

Paul Sollier: The First Clinical Neuropsychologist

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Abstract

Paul Sollier (1861–1933) is perhaps the most unjustly forgotten follower of Jean-Martin Charcot. He studied with Désiré Bourneville, Charcot's second *interne*, and was considered by Léon Daudet as the cleverest collaborator of Charcot, along with Joseph Babinski. Charcot assigned him the task of summarizing the theories on memory, which led to two major books, in 1892 and 1900, that anticipated several contemporary concepts by several decades. In 1905–1906, the novelist Marcel Proust spent 6 weeks with Sollier in his sanatorium at Boulogne-Billancourt, and it is now obvious that several of Proust's ideas on involuntary memories which appear inside *In Search of Lost Time* (published 8 years later) had been inspired by Sollier's theories on the 'surge of reminiscences'. Sollier also designed the framework which led to the intellectual quotient (IQ) and made interesting studies on hysteria and behavioral issues in neurological diseases, activities that may make him the first modern clinical neuropsychologist. Sollier was also the first to correlate clinical findings with neurophysiological concepts, which makes him a precursor of our current approach to neurology and psychiatry.

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Marcel Proust (1871–1922), one of the greatest novelists of all time, is also known for his extraordinary skills in analyzing the forms and psychological mechanisms of memory. His best-known

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novel *In Search of Lost Time* [1] (first published in 1913; inaccurately translated into English as *Remembrance of Things Past*) emphasizes the importance of what he called 'involuntary memory', which is deeply associated with emotions. In 1905–1906, Proust, who was psychologically exhausted, spent 6 weeks in a sanatorium under the care of Dr. Paul Sollier, a pupil of Charcot, whom the master of La Salpêtrière had asked (a few years before his death) to synthesize the most recent discoveries on memory [2, 3]. Sollier published two major works on memory: *Les Troubles de la Mémoire* in 1892 [4] and *Le Problème de la Mémoire* in 1900 [5]. It is striking that in Proust's novel, many of the developments on memory, including 'involuntary memory', seem to take their roots in Sollier's work. While Sollier's influence on Proust's work has recently been highlighted [6, 7], his role as a major precursor in cognitive and behavioral neurology of memory remains completely forgotten.

Who was Paul Sollier?

It is striking that without his famous patient, Sollier's name would be completely forgotten today. His name appears only in connection with idiocy in the *History of Mental Symptoms* by

Fig. 1. Paul Sollier (standing far right) and Joseph Babinski (standing far left) in 1886. Sitting on the far left is Maurice Klippel, who chaired the famous 1908 debates on hysteria. Participants from left to right: (standing) Babinski, Condoléon, Chaslin, Huet, Sollier; (sitting) Klippel, Berbez, unknown. The *Album de l'internat de La Salpêtrière*. Courtesy of the Bibliothèque Charcot, Hôpital de la Salpêtrière, Université Pierre et Marie Curie, Paris.



Berrios [8], while it is absent from neuropsychological textbooks and monographs on memory, as well as history of neurology textbooks [3]. His face also seemed to have disappeared, since it has been very difficult to locate photographs of him. Reviews on Charcot's legacy usually do not quote Sollier [9–12], although at the time he was reported by Léon Daudet to be the cleverest collaborator during rounds and best follower of Charcot, along with Babinski [13] (fig. 1), although he never was an *interne* of Charcot himself. Daudet also emphasized that contrary to Charcot, Brissaud and many others, Sollier showed a particular interest in healing patients, instead of just studying and reporting cases.

Paul Sollier was born on 31st August 1861 in Bléré (Indre-et-Loire), and studied in Le Mans before starting medical school in 1881 in Paris. Before training with Désiré Bourneville (who had been Charcot's sixth *interne*, in 1868) at the Bicêtre hospital in Paris (where he would become director of the pathological museum), Sollier became an *interne* in 1887 (he was 5th

of 52 candidates for this contest, held in 1886) (fig. 2) and a doctor in medicine in 1890 [14]. His doctorate thesis ('Psychologie de l'idiot et de l'imbécile') was presented on 23rd December 1890 in front of Victor Cornil (who had been the first *interne* of Charcot), Paul Brouardel and Gilbert Ballet [15]. The following year, he was appointed *chef de clinique* (senior registrar) for mental diseases at Bicêtre, and became a member of the *Société Médico-Psychologique*. In 1897, he founded the 'hydrotherapeutic' sanatorium of Boulogne-Billancourt (fig. 3) in a suburb of Paris, 1 year before starting regular series of lectures at the Université Nouvelle in Brussels, where he became a member of the board in 1909. Every week, he would go and spend 2 days in Brussels for teaching. In 1886, he married Alice Mathieu-Dubois, the daughter of a dentist from Guyana. At Boulogne-Billancourt, Alice took charge of the administrative duties of the hospital, but before that she had followed a similar path, since, after being appointed *externe* in 1883, she presented her doctorate thesis on the denture in



Fig. 2. The *internat* laureates in 1890. Sollier is on top. Achilles Souques is sitting in the middle at the bottom. Georges Guinon is sitting on the left. The *Album de l'internat de La Salpêtrière*. Courtesy of the Bibliothèque Charcot, Hôpital de la Salpêtrière, Université Pierre et Marie Curie, Paris.

idiots under Bourneville in 1887. One of Sollier's career achievements was his election as president of the Société de Psychologie, while he was never admitted to the Académie de Médecine, despite several attempts. Similarly, while he was appointed professor in Brussels, he never obtained the same title in Paris.

Sollier wrote articles and books on many topics, including alcoholism, morphine addiction,

hysteria and neurasthenia, aphasia from insula lesion, chorea and athetosis, spinal cord claudication, hiccups in syringomyelia, tabes dorsalis, epilepsy, anorexia nervosa, autoscopy, war neurology, and neuromuscular physiology [14]. He also contributed with papers on psychological-philosophical topics, such as doubt, consciousness, the mental state of dying people, gambling, miracles in science, and morality [14]. He also

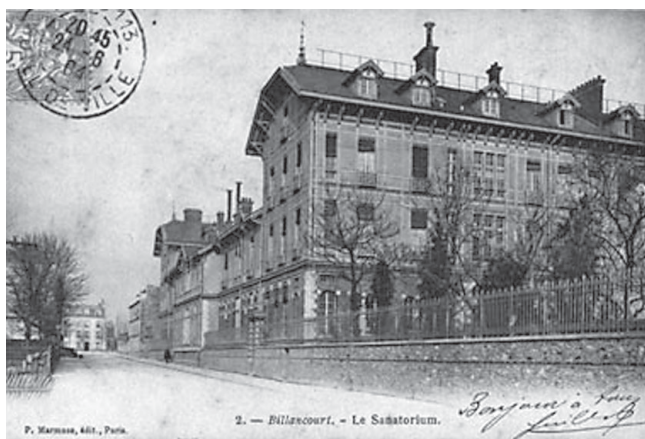


Fig. 3. The sanatorium of Boulogne-Billancourt. O. Walusinski, private collection.

developed an interesting neurophysiological theory on hysteria, expanding Charcot's concept of a 'dynamic lesion' in the cerebral cortex into a cortical dysfunction involving inhibition of certain areas vs. activation of other areas [16]. It is striking that recent studies using functional imaging with magnetic resonance have indeed confirmed the exactitude of Sollier's theory [17]. Based on this concept, Sollier developed a therapeutic program aiming at 'awakening' the inhibited cortical areas, mainly in stimulating apparently forgotten memories in the individual patients. He used his methods during World War I in shell shock cases and psychoneuroses, mainly at the Neurological Center of the 14th Military Region, in Lyon, of which Sollier was director from 1914 to 1917 [18]. Sollier tried to balance the organic versus the non-organic factors in shell shock, and his conclusions were summarized in a treatise of war neurology, which was published in 1918 [19]. Contrary to most of his fellow neurologists in other military neurological centers, he was a proponent of psychotherapy rather than more aggressive treatments, such as electric shocks with faradic or galvanic currents (*torpillage*, 'torpedoing'), which had been developed mainly by Clovis Vincent (with the blessing of Babinski) and by Dejerine's pupil Gustave Roussy [18].

Apart from memory, Sollier's main area of expertise was mental retardation, in which he completed his medical thesis in 1890 [15]. Before Alfred Binet, he developed the measurement of mental state by comparison with normal individuals of the same age, and supported a quantitative view which would lead to the creation of the intellectual quotient or IQ [18]. His international fame was considerable at his time, as shown by translations of his books into Italian, Russian, Polish, German, and English (fig. 4). A few years after he died in 1933, his sanatorium in Boulogne – which had been transformed into the Ambroise Paré hospital (it had been bought in 1921 by the *Paris Assistance Publique*) – was destroyed during World War II by allied bombing of the nearby Renault factory (on 3rd March 1942) [2], with the disappearance of many archives. Because of his rather peripheral location in Boulogne-Billancourt, his atypical scientific interests, and his failure to be elected at the *Académie de Médecine* or obtain a professorship in Paris, Sollier never had a real group of clinical students – in contrast to Charcot and his successors. His only direct pupil was his stepson Paul Courbon, who became chief psychiatrist of the mental asylum of Perray-Le Vaucluse, where his most famous patient was probably Léona Delcourt (Nadja of the celebrated

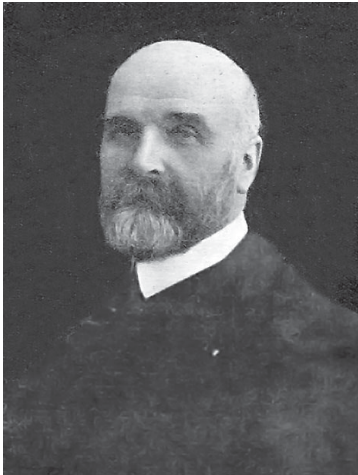


Fig. 4. Paul Sollier at the end of his career. Courtesy of The French National Academy of Medicine, Paris.

book by the surrealist writer André Breton). At the end of his career, Sollier became interested in the study of human factors during work, which he called ‘psychotechnics’, and which would later become ergology. He died suddenly at his home in Paris (14, rue Clément-Marot) on 8th June 1933.

Sollier’s Work on Memory

In his first book on memory [4], Sollier attempted to synthesize Charcot’s teaching on amnesia, in order to provide the best update of the time. It was published in 1892 shortly before Charcot’s death, with enough success to justify a second edition in 1901. Sollier’s magnum opus on memory appeared in 1900 [5], based on a series of lectures made at the Université Nouvelle de Bruxelles. This book appears as a masterly synthesis of neurological and psychological ideas on memory, together as the platform for novel concepts now proved to be several decades ahead of their time.

Sollier asked a series of simple questions, such as: ‘What are the cellular modifications which lie behind the process of memory?’, ‘Which brain

regions are active in memory?’, ‘What are the components of autobiographical memories?’, ‘What are the mechanisms of remembering?’, and ‘How do invariant features of memories match with their variable characteristics?’ [20]. Sollier’s main references include Ribot, Richet, Ebbinghaus, and Pitres, while he virulently criticized Bergson’s spiritualist theories and poor knowledge of brain anatomy and function. Sollier complained that in general memory was too infrequently addressed by the neurophysiologists and the neurologists of his time – already on page one he emphasized Richet’s formula that memory is ‘the critical key to the whole intellectual building’ [5], an opinion which has recently been revived [21]. Overall, several of the concepts developed by Sollier can be considered as incredibly advanced for his time, which make him an extraordinary precursor of contemporary thinking on the mechanisms of memory:

Conditions for Memory Stabilization

Sollier delineates 6 main factors: stimulus intensity, duration, repetition, attention, coexisting emotion, and will. He also underlines the fact that the lack of successful voluntary recall does not correspond to a failure of stabilized fixation, since involuntary retrieval demonstrates effective stabilization.

Cellular Changes and Plasticity behind Learning

Sollier underscores the constant changes which take place at the nerve cell level following incoming stimuli [5, pp. 59–84]: ‘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 simultaneous ‘perception of the present’ and ‘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’. On

the other hand, at the morphological level, stimuli and learning are associated with extensions of nerve cells, through: 'Free endings which develop contacts with the ones from adjoining nerve cells. These extensions grow and subsequently develop a tighter contact with the extensions of the adjoining cells', explaining why 'exercising develops memory, and how memory retrieval becomes quicker with increased repetition'. While the concept of plasticity can already be found in the work of Ebbinghaus, Taine, and Bergson [22], this is the first time that a precise mechanism linking neuronal plasticity to memory was put forward.

Memory Is a Universal Phenomenon of the Nervous System

Sollier emphasizes memory as a basic property of nerve cells. This led him to develop a concept of brain functioning that associates global functioning with specialized activity in focal cerebral regions, in an interesting effort to reconcile localizationism with anti-localizationism [5, pp. 18–19].

Memory Organization Centers Are Different from Perception Centers

Basing his reasoning on the fact that a localized lesion of perception centers does not abolish corresponding perceptive memories, Sollier draws a simple pathway of stimuli traveling from reception centers to perception centers and then to memory centers, which are not co-localized in the brain. 'Everything suggests that there is a brain center where memories are stored, and from which memories can be retrieved' [5, p. 94]. Sollier did not hypothesize where these memory centers are located, and we would have to wait another 60 years before the role of hippocampus would be clearly delineated [23].

Memory Organization Is Controlled by the Frontal Lobes

Over 80 years before the scientific demonstrations by Milner's and Tulving's groups [24, 25], Sollier

spoke of an 'intellectual center' in the frontal lobes which regulates learning and retrieval of memories [5, p. 115].

Neurophysiological Mechanisms Explain why a Recalled Memory Is Identified as Memory Rather than an Actual Perception

While Taine had just emphasized a psychological explanation in which the recognition of a past memory occurs because it is contradicted by current perceptions, Sollier put forward a neurophysiological phenomenon: in perception, the cell excitatory current is 'centripetal' at the level of the structures where memory will be stored, while during retrieval the cell excitatory current is 'centrifugal' from these structures [5, pp. 131–133]. This hypothesis also led Sollier to suggest the modern concept that during remembering, the corresponding perceptive cortical zones become activated [26].

Besides formulating these innovative concepts, Sollier envisioned the study of memory from a unique multidisciplinary point of view, including biology, physiology, psychology, and pathology [27].

Involuntary Memory

Although the phenomenon of involuntary surges of memories had already been mentioned by Aristotle, Voltaire, Diderot [22], and at the time of Sollier by other collaborators of Charcot (such as Pierre Janet [28]), Sollier was the first to analyze it in such detail, so that he could use it during specific therapy with his patients. He transformed Ribot's idea that 'forgetting is the condition of memory' [29] into 'the passage from the conscious to the unconscious' [5, p. 58], with the reverse phenomenon in 're-experiencing' ('reviviscence') [5, p. 29]:

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 they are going through the same events as before.

For Sollier, autobiographical memories may therefore often correspond to ‘re-experiencing of anterior states of personality’ [5, pp. 68–69]:

The memory which is building up in me thus is not really formed by the impressions which come from it, but by all concomitant impressions. The main object images belong to that picture. They have the main place, but not the only one. Later, I will be able to retrieve them, as they are the sole perceptions which have been conscious; but in reality, a whole state of personality may surge.

The items which coexist with the main image allow one to precisely distinguish memories of the same object: ‘This is the cenesthetic state, i.e. the state of personality, which allows one to differentiate memories which seem identical.’

Sollier linked involuntary memory with affective and emotional factors [5, p. 113]:

I am feeling a violent emotion during an accident which I have witnessed, and this emotional state triggers in me the revival of memories of facts which bear no relationship with the actual accident, but have determined in me a similar emotional state.

Besides emotional triggers, Sollier also underlines the role of less conspicuous factors which may lead to involuntary retrieval of memories, and called this phenomenon ‘association’, a topic on which he would subsequently write a whole book [30]. In parallel, he emphasizes the poor efficiency of voluntary retrieval of life events [5, p. 115]:

Our will really plays a trifle role in the evocation of memories, and it is an illusion to believe that it is under the influence of free and voluntary efforts that this evocation takes place.

Marcel Proust’s Treatment with Sollier

When treating hysteria and neurasthenia, Sollier utilized the fact that during involuntary re-experiences ‘the personal element dominates the

sensory element at the time of the impression’ [5, p. 122]. He applied ‘isolation therapy’, which was also used by Jules Dejerine and other neurologists, and had been introduced by Esquirol. This was subsequently used by Charcot, and summarized by Camus and Pagniez [31]. In isolation therapy, the patient was admitted to hospital and isolated from his usual social environment, having contact only with his physician and one or two of his collaborators. Psychological regression was supposed to be triggered by confinement to bed for at least a week, with food limited to milk products. The aim was to produce a ‘dependence’ of the patient upon his physician, so that therapy would be easier. Sollier’s therapy was known to be shorter than Dejerine’s, and this was attractive to Proust – who was also attracted by the fact that under Sollier’s care, the isolation was less strict than with other physicians [32]. With Proust, as with his other patients, Sollier used involuntary memory to trigger re-experiencing, in order to obtain a new mental and affective balance that would lead to improvement in the reported symptoms. Unfortunately, one knows very little about the specific development of Proust’s therapy, since Sollier’s archives have not been recovered, and Proust remained mute about it. It is even striking that while Proust is known to have written thousands of letters, his therapy with Sollier is scarcely mentioned in his correspondence. Proust mentions that his therapy was a ‘psychotherapy’, a novel term which had been introduced in 1895 [33]. In his rare accounts of his stay in Boulogne, he complained about the inefficacy of the treatment, which was painful and hurt him [34]. It is clear that this treatment could not be expected to improve Proust’s severe asthma. On the other hand, it was useful – although only temporarily – in reorganizing his disturbed sleep-wake cycle, and also in stimulating him to go back to writing. Moreover, several of Proust’s ideas on involuntary memory appear to have developed from what he learned from Sollier, both from his books and from his personal experience as a patient [2, 3, 6, 7].

In his rare comments on his stay with Sollier, Proust did not give a positive image of his physician, especially since their interaction apparently began with a quarrel about the philosopher Henri Bergson, who was also Proust's cousin [7] (fig. 5). It is likely that Proust tried to impress his physician by quoting Bergson from memory [6], not knowing that Sollier had a deep knowledge – and aversion – of Bergson's work. Later, while Proust never openly acknowledged what Sollier's theories on memory may have brought to him, it is interesting to see that he always vigorously defended himself as having been influenced by Bergson, since Bergson completely omitted to mention involuntary remembering in his work on memory [35]. However, in his 1908 notebook, in which he was elaborating the frame of his novel, Proust wrote down Sollier's name just beside the main involuntary memory phenomenon which leads to the final key of the novel [36]. This probably constitutes the best – though involuntary – homage that Proust could ever make to Sollier [37].

In Search of Lost Time: In Search of the Lost Neuropsychologist

In the 3,125 pages of Proust's novel [1], we have counted 1,210 uses of terms relating to memory (like remembering, forgetting, recall, etc.), which corresponds to an allusion to memory every 2.6 pages. In the 270 pages of volume 6 (*The Fugitive*), memory is quoted more than once per page. This is not the place to discuss the place of memory in Proust's work, but it contains the thorough analysis of at least 10 main topics on memory [37]: involuntary memory, voluntary memory, affective memory, the constructive and deconstructive process of memory, reality-memory discrepancy, the phenomenology of memory and remembering, habitude, forgetting, memory processing into patterns, the role of time in memory, and memory dysfunction. Involuntary memory is the best known of these topics. Proust emphasized direct

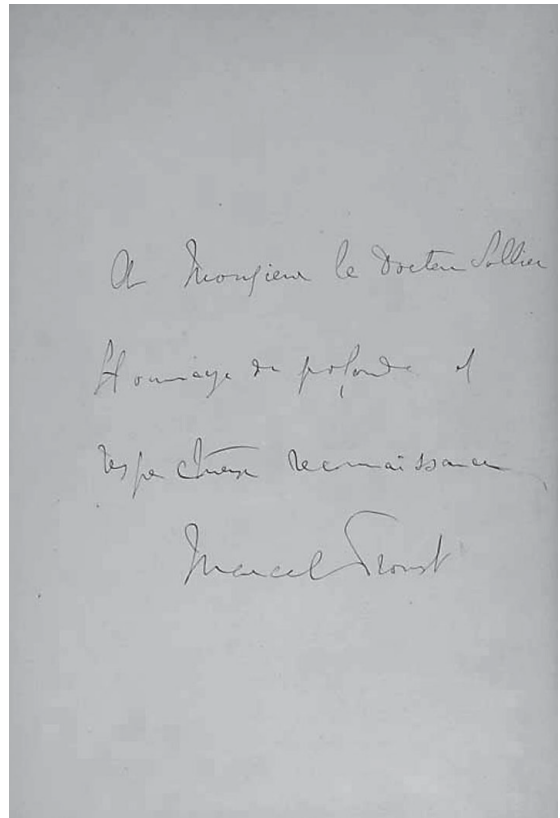


Fig. 5. Inscription to Paul Sollier by Marcel Proust on his first book *Les Plaisirs et les Jours*. Private collection.

and indirect associations which may lead to re-experiencing as defined by Sollier. He also mentioned the 'floating of consciousness', sometimes provoked by medications, which may lead to the surge of vivid memories, and he made a parallel with similar phenomena which develop during sleep and dreams. It is highly likely that Proust was markedly influenced by Sollier through his books and his own therapy at Boulogne, where he may have discovered the 'function' of his own forgotten memories [3, 6, 7]. However, Proust went beyond Sollier on two matters [37]. Firstly, he emphasized the 'shock' provoked by the surge of a previously forgotten vivid memory, which may

lead to an intense feeling of happiness and beatitude due to the affective overlap between the past and present. This phenomenon makes a synthesis between the past and present persons in the subject, with a feeling of non-temporality. Secondly, the resurgence of a vivid past memory first produces an impression that may subsequently lead to desire and decision, and be followed by action.

Proust never emphasized his main sources, and in that way, he behaved towards Sollier as he did with Schopenhauer and Bergson, who also greatly influenced him [32]. Until recently, Sollier was just considered by Proust experts as the doctor who conducted Proust's only inpatient treatment, without results. In neurology and psychology, Sollier's contribution was also forgotten, probably because his atypical studies led him neither to be considered as a neurologist by the neurologists nor as a psychiatrist by the psychiatrists

– at a time where these two fields were diverging from each other. As he had done with Bergson and his 'poor knowledge' of brain anatomy, Sollier indeed criticized the two rising stars of psychiatry, Janet and Freud, because they were not considering neurophysiology and brain studies enough [6]. At the same time, neither memory nor emotions, on which Sollier also wrote a major book in 1905 [38], were considered a neurological topic, despite Charcot's legacy. Since the early 21st century now seems to provide the scientific ground for some form of reunification of neurology and psychiatry, it is also certainly the right time to rehabilitate Paul Sollier and to bring out of the shadows his extraordinary ground-breaking work on memory, mental retardation, emotions, hysteria and other topics in what would become neuropsychology and cognitive/behavioral neurology in the second half of the 20th century.

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