

Jules Bernard Luys: A Singular Figure of 19th Century Neurology

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ABSTRACT: Jules Bernard Luys was a highly industrious and dedicated French investigator who made important contributions to the fields of neuroanatomy and neuropsychiatry in the second half of the 19th century. His name is still eponymically attached to the subthalamic nucleus and the centre médian nucleus, two structures that are at the center of our current thinking about the functional organization of the basal ganglia and the pathophysiology of Parkinson's disease. While developing a highly original view of the anatomical and functional organization of the human brain, Luys contributed significantly to our knowledge of the neuropathological and clinical aspects of mental illnesses. Luys devoted the last part of his career to hysteria and hypnosis, engaging himself in experiments as extravagant as the action of medication at distance. In doing so, he became perhaps the most highly caricatured example of the fascination that hysteria exerted upon various renowned neurologists at the end of the 19th century. This paper briefly summarizes the contribution of this remarkable figure of the history of neurology.

RÉSUMÉ: Jules Bernard Luys: une figure singulière de la neurologie au 19^{ème} siècle. Cet article résume la contribution remarquable du neuropsychiatre français Jules Bernard Luys à la connaissance de l'anatomie du cerveau humain au cours de la deuxième moitié du XIX^e siècle. Tout en développant une vision très originale de l'organisation anatomique et fonctionnelle du système nerveux, Luys contribua de façon significative à l'avancement des connaissances sur l'anatomopathologie et le traitement clinique des maladies mentales. Son nom reste toujours rattaché à deux structures prosencéphaliques – le centre médian du thalamus et le noyau subthalamique – dont on reconnaît aujourd'hui l'importance dans la physiopathologie de la maladie de Parkinson. Luys consacra la dernière partie de sa carrière à l'étude de l'hystérie et de l'hypnose. Il sombra alors dans l'irrationnel et devint l'un des exemples les plus extrêmes de la fascination qu'exerçait l'hystérie sur le monde de la neurologie en cette fin de siècle qui vit ressurgir le mysticisme et l'occultisme au cœur même du positivisme et du matérialisme. Cet article résume la contribution de cet homme remarquable à l'histoire de la neurologie.

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Jules Bernard Luys (Figure 1) was born into a wealthy Parisian family on August 17, 1828. He completed all of his classical and medical studies in Paris and spent his entire career in the Paris area.¹⁻⁴ He started his internship in 1853 and immediately initiated a series of anatomical studies under the direction of Charles Robin (1821-1885). Robin championed the use of the microscope in clinical medicine in France as Rudolf Virchow (1821-1902) did in Germany. At the age of 28, Luys wrote a widely acclaimed memoir on the use of the microscope in pathological anatomy, diagnosis and treatment of diseases. He became doctor of medicine in 1857 after having successfully defended a thesis on the histopathology of tuberculosis. Highly revealing of Luys' organicist view of diseases is this sentence borrowed from Jean Cruveilhier (1791-1874), professor of pathological anatomy at the Paris Medicine School, that opens his thesis: *Metaphysical causes will vanish as the pathological anatomy of textures will progress.* Luys was elected as *médecin des hôpitaux de Paris* in 1862 and, following a relatively short

stay at the Hôpital de la Salpêtrière, where he succeeded Alfred Vulpian (1826-1887), he was appointed to the Hôpital de la Charité, to which he remained affiliated until his retirement in 1893.

Following his nomination as *médecin des hôpitaux*, Luys started intensive work on the anatomical, pathological and functional organization of the central nervous system. Among other things, he contributed significantly to the identification of the pathological lesions underlying locomotor ataxia and

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Figure 1: A portrait of Jules Bernard Luys in his sixties. From Beaudoin M. *Nécrologie de M. le Dr Luys (de Paris). Le Progrès Médical* 1897; 2: 141-142. [Bibliothèque Charcot, Hôpital de la Salpêtrière, SCMD, Université Paris VII].

progressive muscular atrophy, but his ambition was really to embrace the organization of the nervous system as a whole. Hence, in 1865, he published the magnum opus of the first and most prolific part of his scientific career. It took the form of a remarkable treatise entitled: *Studies on the Structure, Functions and Diseases of the Cerebro-spinal System*,⁵ which was presented to the *Académie de médecine* by Charles Robin and rewarded by both the Medicine and Science Academies. This 660-page text book, accompanied by an 80-page atlas, offered many original insights and descriptions that helped clear the clouds that had covered neuroanatomy in France since the turbulent passage of Franz Joseph Gall (1758-1828) and his phrenological devotees, earlier in the XIXth century.²

Luys also wrote several papers on the normal and pathological anatomy of various brain structures or regions, including a manuscript entirely devoted to the cerebral cortex in which he made ample use of photomicrography, a novel technique at that time.⁶ Particularly important along this line is a large volume entitled: *Photographic Iconography of the Nervous Centers*.⁷ This remarkable atlas, which was published in 1873, showed high quality photomicrographs of serial sections of human brains in frontal, sagittal and horizontal planes, accompanied by beautiful drawings identifying the various structures seen on each photomicrograph.

Being endowed with a strictly deductive mind, Luys used his vast knowledge of the structure of the nervous system to

progressively develop a highly personal view of how the brain works. A synthesis of his ideas on cerebral functions was published in 1876 in a small book entitled: *The Brain and its Functions*.⁸ In this book, Luys makes an interesting analogy between the simple reflex that occurs at the spinal cord level and the much more complex phenomenon that allows sensory stimuli to be transformed and “reflected” into motor manifestations through a series of complex events that occur at the various stages of the neuraxis. He starts by emphasizing the fact that the central forebrain nuclei (*les noyaux gris centraux*), which are composed of the thalamus (*la couche optique*) and the basal ganglia (*le corps strié*), occupy a central position in brain organization. He then illustrates how the peripheral sensory information is conveyed through the *inferior converging fiber system* to the thalamus, where it is “spiritualized” before being relayed to the small-celled, upper layers of the cerebral cortex, which he considers as the true *sensorium commune*. The nervous impulse is then transferred locally to the large-celled, deeper layers of the cerebral cortex, which he considered as the effector or motor part of the cortex. The impulse is then relayed via the *superior converging fiber system* to the striatum, where it is “materialized” before reaching the somatic muscles at the periphery. This book, which contains several other interesting analogies, was received with reservation by his colleagues, but nevertheless became one of the bestsellers of the *International Scientific Library*. It went through seven editions and was translated into German⁹ and English.¹⁰ In recognition of his contribution to our knowledge of the anatomy and pathology of the central nervous system, Luys was elected in 1877 to the *Académie de Médecine*, one of the most prestigious medical institutions in France.

LUYS' CONTRIBUTION TO NEUROANATOMY AND NEUROPSYCHIATRY

Besides his studies on neuromuscular diseases, Luys made highly original contributions to neuroanatomy, including the first identification of two forebrain structures that still bear the name of their discoverer: a major thalamic nucleus termed the *centre médian* and an important component of the basal ganglia named the *subthalamic nucleus*.

Luys remarkable artistic talent enabled him to portray his original concepts on the organization of the thalamus in elegant three-dimensional diagrams assembled in the atlas that accompanied his 1865 treatise (Figure 2). Luys was one of the first investigators to realize that the thalamus was composed of several distinct functional units, each unit dealing with specific sensory inputs and relaying this sensory information to specific cortical loci.⁵ He even proposed that each cortical area that received inputs from specific thalamic units or centers project back to the same centers, thus foreseeing the existence of the important corticothalamic projection system (Figure 2A). Luys identified four major thalamic centers to which he attributed a specific functional modality: (1) the *centre antérieur*, related to olfaction; (2) the *centre moyen*, related to vision; (3) the *centre médian*, related to somatic sensory input; and (4) the *centre posterior*, related to audition (Figure 2B). Luys also commented largely upon the thalamic midline gray matter that he rightly saw as forming a morphological and functional continuum with the

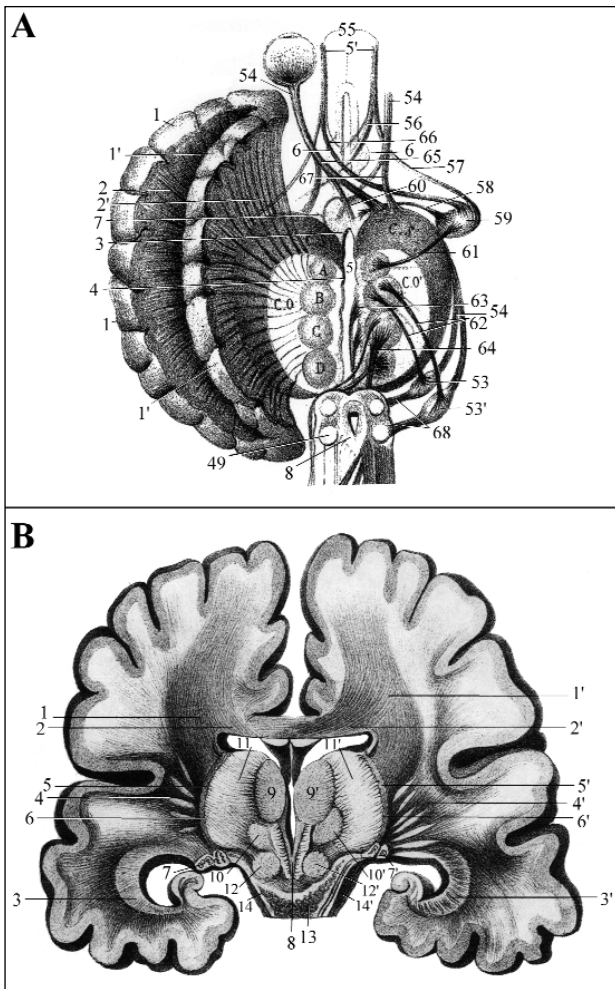


Figure 2: A: Luys' artistic talent allowed him to provide some of the very first three-dimensional representations of the human brain. This figure illustrates, among other things, the fiber connections that link the four thalamic centers (A, B, C, D) of Luys with specific regions of the cerebral cortex. B: Luys' drawing of a frontal section through the human thalamus showing, among other things, two of his four thalamic centers: the centres moyens (9, 9') and the centres médians (10, 10'). From Luys JB. *Recherches sur le système cérébro-spinal, sa structure, ses fonctions et ses maladies*. Paris: Baillière, 1865: plate 1, upper part of figure 1 (A) and plate 23, Figure 2 (B). [Bibliothèque Charcot, Hôpital de la Salpêtrière, SCMD, Université Paris VI].

central gray matter of the brainstem. He envisaged the thalamus as a brain structure interposed between the purely reflex phenomena of the spinal cord and the higher cognitive activities of the brain. He considered the thalamic functional centers as regions where sensory impressions were condensed, stored and elaborated into a new, perhaps more intellectualized, form of energy that ultimately serves to excite (*erect*) the cortical substance. Hence, Luys not only emphasized the role of the thalamus as a sensory relay, but also anticipated, in some ways, the role that the thalamus might play in attention and consciousness.

It is also in his 1865 treatise⁵ that Luys provided the first description of the lens-shaped subthalamic nucleus, which he

rather inappropriately termed the *bandelette accessoire des olives supérieures* (accessory band of the superior olives). This improper term was criticized by August Forel (1848-1931), who nevertheless named the structure *Luys' body* (Luys'schen corpus or corpus Luysii) in recognition of its discoverer.¹¹ Although not particularly well-illustrated in his 1865 treatise,¹² the subthalamic nucleus is clearly delineated in several photomicrographs and drawings of his *Iconography*⁷ (Figure 3), as well as in a later paper that he specifically devoted to this structure.¹³ Luys saw the subthalamic nucleus as a center for the dispersion of cerebellar influence upon the corpus striatum, a disposition that allows the nucleus to play a "crucial role in the synthesis of automatic motor actions".¹³ Hence, Luys not only discovered the subthalamic nucleus, but he was also the first to think about this structure as being intimately linked to the basal ganglia. Luys also traced the nervous fibrils that link the subthalamic nucleus with the globus pallidus (the subthalamopallidal connection of the current literature) and described a fiber projection from the cerebral cortex to the subthalamic nucleus.¹³ He also clearly envisaged the fact that the various areas of the cerebral cortex are directly represented at the level of the striatum via the corticostriatal projections (*les projections corticostriées*).⁵ Many of these structures and fiber pathways are now central to our current thinking about the anatomical and functional organization of the basal ganglia, as well as to the physiopathology of Parkinson's disease.^{12,14}

Luys routinely used a microscope in his anatomopathological studies and he even developed his own microtome, with which he was able to prepare thin sections of the human brain that were particularly suitable for microscopic observation and photomicrography.⁴ His interest in microscopy has allowed him to provide realistic drawings of some neurons of the human striatum (Figure 4 B),⁵ more than 30 years before Rudolph Albert von Kölliker (1817-1905), to whom the original description of

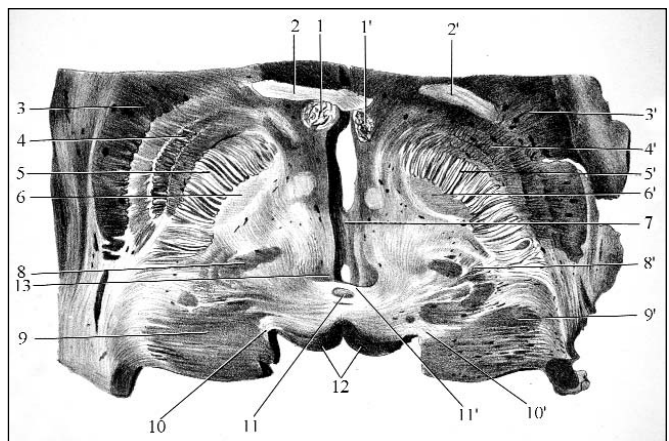


Figure 3: Drawing of a somewhat oblique section of a human brain that passes through the anterior commissure (2, 2'), rostrally, and the superior colliculus (12), caudally. The subthalamic nucleus (6, 6') is identified here as the *bandelette accessoire de l'olive supérieure*. Also shown are fibers of the internal capsule (5, 5') that separate the subthalamic nucleus from the lenticular nucleus, including the putamen (3, 3'), which is termed here the *extraventricular nucleus of the corpus striatum*. From Luys JB. *Iconographie photographique des centres nerveux*. Paris: Baillière, 1873: plate 49. [Bibliothèque Charcot, Hôpital de la Salpêtrière, SCMD, Université Paris VI].

these cells is usually attributed.¹⁵ Luys' 1865 treatise also contains the first illustration of neurons of the human substantia nigra (Figure 4A).⁵ Interestingly, Luys, like most anatomists of his time, refers to the substantia nigra as the *locus niger de Soemmering* [sic], despite the fact that this structure was first described not by Samuel Thomas Soemmerring (1755-1830) but by Luys' compatriot Felix Vick-D'Azir (1748-1794).¹⁶ Some of Luys' drawings betray his reticularist view of the organization of the central nervous system by showing neurons supposedly linked together by *anastomoses* (Figure 4C).

Besides his neuroanatomical and neurological work, Luys contributed significantly to the study of mental diseases. As early as 1864, he was offered the directorship of the *Maison de Santé d'Ivry-sur-Seine*, which had been previously headed by *aliénistes* (psychiatrists) as famous as Etienne Esquirol (1772-1840), Jules Baillarger (1809-1890) and Moreau de Tours (Jacques Moreau, 1804-1884). Luys' clinical and pathological observations on mental diseases were brilliantly summarized in his voluminous *Treatise on Clinical and Practical Treatment of Mental Diseases* published in 1881¹⁷ and for which he received the prestigious Lallemand Prize of the *Académie de Médecine*. Claude François Lallemand (1790-1854) was an outstanding French clinicopathologist of the nervous system and it was the first time that the prize bearing his name was awarded. Furthermore, a critical evaluation of the various approaches used at that time to treat mental diseases can also be found in one of Luys' books entitled: *Treatment of Madness*.¹⁸ Published in 1893, this book is a lucid synthesis of Luys' long and valuable experience with patients suffering from mental illnesses. The French government recognized Luys' major contribution to neuropsychiatry by appointing him *Chevalier* and *Officier* of the *Légion d'honneur* in 1877 and 1893, respectively.⁴

LUYS ON HYSTERIA AND HYPNOSIS

The year 1886 marks the start of a second, but much less shiny, career for Jules Bernard Luys. Having just been named senior physician at la Charité, Luys decided to devote most of his time to his new passion: hysteria as seen through hypnosis. His interest in hysteria appears to have been fuelled by his participation, together with Jean-Martin Charcot (1825-1893) and Victor Dumontpallier (1826-1899), in the "Burkism Commission" (*la commission du Burkisme*). This commission was formed in 1876 by Claude Bernard (1813-1878), then President of the *Société de Biologie*, to investigate the validity of metalotherapy, as advocated by Victor Burk (1822-1884).⁴

Under the impetus of Dumontpallier, Luys tried to develop a specific school on hypnotism (*l'École de la Charité*), whose ideas lay somewhere between the well-established and authoritative school of la Salpêtrière led by Charcot and the new and challenging school of Nancy headed by Hippolyte Bernheim (1840-1819).^{4,19} Protected by a candid faith in his own researches, Luys became infatuated with the baffling Dr. Gérard Encausse (1865-1916). This enigmatic individual, best known in occultist milieu as the *Mage Papus*,²⁰ became chief of Luys' hypnotherapy laboratory. Together, Luys and Encausse imagined extravagant experiments, the results of which were minutely reported to different Learned Societies.^{4,21} In so doing, he became perhaps the most extreme example of the fascination that hysteria exerted at the end of the 19th century upon various individuals, including those with a supposedly rational and scientific mind. Particularly revealing of Luys' state of mind at that time are his experiments on the *action of medication at distance*^{22,23} that led to the report of hypnotized patients showing marked emotional changes simply at the sight of test tubes containing various drugs and toxic substances. These effects

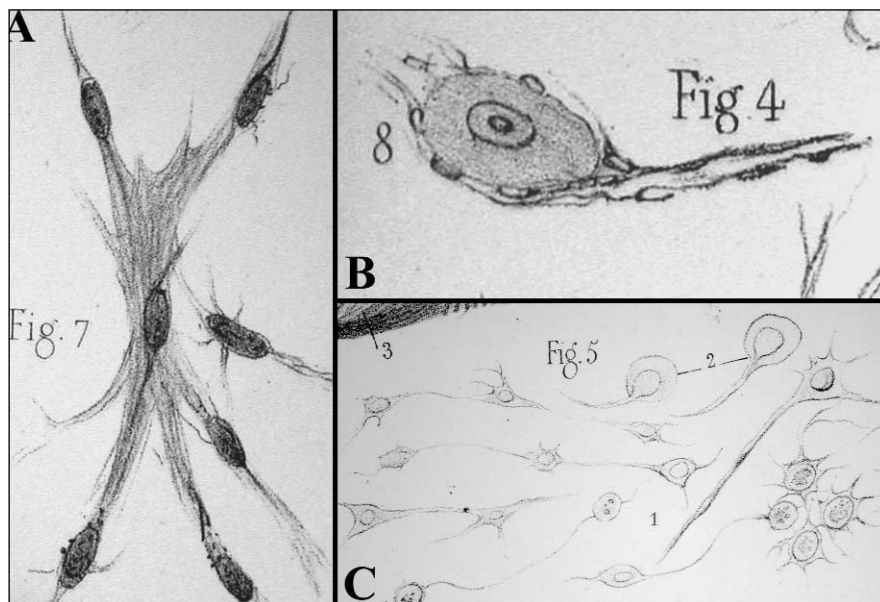


Figure 4: Drawings made by Luys to illustrate some neurons of the substantia nigra (A), a large neuron of the striatum (B), and some of the "anastomoses" that he thought existed between neurons of various brain regions (C). Figures A and B are taken from Luys JB. *Recherches sur le système cérébro-spinal, sa structure, ses fonctions et ses maladies*. Paris: Baillière, 1865, plate XIX, whereas figure C is derived from plate XX of the same reference. [Bibliothèque Charcot, Hôpital de la Salpêtrière, SCDM, Université Paris VI].



Figure 5: **A:** Engraving by Laurent Gsell entitled: “Leçon du Dr Luys à la Charité,” which shows Luys lecturing on hysteria at the Hôpital de la Charité, with a young female patient under hypnosis. **B:** Esther, a young “hystero-epileptic” patient that had been followed by Luys since the age of 13, first at la Salpêtrière and later at la Charité. She is shown here in a normal state. **C:** Esther under hypnosis displaying a state of beatitude following the presentation, on her left side, of a test tube containing morphine chloridrate. **D:** Esther under hypnosis displaying a state of profound terror following the presentation, on her right side, of the same morphine-containing tube. [The drawing in A was obtained from the Bibliothèque Charcot, Hôpital de la Salpêtrière, SCDM, Université Paris VI (Foveau de Courmelle F. *L’hypnotisme*. Paris: Hachette, 1890), whereas the photographs in B, C and D were reproduced from a copy of Luys’ book that belongs to the first author Luys JB. *Les émotions dans l’état d’hypnotisme et l’action à distance de substances médicamenteuses ou toxiques*. Paris: Baillière, 1890].

were described as abrupt, labile and highly variable; completely opposite behavioral changes were sometimes produced simply by varying the side from which the test tube was presented to the patient (Figure 5B-D). Luys did not pay attention to the serious warning that he received in 1888 from the members of the *Commission de l’hypnotisme*, which was specifically set up by the *Académie de Médecine* to investigate the validity of his results on the action of medication at distance. Instead, he sank

even lower into the world of irrational by engaging himself directly into the fields of animal magnetism and spiritualism through a series of studies on the storage of cerebral activities within magnetic crowns²⁴ and the direct visualization of brain emanations.²⁵

Luys’ experiments heavily relied upon the application of hypnosis principally to young female patients that were thought to suffer from hysteria. They were frequently performed during

public sessions that were held at Luys' clinical service at the Hôpital de la Charité (Figure 5A) and, occasionally, at Luys' personal residence.^{3,4} These live demonstrations attracted not only specialists but also le *Tout-Paris*, including members of the popular press, who often reacted in a highly critical manner to such singular assemblies. One of the most virulent Parisian journalists has described these *Folies-Cliniques* as being particularly suited for “decadent Parisians and neurotic mondaines, forming an elegant and blasé audience that rushes to Doctor Luys' experiments to get their own imagination brutalized”.²⁶ Léon Daudet (1867-1942), the son of the famous novelist Alphonse Daudet (1840-1897), an intimate friend of Charcot, was an intern at la Charité when Luys was directing these wild sessions. He described vividly how Luys, to whom the idea of mystification was completely unknown, could remain unperturbed for hours among his subjects, Esther, Gabrielle and the others, who had rehearsed their performance days in advance, while enjoying a very special treatment in their hospital quarters.²⁷

Virtually all of Luys' colleagues, however, including those who expressed the most severe criticism of his naive incursion into the mined field of hysteria, were supportive of this vigorous, active and industrious individual.^{3,4,21} They were all convinced of the total good faith of this courteous and cordial man who liked receptions, music and good food, but whose foray into the study of drug effects at distance cost him part of the scientific renown he took nearly forty years to acquire.¹ But what to think

of such a radical turnaround, such an obvious absence of critical sense in a 60-year-old man previously endowed with a remarkable intellectual rigor and exceptional gifts for clinical and anatomical observations? Was this radical change the result of a progressive judgement erosion due to aging or simply the reflection of a fascination for the fabulous, a need for the supernatural at the end of a century that was dominated by the materialist and positivist philosophy of Auguste Comte (1798-1857)? There are no easy answers to such questions, but it is remarkable that several other famous neurologists have also been spellbound by hysteria at the end of the 19th century. For example, Joseph Babinski (1857-1932) had actively investigated the possibility of transferring certain hysterical manifestations from one subject to another through a simple magnet.²⁸ The great Charcot himself was released honorably from this spell by discovering, only a few months before his death, that faith could heal.²⁹ The tail of the 19th century must have been a very bizarre period, a time that saw the rebirth of mysticism right in the midst of materialism.^{30,31}

THE LAST YEARS

Luys was afflicted by a progressive deafness during the last years of his life. Despite this handicap, he continued to participate actively in various academic sessions and published regularly the results of his neuroanatomical studies. His hard working capacity still intact, Luys gave a talk on the “structure



Figure 6: **A:** The main entry of what used to be the hotel particulier of Luys in Paris, when he was chief physician at the Hôpital de la Charité. It is located at 20 rue de Grenelle, at a walking distance from where the hospital used to stand. **B:** Luys' grave at the Montparnasse cemetery. The grave also holds his first wife (Marie Louise Clémentine Luys, born Bied-Charreton), his two sons (Henri and Georges, who were both physicians), and other members of their families. [Photographs taken by the first author].

of the brain” at the Congress of Psychology that was held in Munich in 1896. This must have been his last major public appearance. Luys died suddenly on Saturday evening, August 21, 1897, at the age of 69. His death occurred only three days after the beginning of his summer vacation at Divonne-les-Bains (Ain). Beside him were his second wife, Berthe (born Jacquot de Brigeat, widow of a Senator) and his younger son, Georges. After the usual formalities, his body was brought back to his beautiful Parisian townhouse, 20 rue de Grenelle (Figure 6A), where it remained until the funeral that was held at l’Église Saint-Thomas-d’Aquin on Wednesday, August 25, 1897. Luys was buried the same day at the Montparnasse cemetery (Figure 6B) in the presence of a few colleagues and friends. Ernest Cadet de Gassicourt (1826-1900), then Secretary of the *Académie de Médecine*, pronounced a brief posthumous eulogy of Luys at the Academy session that was held on December 14, 1897. In his allocution, Cadet de Gassicourt, who had known Luys personally for 40 years, praised the honesty of this valiant investigator who, despite his unfortunate last-minute incursion in the field of hysteria, made an outstanding contribution to our knowledge of the anatomical and functional organization of the human brain.

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