive (...), it is constantly transforming itself". At the morphological level, stimuli and learning are associated with nerve cell extensions through "free endings which develop contacts with those of adjoining nerve cells". "These extensions grow and subsequently develop closer contact with the extensions of adjoining cells", explaining why "exercising develops memory, and how memory retrieval becomes quicker with increased repetition". While a concept of plasticity could already be found,¹⁸ this is the first time that a mechanism linking neuronal plasticity to memory was put forward.

(3) Memory is a universal phenomenon of the nervous system.

Sollier emphasised memory as a basic property of nerve cells (pp18–19), which went far beyond the concept of memory as a behavioural feature in humans.

(4) Memory organisation centres are different from perception centres

Basing his reasoning on the fact that a lesion of the perception centres does not abolish corresponding memories of perception, Sollier drew a simple pathway for stimuli, which travel from reception to perception centres, and to memory centres, which are not colocalised in the brain. "Everything suggests that there is a brain centre where memories are stored, and from which memories can be retrieved" (p94). Sollier did not hypothesise where these memory centres were located, and another 60 years passed before the role of the hippocampus was delineated.¹⁹

(5) Memory organisation is controlled by the frontal lobes

Over 80 years before scientific demonstrations,^{20,21} Sollier spoke of an "intellectual centre" in the frontal lobes, which regulates learning and memories retrieval (p115). In that, he underlined the need for memory centres to be connected with higher organisational centres, which he localised in the frontal lobes.

(6) Neurophysiological mechanisms explain why a recalled memory is identified as memory

Sollier put forward a neurophysiological phenomenon: in perception, the excitatory cell current is "centripetal" at the level of the structures where memory will be stored, while during retrieval the current is "centrifugal" (pp131–3). This hypothesis also led Sollier to suggest the modern concept that,

while remembering, the corresponding perceptive cortical zones become activated.²²

Re-experiencing forgotten memories

Although the phenomenon of an involuntary surge of memories had already been mentioned,^{18–23} Sollier was the first to analyse this surge, in order to use it during therapy. He transformed Ribot's idea that "forgetting is the condition of memory"²⁴ into "the passage from the Conscious to the Unconscious" (p.58), with the reverse phenomenon during "re-experiencing" ("reviviscence"): "A memory is an image(...) which reproduces a past impression. Re-experiencing is something more: it is not only the appearance of an image into the field of consciousness, but this appearance is so clear and is accompanied by such a precise and intense reproduction of the state of personality of the subject at the time of the initial impression, that this subject again believes he is going through the same events as before" (p.29). For Sollier, autobiographical memories thus may often correspond to "re-experiencing anterior states of personality" (p68–9).

Sollier linked involuntary memory with emotional factors (p113) and also underscored the role of "associations", on which he would write an entire book.²⁵

Sollier and Proust: the involuntary memory connection

Proust's treatment with Sollier has been detailed elsewhere.²⁶ "Isolation therapy"²⁷ was applied, with involuntary memories retrieval, to obtain a new mental balance. While one knows very little about the development of Proust's therapy,^{26–28} several of Proust's ideas on involuntary memory appear to have developed from what he learned from Sollier.^{2–6, 26} Proust never acknowledged Sollier, but in his 1908 notebook, in which he elaborated the framework for his novel, Proust wrote down Sollier's name just beside the main involuntary memory phenomenon which leads to the key understanding in the novel.² This constitutes the best homage that Proust could ever give to Sollier.

Sollier's contribution was forgotten, because his atypical studies led him to be regarded not as a neurologist by the neurologists and not as a psychiatrist by the psychiatrists. Sollier indeed criticised the rising stars of psychiatry, Janet and Freud, because they were not adequately considering brain studies.⁶ As it appears that the early 21st century is providing the grounds for some reunification of neurology and psychiatry, it is also the right time to rehabilitate Paul Sollier and to bring from the shadows his extraordinarily modern work on "memory."

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