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Jean-Martin Charcot's House Officers at La Salpêtrière Hospital

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Abstract

From the time he became *chef de service* at La Salpêtrière Hospital in 1866 until his death in 1893, Jean-Martin Charcot oversaw 32 house officers. Some of them became famous, such as D.M. Bourneville, E. Brissaud, P. Marie and G. Gilles de la Tourette. Others are less well known. The fact remains that Charcot knew how to surround himself with fine students and leverage their talents in order to make the neurological discoveries by which he would become famous throughout the world. Here, we present the biographies of H. Soulier (1862), J. Cotard (1865), R. Lépine (1867), A. Gombault (1872), A. Pierret (1874), A. Pitres (1876), P. Oulmont (1877), G. Guinon (1885), P. Blocq (1887), E. Huet (1888), E. Parmentier (1890) and A. Souques (1893). Each of these men with their unique paths and interests helped lay the foundations for the birth of neurology at the end of the 19th century in Paris. As Emile Littré said: *'La science de la Médecine, si elle ne veut pas être rabaissée au rang de métier, doit s'occuper de son histoire et soigner les vieux monuments que les temps passés lui ont légués'*, which could be translated as 'to avoid being reduced to a trade, the science of medicine must attend to its history and take care of the old monuments handed down by time'.

In 1955, Georges Guillain began his biography of J.-M. Charcot with these words [1]:

In the 19th century, Jean-Martin Charcot was one of the most famous professors of the medical school in Paris, known in France and all countries of the New and Old Worlds; he was unanimously considered the founder of neurology.

While the perspective afforded by time has not diminished his influence, historical studies have focused on the individualization of neurological pathologies or on the birth of a new psychiatry, opening the way to psychoanalysis. Charcot's accomplishments would have been impossible without the help of a number of zealous *internes* (house officers) and *chefs de clinique* (specialist registrars) who became his disciples (fig. 1–3).

As a consequence of the French Revolution at the end of the 18th century, medical training in France developed a dichotomy that would last until the 20th century. The official theoretical training took place at the university, where students defended a thesis at the end of their studies. In theory, students could complete their medical studies without any clinical practice with patients. Napoléon Bonaparte is known throughout the world as a military genius and conqueror, but his work as an administrator, less well-known, has survived him even in our time. To create an elite in all areas, alongside universities he founded schools with very selective entrance requirements based on a competitive exam. Among others, Ecole Polytechnique trained military officers,

Fig. 1. **a** Jules Cotard. **b** Raphael Lépine. **c** Jules-Aimé Michaud. **d** Albert Gombault. **e** Maurice Debove. **f** Antoine Pierret. Reprinted with kind permission of the Bibliothèque Charcot, La Salpêtrière Hospital, Université Pierre et Marie Curie, Paris, France.

Ponts et Chaussées and Mines trained engineers, and Ecole Normale Supérieure trained teachers. Based on the same principle, hospital house officerships were created by the health and hospital regulations of 4 Ventôse year X (23 February 1802) to select the best future physicians. The first entrance exam took place on 26 Fructidor year X (13 September 1802) with 64 candidates, 24 of whom were selected. Parallel to their university coursework, medical students could gather clinical experience with patients by passing the non-resident entrance exam (they did not live at the hospital and had neither diagnostic nor therapeutic responsibilities). After 2 years as non-residents, attending private lectures by senior house officers or young *chefs de clinique*, students passed the entrance exam for house officership, with most students vying for a position in Paris. In this way, house officers became hospital administration employees rather than university students. After 4 years they could either open up a private medical practice or continue their university careers (*chef de clinique*[1], *agrégé*[2], professor) and/or hospital careers (hospital physician). This intricate system is so complex that it is not well understood outside France. As a result, it seems necessary to

[1] Specialist registrar.
[2] An *agrégé* has passed a national competitive exam to obtain a university professorship.

Fig. 2. **a** Albert Pitres. **b** Paul Oulmont. **c** Georges Guinon. **d** Paul Berbez. **e** Paul Blocq. **f** Ernest Huet. Reprinted with kind permission of the Bibliothèque Charcot, La Salpêtrière Hospital, Université Pierre et Marie Curie, Paris, France.

provide this information before presenting the biographies of some of Charcot's house officers [2]. We should also point out that Charcot started the 'lessons' that would make his teaching famous in 1866. They always took place at La Salpêtrière Hospital, although he taught classes at the medical school during his many years as professor of anatomical pathology.

Charcot himself completed his house officership in 1853 and defended his doctoral thesis on the distinction between gout and other forms of rheumatism [3]. In 1862, Charcot began his duties as hospital physician at La Salpêtrière, where he stayed for the rest of his career. From 1862 to 1893 he was responsible for 32 house officers (see 'Appendix'). As we will discover, not all of them became neurologists. Some became professors at the medical school in Paris: Victor Cornil, Charles Bouchard, Alix Joffroy, Georges Debove, Fulgence Raymond, Edouard Brissaud, Gilbert Ballet and Pierre Marie. Some students from the provinces returned to their native cities to become professors, either at the school of medicine and pharmacy in Lyon (Henri Soulier, Raphaël Lépine and Antoine-Auguste Pierret) or at the Bordeaux medical school (Albert Pitres). The most renowned are mentioned in other chapters of this book. Perhaps wrongly, we are focusing on the least renowned. Jules-Aimé Michaud, Antoine Bernard, Paul Berbez, Adolphe Dutil and Henri

Fig. 3. **a** Adolphe Dutil. **b** Emile Parmentier. **c** Achille Souques. **d** Louis Hallion. Reprinted with kind permission of the Bibliothèque Charcot, La Salpêtrière Hospital, Université Pierre et Marie Curie, Paris, France.

Lamy will only be mentioned briefly. There are already a plethora of biographies on Jean-Baptiste Charcot.

Henri Soulier and Victor Cornil

On 13 November 1861, Jean-Martin Charcot became head of the department for aged women at La Salpêtrière Hospital, and his friend Alfred Vulpian (1826–1887), with whom he did his house officership, took charge of the other medical department. They were still unknown physicians when they began their new duties at La Salpêtrière, an institution on the outskirts of Paris considered obscure by their colleagues, but where they had completed their house officerships. Over the course of 4 years they worked together on a variety of subjects, all of them linked to geriatrics, and of course to the neurological diseases associated with aging but were incorrectly identified. Charcot and Vulpian published the seminal work *De la paralysie agitante* in 1862, a masterly description of Parkinson's disease. Henri Soulier (1834–1921) was at that time the first house officer under Charcot [3], who was only 9 years his senior. Soulier, who became a house officer in 1859, was originally from the Alps and came from Malgaigne's department of orthopedic surgery [4]. Soulier published his first joint article with Charcot as early as 1862: *'Une observation de rupture du cœur'* (Observation of heart rupture) in the *Comptes rendus de la Société de Biologie*, with Charcot presiding over the Société de Biologie at

that time [5, 6]. Except for one article published in 1867 in the *Journal de Médecine de Lyon* entitled *'Etude critique sur le ramollissement cérébral'* (Critical study on cerebral softening), Soulier did not leave behind any neurological writings [7]. This text was a diligent compilation highlighting the work of Adrien Proust (1834–1903) and Jules Cotard (see below). It clearly underlined that 'cerebral softening is the regressive disorganization following disordered, insufficient or suppressed brain vascularization'. Soulier emphasized how the views of Jean Laborde (1830–1903) at Bicêtre Hospital opposed those of the house officers at La Salpêtrière Hospital. Laborde saw the cause of cerebral softening in the primary dilation of brain capillaries, but for the house officers – who Soulier supported – cerebral softening was primarily caused by vascular occlusion. Soulier, who became physician at the Lyon hospitals in 1883, was the first chair of therapeutics, from 1877 to 1907, when the Faculté de Médecine et de Pharmacie de Lyon was founded. His *Traité de Thérapeutique et de Pharmacologie* was published in several editions between 1891 and 1901. His successor as Charcot's house officer was Victor Cornil (1837–1908). In 1862, Charcot innovatively installed 'a laboratory' – at first just a few microscopes – next to the room where he examined his patients. Charcot brought Guillaume Duchenne de Boulogne (1806–1875) to his new laboratory. Duchenne de Boulogne developed his research on progressive muscular dystrophy and started his faradization experiments on facial muscles to study the physiological expression of emotions.

Charles Bouchard and Jules Cotard

Charles Bouchard (1837–1915) succeeded Cornil as house officer for 2 years, separated by the house officership of Jules Cotard (1864 and 1866). In March 1866, Bouchard presented a paper on the 'alteration of small encephalic arteries that can be considered as the most frequent cause for brain hemorrhage' to the Société de Biologie. This work, completed with Charcot, described aneurysms since referred to as Charcot-Bouchard aneurysms [5, 8]. Parallel to his work during that period on combined sclerosis of the dorsal and lateral cords, Charcot was deeply involved in the study of 'apoplexy and cerebral softening'. In 1866, he chaired the committee for Ivan Poumeau's thesis entitled *Du rôle de l'inflammation dans le ramollissement cérébral* (The role of inflammation in cerebral softening). Jules Cotard (1840–1889) would pursue this research. Cotard became famous for the syndrome named after him. He started his house officership in 1863, as did Valentin Magnan (1835–1916), and during his first year he focused on surgery. He was very inspired by the positivist philosophy of Auguste Comte, and the anatomical-clinical method elaborated by Charcot and Vulpian pleased his Cartesian mind [9]. In 1894, Antoine Ritti paid him this tribute [10]:

> He was one of the first builders of this school, whose members have since had such brilliant destinies due to the expert guidance and remarkable work of their illustrious leader. He was passionate about research on nervous system pathology, which was already of prime importance, and he was convinced that it would one day solve the delicate problems of human nature that philosophers had unsuccessfully explored without the scientific method for centuries.

His first paper, written with Charcot, was published in 1865 in *Comptes-rendus de la Société de Biologie*: *'Sur un cas de zona du cou avec altération des nerfs du plexus cervical et des ganglions correspondants des racines spinales postérieures'* (A case of shingles of the neck with alteration of the cervical plexus and the corresponding dorsal root ganglia) [5]. In it he described the ordeal of a 78-year-old woman with breast cancer that had metastasized to her cervical vertebrae. She suffered from terrible neuralgic pains of the brachial plexus and developed shingles on her arm 10 days before her death. The autopsy showed that cervical vertebra No. 4 was completely compressed; the spinal cord and roots remained intact, but

Cotard's macro- and microscopic examination revealed significant inflammation of the spinal ganglia and the trunks of the plexus. The infectious origin of shingles was unknown at the time, so he concluded that the rash resulted from this inflammation, and that the shingles was a mechanically caused neuritis.

During this period he befriended Jean-Louis Prévost (1838–1927), house officer since 1864 under Vulpian, whose department had close ties to Charcot's. Prévost was born in Geneva and had studied in Zurich, Berlin and Vienna. He prepared his thesis on a theme suggested by Vulpian: '*De la déviation conjuguée des yeux et de la rotation de la tête dans certains cas d'hémiplégie*' (Gaze and head deviation in certain cases of hemiplegia) (1868). This clinical sign had been previously neglected. Shortly afterwards he left for Geneva to create a research laboratory where he worked with two famous students, Paul Dubois (1848–1918) and Jules Dejerine (1849–1917). When Dejerine decided to continue his training in Paris, Prévost recommended and introduced him to Vulpian. Prévost and Cotard combined the observations they made during their house officerships on 'cerebral softening'. The term was proposed by Léon Rostan to differentiate the anatomical-pathological aspect of the brain from encephalitis and apoplexy (hemorrhage) [11]. They presented their work to the Société de Biologie, presided over by Charcot, in December 1865: *Etudes physiologiques et pathologiques sur le ramollissement cérébral* (Physiological and pathological studies on cerebral softening).

While François Bayle (1662–1709) was the first to describe the calcifications and plaques seen in cerebral arteries, he was also among the first to relate this to apoplexy in his *Tractatus de apoplexia* published in 1677. It was not until 1856, however, that Rudolf Virchow (1821–1902) proposed the concept of thromboembolism in Germany. Based on observations by Charcot and the work of Cotard and Prévost, Adrien Proust (1834–1903) developed these concepts in the thesis he presented for the *agrégation*[3] exam in 1866. They had already been advanced by Maxime Durand-Fardel (1815–1899) [11]. Prévost and Cotard used rabbits for their experiments on the effect of carotid ligation and injection of fine powder (club moss spores) or coarser substances (tobacco seeds). They established that paralysis differed according to the severity of the occlusion and whether it was proximal or peripheral. Tobacco seeds obstructed the middle cerebral artery and caused a non-hemorrhagic pinkish softening, comparable to the softening found during the autopsies of their patients. They described the changes over time in the lesions, from the first 'anemic' signs to the later hemorrhagic infiltrations. With the help of manometers and rubber tubes, Cotard demonstrated that blood pressure was highest at the obstruction, generating 'a collateral congestion in the small branches that formed around the obliteration' immediately after the occlusion, and that it decreased when the collateral branches dilated in compensation. Later an inflammation started around the necrosed regions, explaining the inflammation theories of Cotard's predecessors at the beginning of the 19th century, including François Broussais (1772–1838) and Louis-Florentin Calmeil (1798–1895), not to mention François Lallemand (1790–1853) and Jean Cruveilhier (1791–1874). Finally Cotard and Prévost discovered fatty scarring in the infarcted zone. For their masterly anatomical-pathological description of the consequences of acute cerebral artery obstruction, Cotard and Prévost received the *Prix Godard* from the French National Academy of Medicine and were granted membership in the Société de Biologie presided over by Charcot [12].

Cotard defended his thesis *L'étude sur l'atrophie partielle du cerveau* (Study on partial atrophy of the brain) under the direction of Charcot in

[3] A national competitive exam used to attribute university professorships.

1868. He discussed non-life-threatening partial atrophies of the brain from the clinical and anatomical-pathological point of view based on 52 observations, of which 6 came from Charcot's files. He deducted that these atrophies were the ultimate expression of processes preceding birth, or occurring in very early childhood, of hemorrhagic, infectious, malformative or unknown origin. He made the novel assertion that neither the state of intelligence nor motor and sensory abilities could predict severity or localization of the atrophy discovered during the autopsy. Paul Broca (1824–1880) had proposed the left frontal localization for language in 1861, but Cotard showed that children with right hemiplegia from their earliest years did not suffer from aphasia [12]:

> It is extremely remarkable that, no matter the side on which the brain lesion is located, hemiplegics since childhood never have aphasia, i.e. complete loss of language faculties with more or less complete conservation of intelligence. In our observations of atrophy going back to early childhood, intelligence is never better developed than the faculty of language; we never observe this inability to express ideas, this singular contrast between intellectual abilities and the faculties of expression that gives aphasics such a unique physiognomy. (...) Based on these propositions that summarize the facts described in our observations, we are able to conclude first of all that when a hemisphere of the brain has been destroyed during early childhood, the other hemisphere can replace it in its functions, and that either of the two hemispheres is sufficient for exercising intellectual abilities that are more or less normal. Consequently, there is no fundamental difference between the properties of the two hemispheres. Gall and other observers after him had already established this fact. Recently, the very curious cases of aphasia with lesions solely in the left hemisphere, to which Mr. Broca has called attention, have cast doubt on the functional symmetry of the two hemispheres. It would thus seem necessary to either admit different functions for the symmetric regions of the two hemispheres, which would topple all of brain physiology, or to assume that certain faculties cannot be exercised without synergy between the two hemispheres. (...) When the facts seem to contradict each other, they are certainly being wrongly interpreted.

We can only admire Cotard's audacity in establishing such clear-cut and accurate conclusions while defending his doctoral thesis before a jury of distinguished professors. After the Franco-Prussian War, Cotard opened his own medical practice while attending the consultations of Charles Lasègue (1816–1883) at the Prefecture de Police. This is where, in 1874, Lasègue presented him to Jules Falret (1824–1902), who was looking for an assistant physician for his asylum in Vanves. He practised there for 15 years and passed away at the age of 49 years after having contracted diphtheria from his daughter [9, 13]. Cotard published his article 'Folies' (Madness) in the *Dictionnaire Encyclopédique des Sciences Médicales* of Amédée Dechambre (1812–1886) in 1877. On 28th June 1880, he presented the Société Médico-Psychologique with his dissertation entitled '*Du délire hypochondriaque dans une forme grave de la mélancolie anxieuse*' (Hypochondriacal delusions in a severe form of anxious melancholia). This dissertation is considered the point of origin for Cotard's syndrome. In a more structured study in 1882 he called it the 'negation delusion'. In 1892, Emmanuel Régis (1855–1918) proposed referring to 'chronic systematic delusions' [13] as Cotard's syndrome. It was not, however, the original clinical description alone that assured Cotard's fame after his death. As house officer under Adrien Proust (1834–1903), he was invited several times to dinner parties with Marcel Proust. The author contributed greatly to his renown by naming one of his characters Professor Cottard in his work *In Search of Lost Time*. One of Marcel Proust's biographers, George Painter, explained [14, 15]:

> Dr. Cottard was a conglomerate of the real-life Dr. Pozzi, his pince-nez and involuntary wink were those of Marcel Proust's Professor, Albert Vandal, but his name was taken from Adrien Proust's fellow-student, Jules Cotard, and Dr. Cottet at Evian. Marcel Proust develops Professor Cottard as one with professional integrity and notes his 'quickness, the penetration, the unerring confidence with which, at a glance, he could diagnose disease'.

It's a perfect depiction of the real-life Cotard, in similar fashion.

Raphael Lépine

In 1866, Charcot published his *Leçons cliniques sur les maladies des vieillards* (Clinical lessons on the diseases of the elderly), which were recorded by Benjamin Ball (1833–1893). He focused on arterial thrombosis during cancer, metastatic spinal cord compressions and infectious diseases such as typhoid fever and pneumonia. In 1867 Charcot did not obtain a professorial chair as expected, while Vulpian became professor of anatomical pathology. His new house officer was Raphael Lépine (1840–1919). Born in Lyon, he was a house officer in the Lyon hospitals in 1860 and in the Paris hospitals in 1865. Afterwards he continued his studies at the Universities of Berlin (1867) and Leipzig (1869).

At the laboratory of Karl Ludwig (1816–1895) in Leipzig he conducted important research on the vasomotor nerves of the tongue [16, 17]. In 1870 he defended his thesis '*De l'hémiplégie pneumonique*' under the direction of J.-M. Charcot. It was an extension of the thesis Charcot had presented for the *agrégation* exam in 1860, '*De la pneumonie chronique*', and of the lessons on diseases of the elderly. Lépine differentiated between pneumonia secondary to hemiplegia and leading to a fatal outcome, and initial pneumonia during which hemiplegia occurred. Each clinical history included the autopsy results. He commented:

> Despite the most meticulous efforts we cannot find any recent brain lesion that would explain these symptoms. [...] We are currently all the more justified in evoking reflex actions as their existence, based on rigorous experimentation, would appear self-evident and certain.

Lépine clearly indicated in his discussion that deterioration of the general state of health, meaning metabolic disorders that can be linked to the infection, was responsible for the hemiplegia [18]. Lépine then became *préparateur*[4] under Charles Brown-Séquard (1817–1894), whose work he cited several times in his thesis. From that moment his motto was: 'You always have to think in terms of physiology.' Back in Paris he became *chef de clinique* in 1872, a hospital physician in 1874 and professor at the Medical School in Paris in 1875 [16, 17]. The thesis he presented for the *agrégation* exam – *De la localisation dans les maladies cérébrales* (Localization in brain diseases) – was a vast review of current knowledge and a tribute to the work of Charcot. In it he contested the exclusive localization of the language area in the left frontal lobe as described by Paul Broca (1824–1880) and indicated the importance of the insula. In this extensive catalogue, he presented observations of abscesses, tumors and partial convulsions that made it possible to predict the site of the lesion, but he indicated that predictions were not as accurate in this area compared to the spinal region. He suggested tests on monkeys to further knowledge, in which there were still major gaps in 1875 [19]. In 1877, he became copy editor for the *Revue mensuelle de médecine et de chirurgie* (*Monthly Medical and Surgical Review*) founded by Charcot, Auguste Chauveau (1827–1917), Léopold Ollier (1830–1900), Jules Parrot (1829–1883) and Aristide Verneuil (1823–1895).

In 1877, he became professor of clinical medicine at the newly opened Faculté de Médecine et de Pharmacie in Lyon where he remained until his retirement in 1910. Lépine is known for his research on the pathophysiology of diabetes mellitus, and particularly on gluconeogenesis. He helped define the role of pancreatic hormone secretions in glucose balance and glycosuria, foreshadowing the discovery of insulin. Two of his publications stand out: *Les complications du diabète et leur traitement* (Complications of diabetes and their treatment) and *Le diabète non compliqué et son traitement* (Uncomplicated diabetes and its treatment) [17]. His brother was Louis Lépine (1846–1933), famous police chief in the *département* of Seine from 1893 to 1897 and again from 1899 to 1913. In 1901 Louis Lépine created the

[4] A teaching assistant in anatomy classes who prepared the cadavers and taught the medical students dissection techniques.

famous 'Concours Lépine', which since that date has awarded a prize every year for a novel invention that improves day-to-day life.

It was during this same year, 1866, that Charcot started his regular teaching sessions with his Tuesday and Friday Lessons. These classes were not closed to a limited audience for long, and established the teaching talents of Charcot well before he obtained an official chair. Désiré-Magloire Bourneville succeeded Lépine, followed by house officers Alix Joffroy and Jules-Aimé Michaud. Michaud stayed for 2 years with Charcot after having been house officer in Lyon. In 1871 he defended his thesis '*De la méningite et de la myélite dans le mal vertébral*' (Meningitis and myelitis in vertebral disease), in which he described Pott's paraplegia. This theme associated neurology and surgery. He returned to Lyon as a hospital surgeon, but passed away shortly thereafter.

It was not until 1872 that Charcot was appointed to the Chair of Anatomical Pathology. In 1868 he chaired the committee for Paul Dubois's thesis '*Etude sur quelques points de l'ataxie locomotrice progressive*' (Study on certain aspects of progressive locomotor ataxia), a thorough update on all Charcot's clinical and anatomical-pathological research in this area.

Albert Gombault

In 1872 Albert Gombault (1844–1904) arrived in his department, after beginning his house officership in 1868. Ernest Mosny (1861–1918) began his tribute to Gombault with the words: 'He was a modest and good man who was horrified by the all fuss he generated' [20]. This modesty, important to Gombault, did not stop the painter André Brouillet (1857–1914) from depicting him in *Une leçon de clinique à La Salpêtrière* in front of Victor Cornil (1837–1908) [21]. Charcot quickly recognized Gombault's skills of observation and experimentation. He knew, as usual, how to use them to his advantage. In his lesson of June 1868 Charcot presented two cases of spinal muscular atrophy recorded by Alix Joffroy (1844–1908), but the microscopic study of the spinal cord was provided by Gombault. Gombault used the study for his thesis, which he defended in 1877 and titled: *Etude sur la sclérose latérale amyotrophique* (Study on amyotrophic lateral sclerosis). Time has not diminished his first work in any way [22]:

> The constant factor relative to the variability of other lesions has always been an atrophy of motor cells potentially leading to their nearly complete death. (...) In terms of its mode of distribution, it generally affects the anterior grey matter symmetrically on both sides throughout the length of the spinal cord. However, it is usually much more pronounced in the upper parts of the cervical region and diminishes from top to bottom. Another important and carefully recorded characteristic is the irregular distribution of cellular lesions. This atrophy occurs randomly here and there, without apparent preference for this or that cellular group to the exclusion of another.

For over 20 years the anatomical-clinical method promoted by Charcot to distinguish neurological diseases achieved its marvelous results only because of Gombault's self-sacrificing and patient work behind the scenes, leading Paul Legendre (1854–1936) to remark: 'In a collaboration with a teacher like Charcot it would be futile to try to sort what was achieved by the student' [23]. Mosny described him as 'the unrivalled master of anatomical pathology, the authority everyone went to for difficult cases' [20]. He became a hospital physician in 1882, and in 1887 *chef de service* (consultant) in the largest department of neurology at the time outside La Salpêtrière, at the Hospice des Incurables d'Ivry outside Paris. Starting in 1887 he began teaching pathological histology privately, as the university had not yet realized the contribution of this new discipline to medical progress. Cornil, Bouchard, Pitres, Marie, Brissaud and Babinski all relied on his expertise. Gombault only published around twenty articles and contributed to the *Manual d'Histologie* of Cornil and Ranvier [24]. But some of his publications summarized the knowledge and debates of the period in an exemplary way, such

as *'Revues générales des localisations cérébrales'* (General review of brain localizations) in 1877 with Henri Rendu (1844–1902) in the *Revue de Sciences Médicales,* or 'Contribution à l'étude des aphasie' (Contribution to the study of aphasia) in 1896 in the *Archives de Médecine Expérimentale et d'Anatomie Pathologique*. Gombault did not only study the nervous system. In 1876, working with Charcot, he described liver lesions provoked by ligature of the common bile duct [25]. In 1878, again with Charcot, he described 'the giant cell', characteristic of tuberculous lesions. In 1881 he completed his description of 'periaxial segmental neuritis' (the neuritis of Gombault and Philippe) during lead poisoning by adding the description of saturnine nephritis [26].

Finally it is important to note that this major contribution to neuropathology took place parallel to a conceptual revolution concerning the architecture of the nervous system, shifting from the network concept of Andreas Gerlach (1811–1878) and Camillo Golgi (1843–1926) to the neuron concept of Wilhelm Waldeyer (1836–1921) and Santiago Ramon y Cajal (1852–1934). Gombault wrote in 1902:

> This new concept undeniably facilitates interpreting or linking a very large number of anatomical, physiological and pathological facts. It should even serve as the sole basis for all histological studies, and henceforth everything will be a matter of different types of neurons and neuronal diseases.

A good example of this reasoning is given by the chapter published with his favorite student Claude Philippe (1865–1903) in the *Traité d'histologie pathologique* of Cornil and Ranvier. He is remembered in spinal anatomy by the Gombault-Philippe triangle, a tract of associative fibers formed in the posterior medullary commissure [27]. Gombault was one of the twelve founding members of the Société de Neurologie. His reserve and modesty, and the fact he did not have a career as a professor, led him to be unjustly forgotten. Yet it can be argued that Gombault's contributions to neurology are no less decisive than those of his teacher Charcot or his colleagues Marie and Babinski [28, 29].

Georges Debove

Charcot was elected to the Académie de Médecine in 1873, the year Maurice Georges Debove (1845–1920) succeeded Gombault. Debove was born in an area just outside Paris at the time, which has since become part of the city. Debove's father died when he was a child and he came from a modest background. At the end of his schooling in the famous upper secondary school Louis le Grand, his mother asked for the headmaster's advice before giving in to her son's wishes to embark on a medical career. He approved the choice, noting that while Debove was capable of becoming a physician, it was unlikely he would ever become a medical professor. Like all oracles he was mistaken. Even if his name is almost forgotten today, Debove had a career crowned by every achievement. He became a house officer in 1869 and began his work under Charcot in 1871, as Charcot was becoming interested in hysteria. During this period marked by the war with Prussia, La Salpêtrière Hospital was bombed but continued its activity throughout. Debove himself was present at the battle of Bapaume (2 and 3 January 1871). After his thesis on oral psoriasis in 1873, he became *chef de clinique* under Germain Sée (1818–1896). He strongly disliked Sée and took pleasure in pointing out his diagnostic errors! He passed the *agrégation* exam in 1878 after his second attempt. During his first attempt, which ended in failure, he was supposed to examine the question: 'Can the physiological action of medications become the rule for their therapeutic use?' Given the lack of pharmacological data available at the time he responded wisely that knowledge was too limited for a favorable response. This lucidity was doubtlessly not to the examiners' liking. In 1881 he was an assistant instructor in internal pathology, then

substituted for Charles Lasègue (1816–1883) in his clinical medicine class in 1883. During his hospital career he successively worked at different institutions, namely Tournelles, Andral and Beaujon, followed by La Charité where he finished his career. As a young physician, after his training with Louis Ranvier (1835–1922), he focused on anatomical pathology research, successively studying mycosis fungoides, pelvic tuberculosis and lymphangitic carcinomatosis. With Gombault he described the sensory decussation in the medulla oblongata. With Charcot he demonstrated bone structure changes in the limbs of hemiplegics and became interested in tremors, which he was the first to study using a graphic method. He suggested that locomotor ataxia was caused by stretching of the nerves [30, 31].

Zealously working under Charcot, in 1879 he became fascinated with the study of hysteria. Debove, in particular, helped demonstrate its existence. He participated in developing experiments on 'remote transfer' and the therapeutic use of magnets. Although he did not attain his teacher's perfect staging, he held a few sessions for magistrates and lawyers on self-accusation based on suggestion by the physician. He later said: 'My year as house officer was almost a *tête-à-tête*, spent in close conversations, always scientific, but not always exclusively medical'. Debove was a close friend of the Charcot family. He was regularly invited in the evenings to Charcot's *hôtel particulier* on boulevard Saint-Germain. It was Mrs. Charcot who had insisted he accompany his teacher in August 1893 on vacation to the *département* of Creuse, because of her husband's attacks of angina. Debove helplessly witnessed the fatal progression of the acute pulmonary edema that killed Charcot during their trip. It fell to Debove to deliver his eulogy during the funeral. This was not simply an emotional choice by Mrs. Charcot, but because she knew that after La Salpêtrière, Debove had turned towards general medicine and in particular heart and pulmonary diseases [1, 32].

He wrote on uremia and heart failure as well as liver and stomach diseases, and he introduced a stomach washing technique using a smooth semi-rigid tube manufactured by one of his friends, Henry Galante, a manufacturer of vulcanized rubber [33]. This very recent innovation illustrated Galante's spirit of invention, also apparent in the vacuum device he designed and built for Georges Dieulafoy (1839–1911). Debove's rubber tube was better tolerated than the rigid tube used by Faucher; it avoided injuries to the esophagus and allowed its exploration by catheter. This invention gave Debove the idea of using the same technique to introduce 'forced' nutrition in tubercular anorexia, rather than removing the contents of the gastric tract. His expertise included infectious diseases, such as typhoid fever and particularly tuberculosis. Fascinated by the discovery of *Mycobacterium tuberculosis* by Robert Koch (1843–1910) in 1882, he introduced systematic bacteriological testing of saliva, and conducted research on contagiousness and hygiene in tuberculosis. With his innovative mind, he developed a technique for thoracocenthesis using a catheter of his invention. This new procedure, combined with the washing of pleural cavities using antiseptics, helped him to heal tuberculous pleurisy, considered fatal in all cases before his invention. In the same vein, he came up with the idea of using sterilizable syringes [34]. With Maurice Letulle (1853–1929) he distinguished between heart, kidney and liver edema, and they introduced new thinking on pathogenesis by associating anatomical pathology with the hemodynamic concepts of the period. After the premature death of François Damaschino (1840–1889) he became professor of medical pathology, and then in 1901, when Carl Potain (1825–1901) retired, he took over the chair of clinical medicine. He did not exclusively specialize in any medical domain, and his teachings covered hygiene and nutrition as well as epidemiology and the premises of endocrinology. He was a brilliant speaker and, when confronted with unproven theories,

always tried to transmit his critical approach to his students.

Several generations of students have been trained using the many books he wrote, such as his medical manual in 9 volumes, his therapeutic manual or his manual of medical diagnosis [30]. Charcot, who recognized his talent as a teacher, introduced him to J. Rueff, an editor for whom Debove oversaw the Bibliothèque Charcot-Debove, which would become famous. This collection included pocket paperbacks with around 250 pages, a brand new concept at the time. Several dozen authors wrote for this collection, such as Victor Hanot (1844–1896), Jules Séglas (1859–1939), Paul Sollier (1861–1933), and Ernest Mosny (1861–1918). Debove was member of the Académie de Médecine (1893), where he improved the scientific quality of the bulletin and was tasked with the eulogies of Charcot, Louis Pasteur (1822–1895), Marcellin Berthelot (1827–1907), Valentin Magnan (1835–1916) and Alfred Fournier (1832–1914). With the death of Paul Brouardel (1837–1906), he became dean of the Faculté de Médecine. His authority calmed the vehement student protests taking place at the time. Caricatures depicted him holding a club! As dean, he tried to put an end to his disagreement with Charles Bouchard (1837–1915). During the 1892 *agrégation* exam, for which he was a member of the jury presided over by Bouchard, a bitter quarrel between Bouchard and Charcot had led Bouchard's students, entirely forgotten by now, to obtain positions to the detriment of Joseph Babinski and Georges Gilles de la Tourette, the two protégés of Charcot. The breach between Bouchard and Charcot, on one hand, and Bouchard and Debove, on the other, became impassable [35]. Yet, according to Charles Achard (1860–1945), Debove tried to ease this nearly 20-year conflict by supporting Georges-Henri Roger (1860–1946), a brilliant student of Bouchard, in his bid for a professorship. Paradoxically, Debove did not have students himself and never succeeded in developing a school like the one where he trained at La Salpêtrière. Achard tells us: 'Debove criticized quickly, but wasn't inspiring and above all did not direct the work of his students'. The diversity of his areas of interest, which he rapidly developed before passing on to others, and his critical and caustic mind doubtlessly stood in the way of his posthumous fame, although World War I forced him to extend his very long career and only left him with a short retirement before he passed away from cancer.

In a hand-written letter dated 7th March 1906, Jean-Baptiste Charcot offered his father's library to the Assistance Publique (public hospital system in Paris). After acceptance of his gift, he wrote to the director: 'Thank you very much for your kind letter. My reception by the Assistance Publique differs significantly from the way I was received by the dean of the Faculté de Médecine...'. At the time of the inauguration, he thanked the director of the Assistance Publique, who 'had accepted with as much grace as another had grudgingly refused, tormented by a cynical demon that would have been the joy of exorcists, whose feats are detailed in these books, and on whom I do not wish to elaborate in this place filled with the memory of his teacher' [36, 37]. Does Debove's attitude reflect an old grudge arising from his not being included among the founders of the Société de Neurologie?

Antoine-Auguste Pierret

During a lesson in June 1868 Charcot presented 'two cases of progressive muscular atrophy with lesions in the grey matter and the anterolateral tracts of the spinal cord'. But the first complete publication on amyotrophic lateral sclerosis, known as Charcot's disease in Europe and Lou Gehrig's disease in North America, was published in 1874 [3].

Born in Verdun, Antoine-Auguste Pierret (1845–1920) became house officer in 1871 and succeeded Debove in Charcot's department in

1874. Charcot directed him towards his laboratory. Together they published the results of their research in a paper entitled *'L'altération de la substance grise de la moelle épinière dans l'ataxie locomotrice, considérées dans leurs rapports avec l'atrophie musculaire qui complique quelquefois cette affection*' (Alteration of spinal cord grey matter in locomotor ataxia, considered in its relation with the muscular atrophy that sometimes complicates this affection) in the *Archives de physiologie.* Pierret defended his thesis, '*Les symptômes céphaliques du tabes dorsalis*' (Cephalic symptoms of tabes dorsalis), in 1876, in which he contested all influence of the cerebellum in ataxia. He also highlighted trigeminal nerve and auditory nerve lesions in tabes to confirm the essential role of lesional damage to the dorsal cords and roots. Shortly afterwards, he became professor of anatomical pathology when the new medical school in Lyon opened in 1877 [16, 38]. Before he became Charcot's house officer, he started an anatomical pathology study on spinal cord development in human beings compared to animals, which was published in the *Archives de Physiologie* in September 1873. Similar studies were published two weeks later in *Archiv der Heilkunde* by Paul Flechsig (1847–1929) of Leipzig. Pierret laid claim to this work in no uncertain terms:

> I intend to contest Mr. Flechsig's claim that he discovered this law: that the physiologically distinct regions of the nervous system undergo special anatomical development that is most often sufficient to predict their pathological aptitudes. This law, which Mr. Flechsig did not hesitate to present as a new result of his research, is the fruit of my own research, already completed under the direction of Mr. Charcot at La Salpêtrière Hospital.

His expertise led him to study the anatomy of the trigeminal nerve in depth, and once again, comparative anatomy involving 'lower vertebrates' [39]. Because he experienced repeated fainting spells in the laboratory, probably due to formaldehyde poisoning, he was given permission to vacate his chair for the chair of mental illness.

He was known for his clinical psychiatry classes held at the Bron asylum. Drawing inspiration from Charcot he gave informal speeches attracting large numbers of curious listeners from outside the medical community. They took great pleasure in his colorful eloquent use of language, which he combined with his acting talent to mimic patients, using his charisma to carry it all off. With his research he attempted to demonstrate that infection or poisoning could be the cause of mental illness [38]. Finally, history remembers him for his role as legal expert in the 'Vacher case'. Joseph Vacher (1869–1898), a serial killer nicknamed 'the South-East ripper', was a soldier known for his violence. He was placed in an asylum in 1893 after having shot a young woman who refused to marry him. He then shot himself, which resulted in deafness and facial paralysis. A medical-legal report found him to be suffering from mental alienation with persecutory delusions that meant his was not responsible for his actions. After spending a year in the asylum, he was discharged and declared sane. As a vagrant with no means to support himself, he murdered his first victim a month later. Eleven other appalling murders followed, provoking strong public condemnation due to the genital mutilation his victims had to endure. He was only arrested in 1897, when he was caught in the act. The case was widely talked about, especially because Vacher offered his confessions in a statement addressed to the country which was published in *Le Petit Journal*, a daily Parisian newspaper. A huge public campaign brought into opposition those who believed his mental illness meant he was not responsible for his acts and those who believed in the legitimate necessity to rid society of dangerous criminals like him. The examining magistrate, unsatisfied with the first expert report which found Vacher not responsible, named three prominent medical experts from Lyon: Alexandre Lacassagne (1843–1924), professor of forensic medicine, Auguste Pierret, and Fleury Rebatel (1845–1905), director of the asylum in Lyon. They rendered their

findings in 1898: Vacher was a sadistic murderer and con artist fit for condemnation. He was executed. The final report illustrated a major change in psychiatric expert witnesses at the end of the century. Although alienists would have probably considered Vacher as not responsible for his actions during the first third of the 19th century, the experts in 1897 reconciled the diagnosis of psychiatric abnormality with the acknowledgement of criminal liability in their assessment [40, 41]. This position foreshadowed a process of holding mental patients accountable for their actions that would remain controversial a century later… In 1976 film director Bertrand Tavernier used this story for the making of *The Judge and the Assassin*.

Albert Pitres (1848–1928)

Fulgence Raymond became house officer under Charcot in 1875, when the latter was devoting the major part of his classes to cerebral localization. Together they described post-poliomyelitis syndrome.

Raymond's successor was Albert Pitres (1848–1928). Born in Bordeaux, the son of a grocer, he started his medical studies at the Ecole de médecine, which had not become a university yet. After his house officership in Bordeaux from 1867 to 1869, he became house officer at the Paris hospitals in 1872 and started working for Charcot in 1876. He defended his thesis under the direction of Charcot on 26 May 1877 with Charles Lasagne (1816–1883), Albert Blum and Georges Hayem (1841–1933) as members of the committee *Recherches sur les lésions du centre ovale des hémisphères cérébraux, étudiées au point de vue des localisations cérébrales* (Research on lesions of the centrum ovale in the cerebral hemispheres, studied from the viewpoint of cerebral localisations). Only a year later, he passed the *agrégation* exam with his thesis on cardiac enlargement and dilation independent of valve lesions.

Henri Gintrac (1820–1878), his first teacher in Bordeaux and the first dean at the new medical school, called on him to teach histology, a discipline he had learned at the laboratory of Louis Ranvier (1835–1922) at the Collège de France in Paris. In 1881, at the age of 32 years, Pitres became chair of clinical medicine until 1919. In 1885, at the age of 37 years, he became dean of the medical school in Bordeaux and remained in that position for over 20 years, anticipating the birth of medical specialities and the need to create their corresponding chairs [42, 43]. The year spent with Charcot marked his entire career. He was so inspired by the anatomical-clinical method that he never abandoned the research on cerebral localizations he had started for his thesis [44]. After Jean Flourens (1794–1867) conducted decortication experiments on frogs and pigeons, he concluded that the cortex was not implicated in moving the extremities. Gustav Fritsch (1838–1927) and Eduard Hitzig (1838–1907) in Germany proved the role of the cortex in movement by publishing, in 1870, the findings of their electrostimulation experiments on the cortex in dogs. It is important to bear in mind the historical context of France's military defeat against Prussia during this period. A race to make discoveries began between the two banks of the Rhine. In collaboration with his friend Nicolas François-Franck (1849–1921), Pitres conducted his research on monkeys. Linked to Charcot's clinical studies and autopsies, the work of Pitres helped to describe the motor centers of the face, tongue and vocal cords and for ocular motility, among other things. In 1895, Charcot and Pitres summed up their discoveries in a book entitled *Les centres moteurs corticaux*. Pitres was thus able to demonstrate that next to the crossed pyramidal tract a direct pyramidal tract existed, which explained certain dissociated forms of hemiplegia [45].

Just like his teacher Charcot, Pitres gave clinical lessons on hysteria, without diverging from the principles of La Salpêtrière. This led him to publish two large volumes in 1891, *Leçons cliniques*

sur l'hystérie, prefaced by Charcot. This introduction gave Charcot the opportunity to justify his position:

> It is with great satisfaction that I see your studies confirm the research results obtained at La Salpêtrière on the same subjects, not only the essential points, but in most cases even down to the smallest details. The legitimacy of our descriptions has been drawn into question on several occasions by objections that the patients who served as our models, as they were confined to a special ward, must have been subject to a sort of learning through mutual contamination, thus acquiring a strange and excessively complicated symptomatology, which does not correspond to normal cases. This is why a unique type of hysteria at La Salpêtrière has been alluded to, albeit never with any proof, an artificial, cultivated hysteria, improved so to speak by education, which would not be observed in other environments. For many years, we have been responding to this criticism, solely based on purely speculative views, by presenting numerous clinical facts, for example showing that relative to an attack of *grand hystérie*, 'imitation' and 'suggestion' – considered to modify morbid appearance, and while very interesting to study – are relatively restricted and strongly limited in their role, contrary to what has been gratuitously suggested. In reality, the modifications produced by these causes only affect the surface; they alter neither the foundation, which is to say the framework, nor the general evolution of morbid phenomena. 'The framework of the structure', as Paul Richer ingeniously expressed it in his beautiful, well-known book, 'remains the same; only the embellishment differs'. At the same time we demonstrated with the help of appropriate clinical facts, that the rules governing the constitution and progression of an attack are the same both within and outside the hospital; they are valid for all times, in all countries, for all races, and the variations they are subject to do not affect their universality, because they can always be logically reconnected to the classic case. I am happy to observe that your lessons also lend strong support to the thesis I am defending. They peremptorily prove that hysteria is absolutely no different in the Provinces than it is in here Paris, provided that the available neuropathological means are sufficient to cover all its forms, and to reveal its major aspects.

Towards the end of his life, after Ernest Dupré (1862–1921) had developed the topic of mythomania, Pitres humbly acknowledged his errors. Pitres wrote *Les obsessions et les impulsions* in collaboration with Emmanuel Régis (1855–1918) based on the concept of Charles Féré (1852–1907), Jules Séglas (1856–1939) and Gilbert Ballet (1853–1916) to the effect that 'fixed ideas have their origin in emotion'. They all described types of compulsions, insisting on the etiological concept of 'degeneration'. Pitres wrote the article 'Encéphale' in Dechambre's *Dictionnaire Encyclopédique des Sciences Médicales* (1864–1889), and he wrote *Contribution à l'étude des névrites périphériques non traumatiques* (Contribution to the study of non-traumatic peripheral neuritis) with Louis Vaillard (1850–1935) in 1883. This same year Pitres directed the thesis of Célestin Sieur (1860–1955) which described the practice of striking the chest with a piece of metal during stethoscopic auscultation to assess pleural effusion, referred to in French as the penny sign. In 1925 he collaborated with the anatomist Léo Testut (1849–1925) on a treatise for medical students entitled *Les nerfs en schéma, anatomie et physiopathologie* (Nerve diagrams, anatomy and physiopathology). Pitres had already taken part in the war of 1870. Despite his age he directed a neurological centre during World War I. A member of the Académie de Médecine and recipient of many honors, he passed away at the age of 80 years after a bad fall [45].

In 1877 Charcot wrote his lesson *De l'influence des lésions traumatiques sur le développement des phénomènes hystériques* (The influence of traumatic lesions on the development of hysterical phenomena). This text indicated that Charcot was carefully exploring what triggered hysteria. During this time Victor Burq (1823–1884) conducted his experiments on metalloscopy and metallotherapy that Charcot had authorized him to perform in his department [3].

Paul Oulmont

Paul Oulmont (1849–1917), born in Epinal, succeeded Pitres. Curiously, he was born and died on the same years as Jules Dejerine. His name remains linked to his passion as a collector of drawings. Having no children, he bequeathed his collection to the museum of his native city where

it can still be seen [46]. A room at the Bichat Hospital in Paris was named after him in 1931 [4]. He became Charcot's house officer in 1877, preparing a thesis which he defended in 1878: '*Etude clinique sur l'athétose*' (Clinical study on athetosis). William Alexander Hammond (1828–1900) had described this recently isolated condition in New York in 1871. It is still called Hammond's disease today. Oulmont suggested that Charcot had described the symptomatology in his 1853 thesis, in the section on primary asthenic gout. Charcot incontestably distinguished hemichorea from hemiathetosis during his lessons in 1876. He associated the hemiathetosis with hemianesthesia caused by a lesion on the posterior part of the internal capsule. Moreover, Charcot had directed the thesis of Fulgence Raymond on this topic in 1876. Oulmont presented three observations collected in Charcot's department as well as others presented by Louis Delasiauve (1804–1893), Désiré Bourneville (1840–1909) and Adrien Proust (1834–1903), together with a review of the English-language literature. He distinguished acquired forms caused by hemiplegia and forms beginning in childhood. Finally, he mentioned double athetosis without ever having seen a case and associated it with brain atrophy even before the anatomical pathology had been precisely established [47]. As a hospital physician, Oulmont spent a large part of his career at the hospital in Tenon. It was he who summarized Charcot's lessons on tuberculosis and caseous pneumonia in the *Revue Mensuelle de Médecine et de Chirurgie* in 1877. Working with Gilbert Ballet (1853–1916) he wrote *Les spasmes musculaires au début des mouvements volontaires* (Muscular spasms at the beginning of voluntary movements), referring to Thomsen's disease, in 1882. He was then asked to write the chapter on Thomsen's disease in Dechambre's *Dictionnaire Encyclopédique des Sciences Médicales* (1864 to 1889), as well as the chapter on infantile spasmodic hemiplegia. His name was associated with Georges Guinon for the description of diabetic neuropathy (1886), with Henri Parinaud (1844–1905) for a description of neuralgia with periodically reoccurring ocular paralysis, with Albert Londe (1858–1917) for the role of mercury intoxication in tics (1885), and with Edouard Brissaud for facial nerve paralysis in hysterical hemiplegia (1887). In 1894 he published a book entitled *Thérapeutique des névroses* and in 1907 *L'obésité, symptomatologie et étiologie, anatomie et physiologie pathologiques* with gastroenterologist Félix Ramond (1871–1960). Finally he took an interest in the 'paralysis of the Isthmus of Panama', demonstrating that the workers digging the Panama Canal were suffering from beriberi (1887) [48].

The Glory Years

In 1881 Charcot triumphed at the International Medical Congress in London. In 1882 the chair of nervous system disorders was created for him. He was welcomed into the Académie des Sciences in 1883 [3]. During the glorious years, from 1878 to 1884, his most famous house officers worked in his department: Paul Richer (1878), Edouard Brissaud (1879), Gilbert Ballet (1880), Charles Féré (1881), Pierre Marie (1882), and Georges Gilles de la Tourette (1884). Only Antoine Bernard (1853–1891), house officer in 1883, has remained unknown. He was born in Marseille and defended his thesis, *De l'aphasie et de ses diverses formes*, to a jury which included Charcot in 1885. His thesis contained the famous explicative drawing by Charcot called *The Bell*, showing the perceptive and expressive aspects of aphasia. Two commercial editions of his thesis were published in 1885 and 1889, relating the experiments conducted for Charcot at La Salpêtrière Hospital. His only other publication, written while he was a house officer in 1883, is entitled *Un cas de suppression brusque et isolé de la vision mentale des signes et des objets* (A case of abrupt and isolated suppression of signs and objects from mental vision). He died at the age of 38 years.

Georges Guinon

Following Bernard, Georges Guinon (1859–1932), who began his house officership in 1883, entered Charcot's department in 1885, while Freud spent 4 months at La Salpêtrière working on the German translation of Charcot's third volume on diseases of the nervous system. Guinon succeeded Georges Gilles de la Tourette as *chef de clinique* in 1888–1890. When Charcot reached the summit of his career and served as physician to the world's important figures, he felt the need to hire 'a secretary' for his private practice. This role was played by one of his assistants at La Salpêtrière who examined the patients beforehand and became an intimate part of his family as well as his personal and professional life. Guinon was the last of the four secretaries, following Charles Féré, Pierre Marie and Georges Gilles de la Tourette [3]. In his *Charcot intime* published in 1925, the year his teacher would have turned 100, he discussed the contradictions that came with his status [49]:

> Charcot felt a paternal responsibility towards his students, who called him *'patron'* or 'boss', just like his entire family did. Mrs. Charcot was *'la patronne'*, helping the house officers with their trials and tribulations. When we needed something from the *patron* and were not sure if he would accept, we asked Mrs. Charcot to ask for us. And it always worked in our favour if, of course, we did not ask the impossible.

Léon Bernard (1872–1934) wrote [50]:

> In all aspects of his person, his emotional as well as his intellectual being, Guinon had been absorbed by the famous personality, whose esteem he considered as the honor of his life. Its memory remained alive for him, like the memory of a great love. Guinon was a simple and straightforward soul. When Charcot suddenly passed away, he faltered; everything he had planned, all high hopes for his life came crashing down; he left.

This testimony explains the affectionate tone of *Charcot intime*. The deep bereavement gave his career an unexpected and unique turn, which was unusual for a brilliant student of Charcot [51].

Shortly after his teacher's death he left for Normandy where he worked as a family physician. Later he set up his practice near Douarnenez harbor in Brittany, where he was known as a discreet and extremely devoted physician until 1919, comforting the families that lost their loved ones during World War I. In 1919 he joined Léon Bernard and the fight against tuberculosis by becoming a medical inspector for the Office Public d'Hygiène in Seine, which the new Léon-Bourgeois law had set up in every French *département*. According to Bernard, he hoped to help the first and most needy victims of this plague, which was very widespread at the time. Despite the direction his professional life took, his neurological career at La Salpêtrière had had a very promising start. He was the one to report that Charcot 'would not tolerate any attacks on the doctrines of La Salpêtrière, which was to say his doctrines'. Guinon was first interested in convulsive tic disorder, recently described by Gilles de la Tourette, adding to the initial description the frequent association of phobic disorders such as arithmomania or onomatomania, depressive episodes and uncontrolled aggressive behavior. The similarity he found between motor tics and exhausting behavioral tics has been validated in our times, now that electrostimulation techniques applied to the basal ganglia can improve these different conditions. In the title of his first work, Gilles de la Tourette had mentioned 'motor incoordination'. Guinon contested this term, showing that the movements were involuntary but correctly coordinated. While Gilles de la Tourette described the development of the disease as continuous and the aggravation as progressive, Guinon argued that the development fluctuated, including periods of remission with decreasing symptoms. On the other hand and in contrast to Charcot, Guinon thought the disease to be a form of hysteria. Guinon wrote the chapter entitled 'Tics' in Dechambre's *Dictionnaire Encyclopédique des Sciences Médicales* in 1887; his differential diagnoses, notably with dyskinesia, neuralgia of the trigeminal nerve and chorea, were more detailed

than Gilles de la Tourette's. He suggested maintaining the term convulsive tic disorder while Charcot called it Gilles de la Tourette's syndrome [52]. Did he feel any acrimony? Not likely, because when Rose Kamper, a deranged patient, shot Gilles de la Tourette, he was the first to help 'his friend', as he warmly recounted in the article in *Progrès Médical* a few days later. Guinon defended his thesis in 1888; it was published as a book in 1889: *Les agents provocateurs de l'hystérie* (Agents causing hysteria). In it he clearly indicated that Charcot perceived hysteria as a consequence, a means by which the patient resisted an external cause, examining 'nervous shock' (trauma, earthquakes, lightning), severe infectious diseases, overwork, chronic intoxications (alcohol, lead, mercury), or other organic diseases (tabes, multiple sclerosis). He also talked about the existence of masculine hysteria, described by Charcot, and mentioned an impressive statistic: hysteria had been diagnosed in 244 of 3,168 consultations in 1886 at La Salpêtrière Hospital. He considered the role of heredity in this pathology as important, as did Gilles de la Tourette; thus, diverging slightly from Charcot, who saw heredity as modestly important and linked to an acquired 'dynamic lesion'. Shortly before Charcot passed away, he confided to Guinon: 'My conception of hysteria is outdated and the description of the nervous pathology has to be revised' [53]. In July 1886 and with Pierre Marie, he published in the *Revue de Médecine* a statement entitled: 'Sur la perte du réflexe rotulien dans le diabète sucré' (Loss of the patellar reflex in diabetes mellitus). It described diabetic neuropathy and explained the differential diagnosis with tabes:

> Suppose we have a patient presenting the following phenomena: suppression of patellar reflexes, searing pain, slight stagger with eyes closed, gradually decreasing vision, problems with urination, decreased erectile function – everything you need to diagnose tabes. But then you discover sugar in the urine sample; you are not looking at tabes any more but at diabetes.

Finally, as Charcot's secretary he played a major role in the publications of La Salpêtrière. He helped write *Leçons sur les maladies du système nerveux faites à La Salpêtrière* (Lessons on nervous system disorders given at La Salpêtrière Hospital) and contributed to *Nouvelle Iconographie de La Salpêtrière*. In the third volume published in 1890, he co-authored a section on hysterical yawning with Georges Gilles de Tourette and Ernest Huet. It was inspired by Charcot's Tuesday lesson of 23 October 1888, describing an amenorrheal young woman with bitemporal hemianopsia who yawned 480 times an hour from the time she woke up until she went to sleep [54]. Finally he was the author of several chapters in the 1891 *Traité de Médecine* by Charcot, Bouchard and Brissaud: disorders of pons, cerebellar peduncles and medulla oblongata; extrinsic disorders of the spinal cord; and disorders of the meninges.

Paul-Adrien Berbez

Paul-Adrien Berbez (1859–?), already a non-resident student under Charcot in 1882, succeeded Guinon in 1886. He had his portrait painted by Brouillet in *La Leçon clinique à la Salpêtrière*, where he sits to Brissaud's right, in front of Jean-Baptiste Charcot [21]. His thesis, defended to a jury including Charcot in 1887, described the experiments on hysteria: '*Hystérie et traumatisme, paralysies, contractures, arthralgies, hystéro-traumatisme*'. Influenced by the 1865 book *L'introduction à la médecine expérimentale* by Claude Bernard (1813–1878), Charcot encouraged the writing of this thesis to explicate the physiological interpretation he wanted to give the phenomena he described, thus distancing himself from the empirical approach of his predecessors.

In 1887, Charcot and Richer published *Les démoniaques dans l'art* (The possessed in art). In a review, Pierre Marie commented in *La Revue Neurologique* of 1887 [55]:

> They carefully analyzed them (cf. the works of art), separating what was created by pure imagination from what was the fruit of knowledgeable and sometimes

brilliant observation, to establish the documentary value of these diverse works. They also irrefutably demonstrated that the supposed convulsions of the possessed were simply hystero-epileptic attacks and, from this point of view, the characteristics of hysteria in past centuries were no different from the ones we observe today.

Paul-Oscar Blocq (1860–1896)

In the same year as Charcot and Richer's publication, Paul-Oscar Blocq (1860–1896) joined Charcot. He was among the brilliant physicians who seemed to have such promising contributions to make to medical progress, but whose careers were cut short. He became a house officer in 1882, and after having worked with Simon Duplay (1836–1924), Xavier Gouraud (1837–1906), Victor Audhoui and Maurice Letulle (1853–1929), he spent his last year with Charcot. His thesis '*Des contractures*', defended in 1888, was inspired and directed by Charcot [56]. He was assisted by Pierre Marie, *chef du laboratoire*, and Joseph Babinski, *chef de clinique*, and Paul Richer provided the illustrations. His thesis described the works of Brissaud on the auscultation of muscles:

> During permanent muscle contracture in hemiplegics, there is a clear difference between the regular and sonorous rolling produced by contraction, and the weak and irregular sound emitted by contracture.

He clearly laid out the clinical and anatomical-pathological differences between permanent contractures in hemiplegia and multiple sclerosis on the one hand, and contractures that he defined as spasmodic and hysterical in origin on the other, which would today be considered as forms of dystonia. In collaboration with a Romanian student who worked with Charcot for a short time, Georges Marinesco (1864–1939), he published a case of Parkinson's disease secondary to a tumor in the substantia nigra. This case became the basis for the theory that this structure did not function properly in Parkinson's disease, which was defended by Brissaud. Again with Marinesco, he was the first to describe senile plaques in epilepsy in 1892. Despite his death at the age of 36 years, he had time to write several books: *Atlas der pathologischen Histologie des Nervensystems* (Atlas of the pathological histology of the nervous system) with Victor Babès (1854–1926), published in 1892 in Berlin; *L'anatomie pathologique de la moelle épinière* (Anatomical pathology of the spinal cord) in 1891, written with Albert Londe (1858–1917) and with a preface by Charcot; *Les troubles de la marche dans les maladies nerveuses* (Walking disorders in nervous diseases) in the Charcot-Debove library; and *Maladies nerveuses, sémiologie et diagnostic* for family physicians. In the *Traité de Médecine* by Charcot, Bouchard and Brissaud, he wrote the chapter on general paralysis with Gilbert Ballet (1853–1916). He also wrote the chapter on chorea in the first edition, and added a chapter on myoclonus in the second edition. Charles Richet (1850–1935) asked him to write the article on agraphia in his dictionary of physiology published in 1895. On 18 November 1892, during a meeting of the Société Médicale des Hôpitaux, Babinski presented in Blocq's name an instrument for studying reflexes that was built by the manufacturers Mathieu [57]. Babinski made the widely known reflex hammer that bears his name, but its form appears to have originated in the mind of Blocq. Here is the description given by Babinski [58]:

> Concerning percussion, it is not to be done with the ulnar edge of the hand, although many still do so. One disadvantage of this procedure is that the impact is spread over too large an area. A reflex hammer, available in different models, is indicated. Here are two that I use most often. One consists of a 20 to 25-cm nickel-plated steel handle, attached to the centre of a disk made of the same material, with a rubber ring around the hollowed groove at its circumference. The second specimen has the advantage that it can easily be stored in a pocket. The handle is similar to the first specimen, but a rectangular plate, in the same plane as the handle, replaces the disk; it also has a rubber ring in its peripheral groove. These hammers are made of elastic material, well suited to their function.

But his posthumous fame is essentially due to his seminal description of astasia-abasia, which

refers to the inability to stand or walk, although the patient can move the lower extremities normally when lying down. Curiously, while he linked the onset of the problem to a strong emotion, he distinguished it from hysteria, but accurately noted how it differed from cerebellar ataxia. Following Blocq, Paul Berbez, Joseph Grasset (1849–1918), Paul Ladame (1871–1919) of Geneva, José-Dantas Souza Leite and others published comparable observations. Whether it was Pierre Marie, Hermann Oppenheim (1858–1919) in Berlin, Adolf Strümpell (1853–1925) in Erlangen, Samuel Kinnier Wilson in London or Emil Kraepelin (1856–1926) in Mecklenburg, all referred to the article by Blocq to describe the clinical picture today considered as a somatoform disorder [59, 60].

During that same time Charcot published *Les leçons du Mardi* (The Tuesday lessons), covering the years from 1887 to 1888. The first handwritten edition included magnificent lithographs. Alphonse Daudet thanked Charcot for the copy he had sent him [3]:

> Limpidity, solidity, concision and these broad strokes *à la Tacitus* coming from both a poet and an observer, that is what captured me in your book, which I read despite fever and pain. But you know that, until now, the man of letters and the dreamer are still stronger than the tabetic. Thank you, dear teacher and friend, to have thought of your old invalid.

Ernest Huet

Ernest Huet (1858–1917) became Charcot's new house officer in 1888 [61]. Trained at the medical school in Caen, he was house officer under Charles Lailler (1822–1892) at Saint-Louis Hospital and Jules Dejerine (1849–1917) at Bicêtre Hospital. He defended his thesis under the direction of Charcot on 26th July 1889. Charcot himself had suggested the subject after the session on Tuesday 24th July 1888, dedicated to chronic chorea, described by Georges Huntington (1850–1916) in 1884 in New York. During this session Charcot had expressed skepticism about heredity in this perfectly described clinical picture, which associated abnormal movements and progressive intellectual degradation. Huet developed family trees based on five personal observations, those of Landouzy, Charcot and Joffroy as well as cases published by Dejerine in 1886 in his book *L'hérédité dans les maladies du système nerveux* (Heredity in diseases of the nervous system). He concluded that these cases progressed through 'transformation heredity', when the disease started during childhood, or through 'similar heredity', when it started in each successive generation after the age of 30 years. Huet dwelled on the differential diagnosis with general paralysis, locomotor ataxia and the very recent description of convulsive tics by Gilles de la Tourette. After having reviewed all published cases, notably in England, a case by Charcot, and Pierret's cases in Lyon, he concluded with disappointment: 'The anatomical nature of chronic chorea, as in acute Sydenham's chorea, is still unknown' [62]. Huet frequently assisted Charcot during the Tuesday lessons, and his name was associated with numerous La Salpêtrière publications. For example, an appendix to the first volume of Charcot's *Leçons du Mardi de La Salpêtrière*, written by his house officer Huet, covered the autopsy of a case presented by Charcot on 27 March 1888. In the *Nouvelle Iconographie* of 1890, he co-authored, amongst others, the above-mentioned observation on 'hysterical yawning' with Guinon and Gilles de la Tourette [54]. But above all Huet created the department of electrotherapy located close to his teacher's department. He practiced there for 25 years, still devoting himself to the care of World War I victims a few days before he succumbed to pneumonia [63]. His major experiment became apparent in the chapter 'Applications de l'électricité au diagnostic et au traitement des maladies du système nerveux' (Applications of electricity to the diagnosis and treatment of nervous system diseases) in the book *La Pratique Neurologique* by Pierre Marie, published in 1911 and richly illustrated with the devices used [64].

Adolphe Dutil

Adolphe Dutil (1862–1899?) succeeded Huet in 1889. He had started as a non-resident student with Charcot in 1882, who evaluated him as 'a highly educated student; will make a good house officer in medicine'. Ranking third in the house officer exam in 1884, he worked with Charles Peter (1824–1893) in 1887, then with Carl Potain (1825–1901) in 1888 before returning to Charcot in 1889. Peter noted in his records: 'Very highly trained, will become a hospital physician'. Potain went even further: 'I consider him one of the best house officers I have ever had in my department'. Charcot merely spoke of 'a highly distinguished house officer'. In 1891, directed by Charcot, he wrote his thesis entitled: *Contribution à l'étude clinique du tremblement hystérique* (Contribution to the clinical study of hysterical tremors) [65]. The thesis seems muddled, mixing hyperthyroidic tremors, postural tremors and other types, all qualified as hysterical tremors, in contrast to the tremors in 'agitated paralysis'. Dutil was Charcot's last *chef de clinique*. He participated in several publications in the *Nouvelle Iconographie de La Salpêtrière*. Shortly after Charcot's death he apparently stopped writing, and we were not able to determine the exact date of his death.

Emile Parmentier

In 1889, Charcot published the second volume of his Tuesday consultations, covering the years 1888–1889. Emile Parmentier (1860–1940), from the *département* of Nord, succeeded Dutil in 1890. He studied in Valenciennes then came to Paris for his medical studies. He became a house officer in 1885, and successively studied under Victor Hanot (1844–1896), Victor Cornil (1837–1908), Germain Sée (1818–1896) and Georges Hayem (1841–1933). He received the gold medal for the best house officer thesis during his year with Charcot [66, 67]. During this year Guinon and Parmentier wrote *'Une complication peu connue de la sciatique, la paralysie amyotrophique dans le domaine du poplité'* (A little known complication of sciatica, amyotrophic paralysis of the popliteus muscle), published in *Les Archives de Neurologie*. In 1891 he published a detailed observation, *'De la forme narcoleptique de l'attaque de sommeil hystérique'* (Narcoleptic form of hysterical sleeping fits), in *Les Archives Générales de Médecine*, which he subtitled *'Pseudo-narcolepsie hystérique'*. The case description was meticulous, describing the absence of puberty at age 26 years, small frame, and extreme pallor referred to as chlorosis. The irrepressible urges to sleep triggered by an emotion perfectly correspond to narcolepsy, and may have been the effect of a pituitary pathology. In the third volume of *La Nouvelle Iconographie de La Salpêtrière* of 1890, the first part of a long article was published that would extend over several successive issues: *'De l'ophtalmoplégie externe combinée à la paralysie labio-glosso-laryngée et à l'atrophie musculaire progressive'* (External ophthalmoplegia combined with labio-glosso-laryngeal paralysis and progressive muscular atrophy). After having left Charcot he did not publish any other neurological work, but nevertheless became one of the twelve founding members of the Société de Neurologie [21]. Parmentier defended his thesis '*Etudes cliniques et anatomopathologiques sur le foie cardiaque*' (Clinical and anatomical pathology studies on cardiac liver) under the aegis of Hanot, who described hypertrophic cirrhosis of the liver with jaundice in 1875. Parmentier became a hospital physician in 1898. At first his main interest was pancreatic pathology, then hematology. In 1900 he compiled the lessons given by G. Hayem at Saint-Antoine Hospital: *Leçons sur les maladies du sang* (Lessons on the diseases of the blood). He wrote the chapter 'Blood' in the *Traité de Médecine et de Thérapeutique* of Brouardel, Gilbert and Girode in 1902. Behind his distant and cold demeanor he was possibly hiding shyness, as did Charcot. He enjoyed 15

years of retirement, an exceptional accomplishment at the time [67].

Jean-Baptiste Charcot, Louis Hallion and Jean-Félix Guyon

While *Les démoniaques dans l'art* was published in 1887, Richer and Charcot published *Les difformes et les malades dans l'art* (The deformed and the infirm in art) in 1889. The following year Bourneville published the last installment of the 'complete works' of Charcot in nine volumes. In 1891 Charcot visited Russia accompanied by his daughter and his son. His health took a turn for the worse. He suffered from chronic lumbar pain and had several attacks of angina [1, 3]. This same year Jean-Baptiste Charcot (1867–1936) became his father's house officer at the same time as Louis Hallion (1862–1940). Hallion, who became house officer in 1888, defended his thesis in 1892: *Des déviations vertébrales névropathiques* (Neuropathic spinal deviation). This work, inspired and directed by Charcot, was totally original and can be seen as the first description of scoliosis and kyphosis, revealing an underlying neurological pathology which Hallion described based on clinical observations: syringomyelia, spinal poliomyelitis, Friedreich's ataxia, tabes and general paralysis, multiple sclerosis, sciatica and hemiplegia [68]. However, his true passion would always be biology. Starting in 1893 he was head of the pathological physiology laboratory at the Ecole Pratique des Hautes Etudes and of the surgical laboratory of the Hôtel Dieu Hospital in Paris in 1897. During his collaboration with Camille Delezenne (1868–1932), he demonstrated the effect of stomach acid in stimulating pancreatic exocrine secretion using secretin, recently discovered by Ernest Starling (1866–1927). He was interested in bulbospinal vasomotor reflexes in nervous diseases (1895), and developed one of the first plethysmographic devices still used during World War I to select pilots for fighter planes [69]. Thoracic surgeon Théodore Tuffier (1857–1929) used the research on thoracic insufflations he conducted in 1896 to perform surgery on a collapsed lung. Following this, Eugène Doyen (1859–1916) treated tuberculosis patients with artificial pneumothorax [70]. Hallion was a pioneer in intensive care through his research on various sodium chloride solutions, laying the groundwork for understanding the physiopathology of edema. He was also the first to use artificial serums for which he imagined 'an artificial serum injection device'. In 1901, with Tuffier, he was the first to perform spinal anesthesia with cocaine injected as a sacrococcygeal epidural, and in the treatment of recurring sciatica. Jean-Marie Athanase Sicard (1872–1929) and Fernand Cathelin (1873–1945) spread the use of this therapeutic method, fighting over who should lay claim to it while neither deserved credit [71]. Hallion wrote the chapter entitled *'Anasthésie'* of the second edition of the *Traité de Médecine* by Charcot, Bouchard and Brissaud in 1905, as well as the chapters *'Maladie de Thomsen'* (Myotonia congenita) and *'Les pathologies des nerfs moteurs'*. His successful book *Pratique de l'opothérapie* was published in several editions. Starting in 1906, in the early days of immunology, he demonstrated the specificity of antibodies. From 1897 to 1899 he directed the journal *L'Intermédiaire des Biologistes*. The last years of his life proved difficult due to an incapacitating blindness and the accidental death of his son-in-law, René Gayet (1892–1939), professor of physiology at the medical school, and his successor at the Ecole Pratique des Hautes Etudes [69].

Henri Lamy

Henri Lamy (1864–1909) – house officer under Féré in 1889 and Brissaud in 1890, who admired his 'enthusiasm' – completed his house officership with Charcot in 1892. Charcot chaired the

committee for his thesis *De la méningo-myélite syphilitique: etude clinique et anatomopathologique* (Syphilitic meningomyelitis: clinical and anatomical-pathological study) on 29 July 1893, a little less than 3 weeks before he passed away. Lamy published it as a book, *La syphilis des centres nerveux*, edited by Masson in 1895. He dealt with the same topic in the fourth volume of the *Traité de Médecine* by Charcot, Bouchard and Brissaud in 1904. Lamy practised as a hospital physician at the Tenon Hospital where he had, among others, Gustave Roussy (1874–1948) as a house officer. Jean Guyon (1864–1907), son of the famous professor of urology Jean-Félix Guyon (1831–1921), was house officer under Charcot during the same year, after his house officerships with Potain (1890) and Bouchard (1891). Charcot noted: 'Very distinguished and hard-working house officer'.

Achille Souques

Achille Souques (1860–1944) was the last house officer under Charcot, in 1892. He won the gold medal for the best house officer thesis, which enabled him to extend his placement another year and included a scholarship that allowed him to travel. After Vienna and Budapest he visited the universities of Munich and Heidelberg. During his stay in Berlin he learned of the death of his revered teacher. He was profoundly affected. This event drastically changed his career plans. While he became *chef de clinique* under Edouard Brissaud (1852–1909), then under Fulgence Raymond (1844–1910), he did not attempt the competitive exam to become a university professor, as he should have. Brissaud paid tribute to him for his help during this interim period: 'During this year Mr. Souques was the true *chef de service*. I would not have been able to manage without his indefatigable support' [72]. Passing his house officer exam in 1886 with one of the highest scores, he was part of a prestigious year that included Paul Sollier (1861–1933), Ernest Dupré (1862–1921), Ernest Mosny (1871–1945) and Miss Klumpke, the future Mrs. Dejerine (1859–1927), among others. During his 2 years as house officer under Charcot, he formed lasting friendships with Jean-Baptiste Charcot (1867–1936), Maurice Nicolle (1862–1932), Henry Meige (1866–1940) and Hallion. Starting off as house officer under Charles Fernet (1838–1919), then under Anatole Chauffard (1855–1932), in whose department he treated the poet Paul Verlaine (1844–1896), he became a hospital physician in 1898 after his time as *chef de clinique*. Physician at Hôtel Dieu Hospital, then at the Hospice d'Ivry, he succeeded Pierre Marie (1853–1940) at Bicêtre Hospital before becoming *chef de service* at La Salpêtrière during World War I, where he opened a department specialized in the neurology of war [73, 74]. In 1899 he was one of the founders of the Société de Neurologie de Paris [21] and an officer. He was elected to the Académie Nationale de Médecine in 1918 and retired in 1926, thereafter devoting his time to poetry and the history of ancient medicine. In 1936 he published *Etapes de la neurologie dans l'antiquité grecque, d'Homère à Galien* (Stages of neurology in Greek antiquity, from Homer to Galen). Covering 15 centuries, he demonstrated that the Ancient Greeks knew about decussation of motor and sensory pathways, epilepsy, migraine, etc. Since he was born in Aveyron on the banks of the Tarn River, he also returned to speaking his childhood language of Occitan. He had a severe heart attack in 1939, but was devotedly nursed back to health by his students, notably Théophile Alajouanine (1890–1980). He developed mandibular cancer in 1942 and died on Christmas Eve 1944, relieved to have seen France liberated by the Americans [75].

Among Charcot's students, Souques best embodies his distinguished influence, taking the form of actual imitation. Pursuing the anatomical-clinical method, he completed the semiological and nosological work of Charcot. As a loved

and renowned teacher, he trained a group of students including Thierry de Martel (1875–1940), Charles Foix (1882–1927), Paul Harvier (1880–1960), the pioneer of neurosurgery Clovis Vincent (1879–1947), Alexandre Barré (1880–1967), Pierre Vallery-Radot (1889–1969), Théophile Alajouanine, Henri Baruk (1897–1999) and Ivan Bertrand (1893–1965). As a connoisseur of art and literature he travelled and visited the museums in Europe, and his language was polished and refined. Enjoying a close relationship with his students, he welcomed them to his *hôtel particulier* on Rue de l'Université in Paris, which was famous for its 2-storey library. The library was bequeathed to the Assistance Publique following his death [75]. It can still be partially seen at La Salpêtrière Hospital, combined with Charcot's library [36]. There is no area in neurology that he did not take interest in and it is impossible for us to mention all of his publications which reveal the pointillistic precision of his clinical examination. In his thesis, inspired and directed by Charcot in 1890, '*Etude des syndromes hystériques simulateurs des maladies organiques de la moelle épinière*' (Study of hysteric syndromes simulating organic diseases of the spinal cord), he argued, in keeping with the La Salpêtrière doctrine, that hysteria can trigger anything, from exaggerated reflexes to trophic problems. But after Babinski revised his work, he wrote:

> Babinski demonstrated that hysteria has no influence on the reflexes, that it cannot be the cause of trophic and vasomotor disorders, that hysterical paralyses and organic paralyses are of an intrinsically different nature. Thus it has become easier to distinguish hysteria from organic diseases of the spine, so easy that the problem has since disappeared.

His studies on Parkinson's disease can be considered a major contribution. In addition to the rigidity and tremors described by Charcot and Vulpian, Souques completed the clinical picture by adding 'suppression of associated movements', notably the loss of arm swinging during walking, and 'kinesis paradoxa', i.e. mutism suddenly giving way to clear expression, or the sudden and effortless release from a rigid position. He noted that the Parkinsonian syndrome following the encephalitis of Constantin Von Economo (1876–1920) was actually a manifestation of Parkinson's disease, contrary to the beliefs of the time. In 1911, he described prepuberal pituitary dwarfism caused by Rathke's cleft cyst with Stephen Chauvet (1885–1950), distinguishing it from the adiposogenital dystrophy described by Babinski-Froehlich. With Jacques Lermoyez (X-1923) and Théophile Alajouanine, he reported on the therapeutic efficacy of pituitary extracts in the treatment of diabetes insipidus. He collaborated with Pierre Marie to redefine the localization of aphasia by publishing three observations of aphasia caused by lenticular lesions. He coined the word 'palilalia' to describe incessant repetition of the same phrase [73, 75]. In 1915, Souques and Miss Rosanoff-Saloff proposed the term 'camptocormia' to describe curving of the spine with flexion of the hips, which can be diminished in decubitus. They encountered this condition in injured patients, and while they recognized the organic muscular origin in some cases they believed that most cases had a neurotic cause [76].

Souques left his name to several semiological signs, such as the interosseous phenomenon (when a hemiplegic is asked to lift his paralyzed arm, the contraction of the dorsal interosseous muscles results in fan-shaped finger extension of the paralyzed hand), or the eyelash sign (in mild peripheral facial paralysis the eyelashes on the paralyzed side seem longer while the eyes are being forced shut). Finally, Souques demonstrated that bone condensation, 'ivory vertebra', indicated metastasis, most often of prostate cancer, whereas previously the diagnosis of vertebral metastasis was only pronounced when the vertebrae were completely flat from compression [75]. Souques wrote the chapters on acromegaly, myxedema and exophthalmic goiter in the *Traité de Médécine* by Charcot, Bouchard and Brissaud of 1894. The

tribute paid by Théophile Alajouanine when he died sums up Souques' personality [73]:

> Your teacher Charcot was an outstanding *chef d'école*; you were modest enough not to try to step out from behind his School's shadow, but you were also a teacher in your own way, discreet and amiable, and the well-loved head of a big family of students who will reverently keep you in their memory.

Jean-Martin Charcot remains famous for his shrewd powers of clinical observation. The portrait gallery of his students presented here shows the degree to which he succeeded in surrounding himself with individuals of outstanding caliber. Able to appreciate all aspects of his students, he gave everyone the chance to make the best use of their talents by directing them towards the laboratory, anatomical pathology, clinical practice or towards a university career. Finally, we note how his 'dear Bourneville' assisted him behind the scenes. *Progrès Médical*, headed by Bourneville, published almost all the theses written under Charcot's direction. In this way the work of each student was rewarded and helped further the discoveries and ideas of the La Salpêtrière School, and thus of Charcot.

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House officership documents are courtesy of the Archives of the Assistance Publique – Hôpitaux de Paris, 7 rue des Minimes, 75003 Paris.

Appendix

J.-M. Charcot's 32 House Officers at La Salpêtrière Hospital from 1862 to 1893
1862 Henri Soulier 1834–1921
1863 Victor Cornil 1837–1908
1864 Charles Bouchard 1837–1915
1865 Jules Cotard 1840–1889
1866 Charles Bouchard 1837–1915
1867 Raphael Lépine 1840–1919
1868 Désiré Magloire Bourneville 1840–1909
1869 Alix Joffroy 1844–1908
1870 Jules-Aimé Michaud
1871 Jules-Aimé Michaud
1872 Albert Gombault 1844–1904
1873 Georges Debove 1845–1920
1874 Antoine-Auguste Pierret 1845–1920
1875 Fulgence Raymond 1844–1910
1876 Albert Pitres 1848–1928
1877 Paul Oulmont 1849–1917
1878 Paul Richer 1849–1933
1879 Edouard Brissaud 1852–1909
1880 Gilbert Ballet 1853–1916
1881 Charles Féré 1852–1907
1882 Pierre Marie 1853–1940
1883 Antoine Bernard 1853–1891
1884 Gilles de la Tourette 1857–1904
1885 Georges Guinon 1859–1932
1886 Paul Berbez 1859-?
1887 Paul Blocq 1860–1896
1888 Ernest Huet 1858–1917
1889 Adolphe Dutil 1862–1899(?)
1890 Achille Souques 1860–1944
1890 Emile Parmentier 1860–1940
1891 Jean-Baptiste Charcot 1867–1936
1891 Louis Hallion 1862–1940
1892 Jean-Félix Guyon 1864–1907
1892 Henri Lamy 1864–1909
1893 Albert Londe 1858–1917
1893 Achille Souques 1860–1944 (interne médaille d'or)

Les chefs de clinique de Charcot
1882 Gilbert Ballet
1883–1884 Pierre Marie
1885–1886 Joseph Babinski
1887–1888 Georges Gilles de la Tourette
1889–1890 Georges Guinon
1891–1892 Adolphe Dutil

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