



Charcot's international visitors and pupils from Europe, the United States, and Russia

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ABSTRACT

The foundation by **Jean-Martin Charcot** (1825–1893) of the Salpêtrière School in Paris had an influential role in the development of neurology during the late-nineteenth century. The international aura of Charcot attracted neurologists from all parts of the world. We here present the most representative European, American, and Russian young physicians who learned from Charcot during their tutoring or visit in Paris or Charcot's travels outside France. These include neurologists from Great Britain and Ireland, the United States, Germany and Austria, Switzerland, Russia, Italy, Spain, Belgium and the Netherlands, Scandinavia and Finland, Poland, Bohemia, Hungary, and Romania. Particularly emblematic among the renowned foreign scientists who met and/or learned from Charcot were **Charles-Edouard Brown-Séquard**, who had interactions with Paris University and contributed to the early development of British and American neurological schools; **John Hughlings Jackson**, who was admired by Charcot and influenced French neurology similarly as Charcot did on British neurology; **Silas Weir Mitchell**, the pioneer in American neurology; **Sigmund Freud**, who was trained by Charcot to study patients with hysteria and then, back in Vienna, founded a new discipline called psychoanalysis; **Aleksej Yakovlevich Kozhevnikov** and almost all the founders of the Russian institutes of neurology who were instructed in Paris; and **Georges Marinesco**, who established the Romanian school of neurology and did major contributions thanks to his valuable relation with Charcot and French neurology.

KEYWORDS

Brown-Séquard; Charcot; Freud; history of medicine; Hughlings Jackson; Kozhevnikov; Marinesco; Paris; Salpêtrière; Weir Mitchell

In European medical history, young doctors for centuries traveled to foreign countries for training. In the seventeenth century, they went to the most prestigious Italian medical schools in Padua and Bologna. **John Locke** (1632–1704), the English philosopher and physician (see *Encyclopedia Universalis*), went abroad a number of times for extra medical instruction in Amsterdam, Paris, and Montpellier. Dora Weiner's biography of **Philippe Pinel** (1745–1826), one of the pioneers of psychiatry, describes all the caretakers of the insane who visited the Salpêtrière hospital in the early 1800s to observe Pinel's moral treatment in action (Weiner 1999). By the middle of the nineteenth century, it was almost

de rigueur for ambitious academic physicians to do a stint overseas, especially for emerging disciplines as neuropsychiatry.

Neurology started to evolve in conjunction with psychiatry in many countries in the middle of the nineteenth century, especially in France, Britain, the United States, German-speaking countries, most of the other European countries, and Russia. Specialists were called *Neuropsychiatrists* in English; *Neurologistes* and *aliénistes*, then *Neuropsychiatres* in French; *Nervenärzte* in German; and *Zenuwartsen* in Dutch (Koehler 2007). It is acknowledged that the foundation by JeanMartin Charcot (1825–1893; see Figure 1) of the Neurological School at the Salpêtrière Hospital in Paris had a prominent influential role, as is developed below (Figure 2; see Broussolle et al. 2012; Clarac and Boller 2010; Goetz 2010). It should be remembered that, unlike other European countries such as Germany or Italy, everything was centralized in the French capital after the reigns of Louis XIV and Napoleon, thus giving only a minor role to other cities (Broussolle et al. 2012; Clarac and Boller 2010). In the middle of the nineteenth century, there were only three medical faculties in France—Paris, Strasbourg, and Montpellier. The other major provincial cities only had medical schools and became full medical faculties in the late-nineteenth and early-



Figure 1. Picture of Charcot by Nadar (Olivier Walusinski collection).



Figure 2. The Salpêtrière Hospital (photographic art work: E. Broussolle and P. Prince 2008).

twentieth centuries. This explains why most of the innovations in medicine in France occurred at that time in Paris, with the representative case of **Jean-Martin Charcot** (1825–1893), a native Parisian who founded the discipline of neurology.

Charcot did his medical studies in Paris and was appointed at the Salpêtrière, the largest hospital in Europe at that time, first as resident (intern) in 1852, then head of a department in 1862 (Goetz 2005, 2010; Goetz, Bonduelle, and Gelfand 1995; Nunn 1871). The Salpêtrière hosted women affected by chronic illnesses—notably, motor disability and epilepsy. Charcot understood the immense potential this offered for the study of neurological diseases, to which he increasingly devoted his career. In 1872, he was elected professor of pathological anatomy at the Faculty of Medicine of Paris. In 1882, he was appointed to the chair created for him as professor for the study of diseases of the nervous system (in French: *Chaire de Clinique des Maladies du Système Nerveux*). Charcot spoke several languages and had a scholarly knowledge of the neurological literature, not only in French but particularly in English and German, and also in Italian and Spanish.

Charcot's interests and achievements included amyotrophic lateral sclerosis, peripheral neuropathy, locomotor ataxia, spinal cord localization, multiple sclerosis, paralysis agitans, cerebral localization, aphasia, and hysteria (Broussolle and Reynolds 2021; Goetz, Bonduelle, and Gelfand 1995).

Charcot initiated a school of neurology based on the clinicopathological method established earlier by **René Théophile Hyacinthe Laennec** (1781–1826), and also due to his interaction with two pioneers in neurology—**Armand Trousseau** (1801–1867) and

Guillaume Benjamin Amand Duchenne, also known as **Duchenne de Boulogne** (1806–1875) (Broussolle et al. 2012; Reynolds and Broussolle 2018; Walusinski 2020a). He had in addition a fruitful cooperation and also friendship with **Edmé Félix Alfred Vulpian** (1826–1887), professor of anatomopathology, then experimental pathology at the Paris Faculty of Medicine (Pearce 2002; Broussolle, Poirier, Clarac, and Barbara 2012). Importantly, Charcot's influence was expanded by his many collaborators and pupils, notably **Paul Richer** (1849–1933) **Edouard Brissaud** (1852–1909), **Pierre Marie** (1853–1940), **Joseph Babiński** (1857–1932), **Georges Edouard Brutus Gilles de la Tourette** (1857–1904), and **Fulgence Raymond** (1844–1910) (Broussolle et al. 2012).

A special mention should be made of **Désiré Magloire Bourneville** (1840–1909), who was a talented editor who contributed to disseminate the work of the Charcot Neurological School, and to make Charcot renowned internationally. Indeed, Bourneville began in 1872 to publish the editing of Charcot's *Leçons sur les maladies nerveuses faites à la Salpêtrière*. Charcot's lessons were later translated into English and other European languages. Bourneville founded the journals *Le Progrès médical* and, with Charcot, *Archives de neurologie*. Most if not all of the medical thesis of the Salpêtrière Neurological School were published thanks to him. **Jules Dejerine** (1849–1917), who was born in Geneva, Switzerland, settled in Paris in 1871, where he studied pathologic anatomy with Vulpian (Broussolle et al. 2012). He headed a department at the Bicêtre hospital (1887), before moving to the Salpêtrière hospital in 1895. Dejerine was considered by Charcot as a competitor and had few interactions with him. **Pierre Janet** (1859–1947), one of the founders of clinical psychology, was a student of the prestigious *Ecole Normale Supérieure*, *agrégé* of philosophy and a doctor in medicine (Fouks et al. 1990; Havens 1966). His research attracted the attention of the recently founded *Société de Psychologie Physiologique* (Society of Physiological Psychology), presided over by Charcot and, with the support of his mentor, gave him a privileged place in the emerging French psychology at the Salpêtrière.

The large ascendancy of the Salpêtrière in France during and after Charcot's time prompted the emergence of leaders in neuropsychiatry outside Paris, as, for example, **Joseph Grasset** (1849–1918) in Montpellier; **Hippolyte Bernheim** (1837–1919) in Nancy, who questioned Charcot's approach of hysteria; and several Charcot's disciples, including **Albert Jean Pitres** (1848–1928) in Bordeaux and **Henri Soulier** (1834–1921), **Raphael Lépine** (1840–1899) and **Antoine Auguste Pierret** (1845–1920) in Lyon (Moulin et al. 2011).

Charcot studies, publications, teaching, and personality attracted colleagues and students not only from different parts of France but also from all over Europe, Russia, the United States, and South America (Broussolle et al. 2012; Gelfand 1994; Goetz, Bonduelle, and Gelfand 1995; Poirier 2013). This trend was pursued far beyond Charcot's death due to the leading role of his collaborators and successors.

Charcot attracting foreign neurologists

We here present an overview of the most representative European and also Russian and American young physicians who learned from Charcot during their tutoring or visit in Paris, or sometimes during Charcot's travels outside France. We conducted a literature search on PubMed and Google Scholar and consulted books on the history of neurology and

especially on Charcot books and teaching lessons. The training of young South American doctors in Paris is presented in another article in the same issue of the journal, whereas that of Asia, Africa, and Pacific territories, although of great importance, will not be taken into account, as the discipline of neurology was not established in Charcot's time in these countries, but created later.

Charcot's foreign pupils are presented according to their native country using the following order: Britain and Ireland, the United States, Germany and Austria, Switzerland, Russia, Italy, Spain, Belgium and the Netherlands, Scandinavia and Finland, Poland, Bohemia, and Hungary and Romania.

Great Britain and Ireland

It is largely recognized that the United Kingdom produced eminent pioneers in neurology since the seventeenth century as, for example, **Thomas Willis** (1621–1675) and **Thomas Laycock** (1812–1876) (Clifford Rose 2010). Laycock was born in Wetherby in West Yorkshire (Rollin and Reynolds 2017). After qualifying in medicine at University College in London, he became a lecturer in medicine at York Medical School from 1846 to 1855. There he overlapped with **Daniel Hack Tuke** (1827–1895) and both of them taught **John Hughlings Jackson** (1835–1911). We do not have evidence that Laycock met Charcot, but in 1835 he spent a session in Paris at La Pitié Hospital under **Jacques Lisfranc de Saint-Martin** (1787–1847) and **Alfred Velpeau** (1795–1867) (Rollin and Reynolds 2017). He absorbed the French clinical-anatomical-physiological method, which he imparted to Hughlings Jackson.

The development of neurology in the mid-nineteenth century was undoubtedly influenced by the almost simultaneous foundation—and interaction—of the Charcot School at the Salpêtrière Hospital in Paris and the leading neurologists at the National Hospital for the Paralyzed and Epileptic and its School at Queen Square in London (Broussolle and Reynolds 2021; Reynolds and Broussolle 2022). **Charles Edouard Brown-Séquard** (1817–1894), born in Mauritius in the Indian Ocean, was one of the first two physicians appointed to the National Hospital (for more details, see the section on the United States). Queen Square rapidly became a national center for the study and treatment of neurological diseases (Shorvon and Compston 2019). The first 13 part-time physicians appointed to the staff in its first 20 years (1860–1880) involved, in addition to Brown-Séquard, some of the most distinguished names in neurology, including Hughlings Jackson, **John Russell Reynolds** (1828–1896), **Edward Henry Sieveking** (1816–1904), **Henry Charlton Bastian** (1837–1915), **William Richard Gowers** (1845–1915), and **David Ferrier** (1843–1928).

The close link between Charcot and British neurology is well established. Charcot attracted a number of young British physicians to Paris. He was fluent in English and traveled many times to Britain and Ireland, including with his family (Coutinho et al. 2022).

Thomas Clifford Allbutt (1836–1925) was Leeds' most distinguished physician of the nineteenth century (Reynolds and Broussolle 2018). He spent a year in Paris with Armand Trousseau and Duchenne de Boulogne in 1860–1861, and also had the opportunity to meet Charcot. He continued to visit Charcot on numerous subsequent occasions (Broussolle and Reynolds 2021).

Charcot first traveled to London in 1861, where he visited several London teaching hospitals and the Hunterian Museum of the Royal College of Surgeons (Hierons 1993).

Charcot and Brown-Séquard attended the annual meeting of the British Medical Association (BMA) in Leeds in July 1869. There Charcot heard the presentation by Russell Reynolds on “Paralysis and Other Disorders of Motion and Sensation, Dependent on Idea” (Russell Reynolds 1869), which, together with his reading of Laycock’s 1840 book on hysteria and **Robert Bentley Todd’s** (1809–1860) classic description of hysterical hemiparesis, had a seminal British influence on his subsequent studies of hysteria, which began soon afterward (Broussolle et al. 2012; Reynolds 2020). Russell Reynolds visited Charcot several times over the next two decades in Paris, and he described in some detail several patients with hemianesthesia and hystero-epilepsy he had witnessed in Charcot’s clinic (Russell Reynolds 1877).

In 1878, a group of several distinguished British and European physicians attended a demonstration of hystero-epilepsy by Charcot in Paris. Among the former were eminent British neurologists **Grainger Stewart** (1837–1900), **William Turner** (1832–1916), **William Henry Broadbent** (1835–1907), and **Ernest Hart** (1835–1898), the editor of the *British Medical Journal* (Gamgee 1878). During the 1870s, Ernest Hart, as well as **Arthur Gamgee** (1841–1909) and Daniel Hack Tuke, regularly visited Charcot at the Salpêtrière (Goetz, Bonduelle, and Gelfand 1995).

During the Franco-Prussian War in 1870, Charcot sent for safety his wife (Augustine Victoire Durvis) and three children (Jeanne, Jean-Baptiste, and his stepdaughter, Marie) to stay in London with their friends, the Casellas, a British family of Italian origin (Bonduelle and Laplane 1999; Coutinho et al. 2022; Teive et al. 2014). In the infirmary of the Salpêtrière Hospital, Charcot attended to French soldiers, some wounded in the fighting, and his valiant work was recognized after the war (Coutinho et al. 2022; Walusinski 2016). When the Paris siege ended, Charcot went to London in 1871 and returned with his united family to Paris (Teive et al. 2014).

Charcot continued to attend the British Medical Association (BMA) meetings in the 1870s and 1880s. In 1877, he was one of the main speakers at the annual BMA meeting in Manchester (Bonduelle and Laplane 1999). At the same time, he presented a specimen of a neuropathic shoulder to the Royal College of Surgeons in London (Hierons 1993). At the annual meeting in Bath in 1878, he was elected an honorary member of the BMA, along with **Louis Pasteur** (1822–1895) (Annual Meeting of the British Medical Association 1878; Coutinho et al. 2022). In 1879, he was again a guest of the BMA at the annual meeting in Cork at the instigation of **George Sigerson** (1836–1925), his Irish pupil and friend who had translated into English the first two volumes of Charcot’s “Lectures on Diseases of the Nervous System” in 1877 and 1881 (Lyons 1997). It is reported that earlier, in 1872, Charcot had visited Dublin and Ireland, initially with a delegation of French physicians (Broussolle et al. 2012; Hierons 1993).

At the BMA meeting of 1877 in Manchester, he lectured on the relationship between tuberculosis and caseous pneumonia. By popular request, he was asked to repeat his presentation the next morning (Coutinho et al. 2022). In 1880, Pierre Marie attended the BMA meeting in Cambridge on Charcot’s behalf and observed that some of Charcot’s views on hysteria met some criticism (Broussolle et al. 2012). Charcot’s final attendance as a guest speaker at a BMA meeting was in Brighton in 1886, where he spoke alongside Hughlings Jackson and **Victor Horsley (1857–1916)** on the rise of a new discipline, neurosurgery. He also visited Horsley at Queen Square and saw him operate on a meningioma (Bonduelle and Laplane 1999). Horsley—a surgeon, physiologist, social campaigner, and politician—is

widely viewed as a founding father of neurosurgery. In 1886, with a written testimonial from Charcot, he was the first neurosurgeon to be appointed to the National Hospital. The testimonial confirms that Horsley had studied with Charcot in Paris in the autumn of 1885 (Broussolle and Reynolds 2021).

An example of Charcot's wide reading of the English literature was in his commentary on **James Parkinson's** (1755–1824) studies on the “shaking palsy.” Charcot acquired Parkinson's essay in 1887 and recognized Parkinson's seminal contribution in his Tuesday lessons. Despite the incompleteness of the essay, he coined the name *maladie de Parkinson* (Parkinson disease) as an alternative to *paralysis agitans* (Coutinho et al. 2022).

Special mention should be made of Hughlings Jackson's and Charcot's respective interests (Figure 3). Hughlings Jackson was physician to the National and the London Hospitals and can be considered the father of British Neurology (Critchley and Critchley 1998). He wrote extensively on many neurological disorders including, for example, epilepsy, paralysis, and cortical localization as well as disorders of movement and speech (Reynolds 2020; Silvester 2009; Taylor, Holmes, and Walshe 1931–1932; York and Steinberg 2006). Charcot praised Jackson's contributions to the field of epilepsy, especially his seminal description of focal motor seizures with their specific march, which he referred to as “Jacksonian epilepsy” (Charcot and Pitres 1877; Coutinho et al. 2022). Historically, **Louis François Bravais** (1801–1843), who graduated in Southern France at Montpellier University, first described in 1827 in his medical thesis in Paris a focal epileptic seizure he called hemiplegic seizure. Accordingly, Charcot proposed the eponym “Bravais-Jackson epilepsy” (Eadie 2010). Jackson in turn recognized the importance of Charcot's studies on spinal cord anatomy and physiology.

As far as we know, Hughlings Jackson never traveled to Paris, but he certainly met Charcot and his colleagues in London, especially at the Seventh International Medical Congress in London in 1881, which gathered 3,000 delegates (Broussolle and Reynolds 2021). Hughlings Jackson presented there a paper on “Epileptiform Convulsions from Cerebral Disease.” In the discussion that followed the international panel, which included Brown-Séquard, focal motor seizures with their specific march were referred to as “Jacksonian epilepsy,” as earlier proposed by Charcot (Charcot and Pitres 1877).



Figure 3. Picture of Hughlings Jackson (public domain).

Hughlings Jackson was greatly admired by Charcot, who kept a portrait of him with a personal dedication in his office (Broussolle and Reynolds 2021).

During the 1881 London congress, Charcot gave a lecture on a case of multiple joint diseases resulting from locomotor ataxia (*tabes dorsalis*). As a visual aid, he presented a wax model of the joint of a 64-year-old woman, as well as multiple photographs. After the lecture, Sir **James Paget** (1814–1899) publicly announced that the name of this previously unheard condition would henceforth be referred to in English as Charcot's disease. At the congress dinner, Charcot, together with **Louis Pasteur** (1822–1895) and **Rudolph Ludwig Karl Virchow** (1821–1902), sat at the top table as distinguished members of the pantheon. Charcot sat two seats away from the Prince of Wales, who was introduced to him later that evening. To top off the celebration, a fireworks display took place, in which portraits of Jean-Martin Charcot, Sir James Paget, and **Bernhard von Langenbeck** (1810–1887) were shown in celebration (Bonduelle and Laplane 1999; Broussolle and Reynolds 2021; Coutinho et al. 2022; Hierons 1993).

Charcot also received some criticisms from British colleagues—for example, **Matthew Duncan** (1826–1890)—in relation to his later work on hysteria and the use of hypnotism (Broussolle and Reynolds 2021; Coutinho et al. 2022; Reynolds and Broussolle 2022). Nonetheless, his conversance with the English language, his visits to Great Britain and Ireland, and his knowledge of the Anglo-Saxon medical literature all contributed to his reputation as one of the greatest clinicians of the nineteenth century (Coutinho et al. 2022).

Charcot and Brown-Séquard became, in 1887, the first foreign corresponding members of the Neurological Society of London founded in 1886. In addition, Charcot was elected an Honorary Fellow of the King and Queen's College of Physicians of Ireland in 1887 and of the Royal Society of Medicine in London in 1891 (Reynolds and Broussolle 2022).

The United States

During the nineteenth century, the strong improvement in medicine, the prospering of new laboratories and discoveries, and the development in teaching in Europe—and especially in Vienna and Berlin as well as Paris—attracted young physicians from the United States (Koehler 2016; Mccullough 2011). It is said that more than 1,000 physicians came to Paris from the United States between 1815 and 1850 (Warner 2003). The flow of physicians who chose to go to an European country to complete their medical education was intense, as illustrated by many books (Hun 1883). **Augustus Kinley Gardner** (1821–1876) provided entertaining details of the medical environment in his colorful memoir, *The French Metropolis Paris*, as seen during the spare hours of a medical student (Gardner 1848, 1850). Besides, the development of medical specialization in the United States was slow, and neurology hardly existed there until after the Civil War (Boller and Birnbaum 2016).

The travel of medical students and doctors from the United States to Europe was part of a much larger phenomenon—beginning around the 1820s and extending until World War I—of American painters, writers, and physicians who voyaged across the Atlantic to get trained in the French capital. A recent book is entirely focused on this phenomenon (Mccullough 2011), with chapters on doctors, including **Elisabeth Blackwell** (1821–1910), the first female physician in America, and **Oliver Wendell Holmes** (1809–1894). All did a training stint in Paris.

Many American neurologists went to Paris during the second half of the nineteenth century, due to the excellence of medicine and clinical neurology in France (Boller et al. 2019). In Paris, Charcot attracted young colleagues and significantly contributed to making the Salpêtrière hospital one of the most important centers of neurology. The young physicians observed Charcot interviewing patients in his office or examining them himself, discussing the differential diagnosis with his assistants, and reviewing possible therapies. Occasionally Americans were able to observe daily rounds and autopsies. Additionally, twice a week they attended organized lectures (Pappert 1995). In later years, the exchange was partially redirected to other European countries, especially Germany, where greater emphasis was given to neuropathology, and also the United Kingdom, where the National Hospital for the Paralyzed and Epileptic opened in 1860.

Among the founders of modern U.S. neurology, special account should be given to **William Hammond** (1828–1900) and **Silas Weir Mitchell** (1829–1941) (Freemon 2010), and also to **Edward Constant Seguin** (1843–1898) and Charles Edouard Brown-Séquard (Boller et al. 2019). All had extensive and highly significant contacts with France. We present below a brief recall of these pioneers of American neurology and their relation to Charcot's school in Paris.

William Hammond graduated from New York University in 1848 and enrolled at Pennsylvania Hospital for his residency (Blustein 2022; Boller et al. 2019; Freemon 2001). Soon thereafter, he joined the U.S. Army Medical Department as an assistant surgeon from 1849 to 1860. He spent almost a year visiting military hospitals in France and other European countries. In 1860, he resigned from the Army to accept the Chair of Anatomy and Physiology at the University of Maryland. At the start of the American Civil War, Hammond rejoined the Army as Chief of the Army Medical Bureau and Inspector of the Union hospitals. Under his leadership the proportion of wounded soldiers who died decreased considerably (Freemon 2001). One of his revolutionary ideas, derived from his experience in Paris, was that some hospitals should be dedicated to the treatment of specific diseases. This led to the opening of the first U.S. hospital almost entirely dedicated to neurological diseases (Boller et al. 2019).

Hammond eventually went to New York City and became, in 1867, professor of diseases of the mind and nervous system at the Bellevue Hospital, where he established a “Nerve Clinic.” In 1871, he published the first comprehensive American textbook of neurology, partly based on Charcot's lectures (Hammond 1871). This book was published years before the first editions—in 1886 and 1894, respectively—of the classical handbooks of neurology of William Richard Gowers in London and **Hermann Oppenheim** (1857–1919) in Berlin. Hammond's treatise was later translated into French, Italian, and Spanish (Pappert and Goetz 1995). In December 1874, the American Neurological Association was founded, largely the inspiration of Hammond. Among his contributions to neurology, he described athetosis in 1871.

Silas Weir Mitchell was the seventh physician in three generations of his Philadelphia family (Boller and Birnbaum 2016; Boller et al. 2019; Cervetti 2012; Tucker, 1914). After obtaining a medical degree from Jefferson Medical College in 1850 at barely 21 years of age, he went to Europe and he spent most of his time in Paris. There, he studied with a scientist often considered one of the founders of experimental medicine: **Claude Bernard** (1813–1878) at the *Collège de France*.

After a year in Paris, Mitchell returned home and wrote important contributions to neurology: namely, neurasthenia, hysteria, rest cure, and particularly on causalgia, phantom limb, and—most importantly—nerve injury among soldiers during the Civil War (Mitchell, Morehouse, and Keen 1864). He is also known as a productive novelist. Most of Mitchell's fictional works contained references to neurologic topics (Louis and York 2006).

Mitchell met Charcot at the Salpêtrière in 1875. At their initial meeting, Mitchell at first did not identify himself and Charcot remarked, “You have a man in Philadelphia who knows more about run-down nervous conditions than anyone else I know of, and I will give you a letter to Dr S Weir Mitchell, whom you must consult.” Mitchell then identified himself and handed him his card (Goetz 1997). Charcot and Mitchell interacted in multiple ways to influence one another's research and the development of nineteenth-century neurology (Goetz 1997).

Edward Constant Seguin was born in Paris in 1843 and moved with his family to the United States in 1850 (Boller et al. 2019). In 1864, he graduated from the College of Physicians and Surgeons (now Columbia University) and later returned to Paris, where he studied from 1869 to 1870 under Charcot, **Louis Antoine Ranvier** (1835–1922), **Victor Cornil** (1837–1908), and Brown-Séquard. Upon his return to the United States, Seguin became professor of diseases of the nervous system at the College of Physicians and Surgeons and authored several articles on aphasia, paralysis, and cerebral localization (Boller et al. 2019). His active correspondence throughout his career with French colleagues was pivotal to expanding relationships and creating a greater international neurological movement. Seguin was a leading practitioner of medicine in New York City and a member of the New York Academy of Medicine. He served as a founding member and an early president of the American Neurological Association in 1889 (Boller et al. 2019; Goetz, Chmura, and Lanska 2003).

Charles-Edouard Brown-Séquard influenced considerably the birth and evolution of U.S. neurology (Figure 4) (Boller et al. 2019). He was born on the Indian Ocean island of

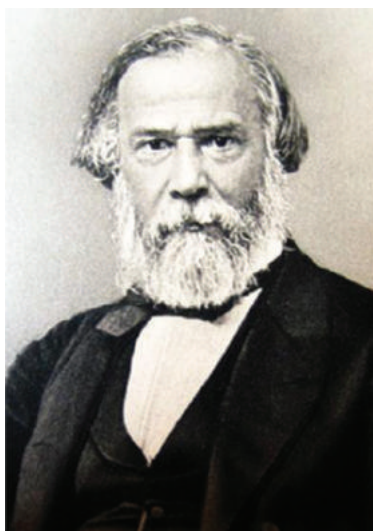


Figure 4. Picture of Brown-Séquard (public domain).

Mauritius. After early studies in his native island, he left Mauritius in 1838 with his mother, intending to study medicine in Paris. In his 1846 thesis, entitled *Recherches et expériences sur la physiologie de la moelle épinière* (*Research and Experiments on the Physiology of the Spinal Cord*), and in subsequent articles he proved that a part of the sensory fibers cross after entering the spinal cord (Brown-Séquard 1850). This formed the basis of what is now known as the lateral spinal cord syndrome, or Brown-Séquard syndrome (Barbara et al. 2012; Tattersall and Turner 2000). Brown-Séquard then returned to Mauritius. In 1852 he left for Philadelphia in the United States, where he delivered a series of lectures. He also held lectures in other cities (Boston and New York). In 1853 he married Ellen Fletcher. After a brief stay in Mauritius, where Brown-Séquard distinguished himself during a cholera epidemic, he left in 1854 by invitation to Richmond, Virginia, to teach physiology at the university there (Boller et al. 2019; Watson and Ho 2011). Only four months later he resigned and continued with his friend Charles Robin to set up a small experimental-physiological laboratory in Paris.

From 1864 to 1866, Brown-Séquard taught, with interruptions, and lectured at Harvard University. There he became friends with **Louis Agassiz** (1807–1873), the noted naturalist. The latter advised him to go to Paris, which advise Brown-Séquard followed. The year after, he became a lecturer at the Sorbonne. In particular, his English nationality stood in the way of an appointment as professor. After a stay in New York during the 1870–1871 Franco-Prussian War, he returned to Paris, resigned in 1872, and left for New York, presumably with the intention of settling there permanently. In the same year he married Maria Carlisle; his first wife had died five years before.

Agassiz tried to help him get a laboratory, but he died in 1873. A year later, Brown-Séquard lost his second wife, shortly after the birth of their daughter Charlotte. This was followed by a period in which he lectured in various places in England and the United States. In 1877, he married Elisabeth Emma Dakin. His naturalization as a French citizen did not happen earlier than 1878, after which he returned to France to succeed Claude Bernard at the Collège de France (Barbara et al. 2012). With Jean-Martin Charcot and Alfred Vulpian, Brown-Séquard founded also the scientific journal *Archives de physiologie normale et pathologique* (Barbara et al. 2012). Other contributions of Brown-Séquard to U.S. neurology have been elegantly narrated in a recent book (Aminoff 2011).

Two other American leaders in neurology in the late-nineteenth and early-twentieth centuries visited Charcot in Paris, respectively, in 1881 and 1882—namely, **Bernard Sachs** (1858–1944), who was professor of neurology of the New York Clinic, and **Moses Allen Starr** (1854–1932), who later became professor of mental diseases at Columbia University in New York City (Haymaker 1953).

Germany and Austria

During the late-nineteenth and the early-twentieth centuries, alongside the attractiveness of Charcot's School in Paris, a great number of medical doctors and students from Europe, Germany, Russia, and North America trained in German-speaking universities, especially Berlin and Vienna. Because Charcot was fluent in German, he regularly updated his knowledge on the remarkable German contribution to neurology and neuropathology. Interestingly, a recent review examined the German reception of Charcot's personality and work (Lehmann, Hartung, and Kieseier 2004). As outlined by the authors, the main

authorities at Charcot's time were **Wilhelm Heinrich Erb** (1840–1921), **Ludwig Hirt** (1844–1907), **Ernst von Leyden** (1832–1910), **Max Nonne** (1861–1959), and **Ernst Adolf Gustav Gottfried von Strümpell** (1853–1925). Other German physicians cultivated to varying degrees professional contacts with Charcot. Based on the fascination of his personality and the significance of his work, they were long and intensely influenced by the Salpêtrière school (Lehmann, Hartung, and Kieseir 2004). The extent of their admiration became apparent in 1882 by the award of an honorary doctorate to Charcot from the University of Würzburg.

Wilhelm Heinrich Erb (1840–1921) is considered the founder of German neurology and one of the world leaders and pioneers in clinical neurology during the second half of the nineteenth century (Viets 1953). He worked in Heidelberg, where a chair of internal medicine was attributed to him (Figure 5). He was in the tradition of his teacher, Nikolaus Friedreich (1825–1982), and also influenced by the French innovator **Duchenne de Boulogne** (1806–1875) (Holdorff 2021; Viets 1948). Erb's work was mainly devoted to spinal and muscular disorders, but also to electrotherapy. He left behind a huge corpus of semiological and nosological elements that now constitute our current knowledge of neurology, much more than just the eponyms associated with his name. In 1891, he founded the journal *Zeitschrift für Nervenheilkunde* (later, *Journal of Neurology*) together with internist-neurologist colleagues. In 1907, he was elected the first president of the *Gesellschaft Deutscher Nervenärzte* (Society of German Nerve Doctors).

Erb and Charcot had a fruitful correspondence and continuous interest of each other's publications in the growing field of neurology, which can be illustrated by a few examples. In a letter from 1881, Erb thanked Charcot for his kind comments in a publication in *Le Progrès Médical* on Erb's inaugural lesson in Leipzig and on his determination to establish modern neurology teaching (Bonduelle, Gelfand, and Goetz 1996). Reciprocally, it is noteworthy to mention how much Charcot personally tried to justify the creation for him of a chair of neurology at the Paris Faculty of Medicine in 1882. Indeed, he consulted eminent colleagues from different countries, notably Erb in Germany (Gelfand 1994). In contrast, the two masters unfortunately disagreed about the etiology of locomotor ataxia—



Figure 5. Picture of Wilhelm Erb (public domain).

that is, *tabes dorsalis*. Charcot pointed out the role of a hereditary predisposition, whereas Erb recognized in 1892 the syphilitic origin of *tabes* some 14 years before the establishment of the relationship by Schaudinn and Wassermann (Viets 1953).

Ludwig Hirt of Breslau was a pioneer in industrial social hygiene and wrote a monumental tome on occupational diseases (work diseases) (1871–1878; see Oelsner 1968). He visited Charcot in Paris in 1883 and subsequently published a report about Charcot's clinic at the Salpêtrière (Hirt 1883).

The German physician Ernst von Leyden was from Berlin. He described in parallel with Charcot the so called “Charcot-Leyden crystals,” which correspond to hexagonal bipyramidal crystals observed in tissues and secretions from sites of eosinophil-associated inflammatory and related allergic immune reactions, notably in asthma. Leyden oriented his career in the field of cancer and contributed to the emergence of oncology as a scientific discipline (Voswinkel and Hansson 2021). Furthermore, he did important experimental research on intracranial pressure (Koehler 2023; Leyden 1866).

German internist and neurologist Adolf von Strümpell was a leading figure in German neurosciences around 1900 and helped to establish neurology as a discipline in its own right (Riese 1953; Engmann, Wagner, and Steinberg 2012). He did his medical studies in Leipzig, where he graduated in 1875. During his stay in Erlangen, Breslau (Wrocław), Leipzig, and Vienna, then back to Leipzig, von Strümpell contributed to the first descriptions of complex diseases such as **Bekhterev** disease (ankylosing spondylitis), primary lateral sclerosis, hereditary spastic paraplegia, Westphal's pseudo-sclerosis (later called Wilson's disease), and *tabes dorsalis*. Strümpell's discussion of hysteria in his text on the diseases of the nervous system was most heavily dependent on Charcot (Strümpell 1885). He discussed and adopted Charcot's five stigmata.

Max Nonne studied at Heidelberg and Berlin (Reese 1960). After his assistantship under Erb in Heidelberg, he went to Hamburg and became director of a medical division at Eppendorf. Then, back in Heidelberg, he described many clinical cases, contributing, among others, to the delineation of cerebellar ataxia and of spinal cord syndrome due to pernicious anemia. Nonne also provided significant contributions to the diagnosis and treatment of neurosyphilis. He went to Paris at the Salpêtrière in 1889 and observed Charcot examining patients. Nonne became impressed by Charcot's charisma, despite his excessive power on hysterical patients (Lerner 1998).

Among other important Charcot's German pupils, a special mention should be made of **Leopold Ordenstein** (1835–1902) (Lehmann, Compston, and Hartung 2018; Walusinski 2020b). He trained in the physiology laboratory of Konrad Eckhard (1822–1905). After obtaining a degree from the University of Giessen in Germany in 1859, he came to study the diseases of the nervous system under Charcot, attracted by the prestige of the Paris medical school. Consequently, Ordenstein defended his “second thesis” in 1867, under the title *Sur la paralysie agitante et la sclérose en plaques généralisée* (*On Paralysis Agitans and Generalized Multiple Sclerosis*; see Ordenstein 1867). This work was published as a commercial version in 1868 (Ordenstein 1868). Charcot was only an assistant professor in the jury to which Ordenstein presented, the latter reusing some of the elements in the 1861 article he had published with Alfred Vulpian (1826–1887) (Charcot and Vulpian 1861–1862). Ordenstein's thesis established clinical differences between multiple sclerosis and Parkinson's disease, with a focus on shaking. It also described new signs as the Parkinsonian dystonic hand (Figure 6). Similarly, Ordenstein made an important advancement in the



Figure 7. Picture of Sigmund Freud taken approximately at the time he met Charcot in Paris (public domain).

Sigmund Freud (1856–1939; see [Figure 7](#)) was born of a Jewish family at Freiberg in Moravia (today in the Czech Republic; see Bogousslavsky [2011](#), [2014a](#), [2014b](#); Camargo et al. [2018](#); Grzybowski and Żołnierz [2021](#)). At the age of four he was taken to Vienna (Austria), where he lived most of his life until 1938, when the Nazis compelled him to move to England, where he died in 1939. Freud did his medical studies in Vienna and was attracted by the renowned School of Neurology held by **Theodor Meynert** (1833–1892) and **Hermann Nothnagel** (1841–1905). Freud was first instructed in comparative neuroanatomy and neurophysiology in, respectively, **Carl Claus's** (1835–1899) and **Ernst Wilhelm von Brücke's** (1819–1892) laboratories. He acquired his medical degree in 1881. He joined Meynert service in 1883 and was appointed Privatdozent in neuroanatomy in 1885.

Freud spent six months in Paris from October 1885 to February 1886 to learn about hysteria and hypnosis from Charcot at the Salpêtrière Hospital (Bogousslavsky [2014a](#), [2014b](#)). This had a profound influence on Freud's career. While in Paris, he said in a letter to his fiancée that no one had ever exerted such influence on him than Charcot (Freud [1886](#), [1979](#); Gelfand [1988](#); Poirier [2013](#)). He named his eldest son Jean-Martin.

Back in Vienna, Freud became much interested in the psychological origins of neuroses. He kept friendly relations with Charcot. He translated Charcot's lectures into German and celebrated his death (Freud [1893](#)). As outlined by Morgan ([1989](#)), Freud had a small (38.5 cm x 54 cm) lithographic version of Brouillet's painting on Charcot's lesson, created by **Eugène Pirodon** (1824–1908), framed and hung on the wall of his Vienna rooms from 1886 to 1938 ([Figure 8](#)) Once Freud reached England, it was immediately placed directly over the analytical couch in his London rooms.

However, Freud developed progressively his own ideas on hysteria; became opposed to Charcot's opinions, such as the presence of dynamic lesions, the role of heredity, and the triggering factors; and introduced the role of sexuality and the terms "suggestion" and "conversion syndrome." In 1895, he published, with **Joseph Breuer** (1842–1925), a book on hysteria and hypnosis (Grzybowski and Żołnierz [2021](#)). Between 1891 and 1939, he became



Figure 8. Lithographic version of Brouillet's painting on Charcot's lesson, created by Eugène Pirodon (1824–1908; Sigmund Freud Museum, London).

less interested in hysteria and hypnosis (Bogousslavsky 2011, 2014b). He published several books on psychology, especially on the interpretation of dreams, sexuality, and psychoanalysis and developed the well-known psychoanalytic theory (Camargo et al. 2018; Grzybowski and Żołnierz 2021).

Moritz Benedikt (1835–1920) was another great leader from the Vienna School (Hassin 1953; Ellenberger 1973). Charcot, who was sustaining Benedikt, proposed in 1893 the term “Benedikt syndrome” for his description of the clinical symptoms of midbrain lesion. Benedikt also developed the concept of hypnotic hypermnesia (Ellenberger 1973).

In summary, German and Austrian neuropsychiatrists did considerable innovative work in neurology and psychiatry. Although they acknowledged the great influence of Charcot in the advance of neurology as a new discipline, they developed increasingly some criticism of Charcot's research on hysteria and hypnosis (Lehmann, Hartung, and Kieseier 2004). Amusingly, Charcot was nicknamed *Napoleonkopf* in German learned societies (Lubimoff 1894; Poirier 2013).

Switzerland

The history of Swiss neurology and of the Swiss Neurological Society is remarkably and extensively presented in a recent article (Bassetti and Valko 2009). **Constantin von**

Monakow (1853–1930) is considered the founder of Swiss neurology, who worked in Zurich for most of his life. He was born in 1853 in northern Russia. His family moved to Switzerland in 1866. Von Monakow was trained with some of the best leaders in internal medicine, psychiatry, neurology, and physiology from all Europe—and notably, in Paris, with Jules Dejerine, who was Swiss-born. Zurich emerged as a major center for science and medicine in the late-nineteenth century. **Albert Einstein** (1879–1955) studied in Zurich in the 1890s. The Burghölzli was probably one of the most prominent research psychiatric hospital in Europe. **Eugen Bleuler** (1857–1939), **August Forel** (1848–1931), and **Carl Gustav Jung** (1875–1961) worked there where they contributed to the emergence of modern dynamic psychiatry. We will mention some of the pioneers and leaders in Swiss neuropsychiatry who visited Charcot in the late-nineteenth century.

Paul Louis Ladame (1842–1919) was a physician from the University of Geneva. After attending Charcot's lesson in Paris, he submitted the description of a case of "abasia in the form of attacks" in 1890 (Ladame 1890). Ladame suggested adding a form simply arising from anxiety to the nosology of hysterical astasia-abasia. He also published on brain tumors and aphasia, then specialized in psychiatry and in social and legal medicine. He was given the first chair of psychiatry at the Geneva Faculty of medicine.

Edmund Landolt (1846–1926), who became ophthalmologist in Lausanne, spent time in a junior capacity in Charcot's service (Goetz, Bonduelle, and Gelfand 1995).

Eugen Bleuler (1857–1939) was born in Zollikon in Switzerland (Ashok, Baugh, and Yeragani 2012). He studied medicine in Zurich, and later pursued his studies in Paris, London, and Munich. He went to Charcot in 1882 to study hypnosis. Then he received his medical degree in 1883. From 1881 to 1883, he was an assistant physician in Waldau near Bern. In 1885, Bleuler became assistant physician in Burghölzli near Zurich. In 1898, he was appointed full professor of psychiatry at the University of Zurich. He is best known for coining the term "schizophrenia" in 1908, which replaced the term "dementia praecox."

Jean-Louis Prevost (1838–1927) was from Geneva. His grandfather was a physician and cared for the famous novelist Henry Beyle, better known as **Stendhal** (1783–1842). Prevost did his medical studies in Zurich, Berlin, and Paris, where he became an intern in the clinical service of Alfred Vulpian (De Morsier 1974; Walusinski 2020b). He spent four years in Paris, where he attended Charcot's lessons. Charcot was president of the jury of his thesis. Prevost published early innovative work on infantile paralysis and cerebro-vascular diseases. He returned to Geneva in 1869, where he did many contributions in the fields of neurology, internal medicine, and pharmacology. Prevost was appointed as professor of therapeutics when the Geneva Faculty of Medicine was founded in 1875. His best known publication is from his 1868 thesis on the description of the conjugate deviation of the eyes toward side of lesion in stroke patients (Lander and Bogousslavsky 2022).

Henry Auguste Widmer (1853–1939) was a distinguished Swiss neurologist who opened the Clinique Valmont in Glion-sur-Montreux, overlooking Lake Geneva in Switzerland. He had also studied with Charcot in Paris before specializing in digestive disorders, diet, and nervous dysfunction. During the years before World War I, he interacted with Parisian intelligentsia, notably Mrs. Geneviève Halévy (also known as Mrs. Bizet or Mrs. Straus) and Robert de Billy and Alberto Santos Dumont (Bogousslavsky 2007).

Adolph Meyer (1866–1950) was another Swiss physician (Meyer 1891) who was born near Zurich and did his medical studies there under August Forel. He oriented his career in the field of neurology and did most of his working years in the United States in prestigious

institutions including The Johns Hopkins University Hospital in Baltimore. With respect to Paris, he mentioned Duchenne de Boulogne, Charcot, and the pupils from the Salpêtrière school, as well as Vulpian and Dejerine (and the Bicêtre), who “have given Paris a significant reputation for the study of nervous diseases.” Interestingly, he was “somewhat disappointed” about Charcot and his polemics on hypnosis with the Nancy school and on peripheral neuritis with Dejerine,

Russia

Russians were no strangers to France, and in Paris, in particular. Historically, culturally, and politically, there were many contacts between these two countries. During the nineteenth century, Russians considered traveling in France a form of cultural and intellectual apprenticeship (Vein 2011). Russian medical students journeying in France in the 1880s and 1890s did so in the context of the major diplomatic rapprochement between the two nations, culminating in the historic Franco-Russian Alliance of 1891. This political development encouraged all sorts of cultural exchanges, including visits to Paris by the Czar, building the Pont Alexandre III (Alexander III bridge) over the Seine river, and a wave of Russophilia in the French arts.

Beginning in the 1860s, two major centers of neurology and psychiatry arose in Russia: the Imperial Moscow University and the Imperial Medical and Surgical Academy in St. Petersburg (Lichterman 2010). Both centers were strongly influenced by leading Western European schools and specialists, notably in Germany, Austria, and France.

The most commonly visited scientist was Charcot, at the Salpêtrière Hospital in Paris (Panova and Lanska 2021). Charcot’s aura gained a new momentum during his March 1881 tour in Russia. His Russian clientele in Paris was already important, and thus he was requested to examine a large number of patients while in Moscow and in Saint Petersburg. Charcot and his travel companions were everywhere received with splendor and solemnity in academic meetings, hospital and university visits, and diner parties. This Russian travel was a spectacular success, increasing the links and scientific exchanges between the two countries not only on a medical but also on a political ground. During the 1880s, Charcot’s famous patients included Grand Duke Nicolas and Grand Duke Constantine of Russia. Count Nicholas Ignatieff, the Czar’s Minister of the Interior, sent his 20-year-old son, Paul, a future minister, to Paris to consult and be treated by Charcot for nervous exhaustion in 1889–1890 (Goetz, Bonduelle, and Gelfand 1995).

Charcot did another travel to Russia in 1891 (Figure 9) which increased the Paris school’s attractiveness among young Russian neurologists. It did not just offer professional training, it created the best minds, which would determine the direction of neurology and psychiatry in Russia for many decades (Vein 2011). After returning home, young Russian doctors not only implemented everything they had learned in Western Europe but proceeded to make their own original contributions.

We briefly comment below on the careers of the most talented pupils of Charcot who became the founders of neurological schools in Russia (Vein 2011). They included such prominent names as **Aleksej Yakovlevich Kozhevnikov** (1836–1902), **Vladimir Karlovich Roth** (1848–1916), **Sergey Sergeevich Korsakov** (1854–1900), and **Lazar Solomonovich Minor** (1855–1942) in Moscow; **I. P. Merzhhevskii** (1838–1908) and **Vladimir Bekhterev**



Figure 9. J.-M. Charcot and Moscow neurologists during his visit to Russia in 1891. Charcot and his daughter, Jeanne, sitting in the center, and A.Ya. Kozhevnikov sitting on the right. Standing (from left to right): V.A. Muratov, G.I. Rossolimo, Jean-Baptiste (son of Charcot), G.I. Pribytkov, V.K. Roth, L.S. Minor (Vein 2011; public domain).

(1857–1927) in St Petersburg; and **Livery Osipovich Darkshevich** (1858–1925), first in Moscow and then at the Imperial Kazan University.

Aleksej Yakovlevich Kozhevnikov was one of the most influential personalities in Russian neurology. In 1866, he was sent abroad for three years. He worked in clinics and laboratories directed by the best specialists in neuropsychiatry and physiology in Germany and also in Paris, where he worked in Charcot's laboratories (Goodenow and Mettler 1953). The time spent with Charcot strengthened Kozhevnikov's belief that neurology has to be seen as an independent discipline.

Kozhevnikov became the founder of the Clinic for Nervous Diseases of the Moscow University, and the first professor of neurology in Russia. The clinic opened its doors in 1890 and became the first specialized medical facility in Europe devoted to the treatment of neurological disorders (Vein 2007). Kozhevnikov brought up a number of talented followers, who later worked all over Russia, and some of them became in charge of the Clinic for Nervous Diseases. Among his most important contributions to neurology, Kozhevnikov was the first to describe *Epilepsia partialis continua* or *epilepsia corticalis*, also called "Kozhevnikov's syndrome" or "Kozhevnikov's epilepsy" (Vein 2007).

Karlovich Roth was admitted to the Moscow University, which he completed in 1871 with honors and where he stayed as a resident at the neurology clinic upon the recommendation of Professor Kozhevnikov (Kazakov, Rudenko, and Stuchevskaya 2014). In 1876, after completion of his residency, Roth went to study and work abroad (Kazakov, Rudenko, and Stuchevskaya 2014). During four years, Roth worked at clinics and laboratories of Paris, Berlin, and Vienna. In Paris, he could visit Charcot and also Vulpian, **Valentin Magnan** (1835–1916), Louis

Antoine Ranvier (1835–1922), Claude Bernard, and **Paul Broca** (1824–1880) (Kazakov, Rudenko, and Stuchevskaya 2014).

Sergey Sergeevich Korsakov was appointed as Kozhevnikov's assistant in 1876 after his stay in Paris. Due to his interest in psychiatry, Korsakov worked in Paris not only with Charcot but also with Valentin Magnan, who, from 1867 to the end of his career, was associated with St. Anne's Psychiatric Hospital in Paris (Vein 2011). One of Magnan's main fields of interest was alcoholism, on which he published several papers in the 1870s (Vein 2011). Although there is no direct evidence, it is plausible that the later renowned work of Korsakov on alcoholism, "About Alcoholic Paralysis" (1887) and "Several Cases of a Particular Cerebropathia and Polyneuritis" (1889), was influenced by Magnan (Vein 2011). The study by Korsakov of the amnesic syndrome in alcoholic patients suffering from psycho-polyneuritis has remained his most important contribution to neurology. In Moscow, Kozhevnikov (Korsakov's mentor) proceeded with his conviction that neurology is an independent field of medicine and accordingly encouraged its separation from the mental diseases. Since 1890, there have been two independent departments at the Moscow University Medical Faculty: Nervous Diseases (headed by Kozhevnikov) and Mental Diseases (headed by Korsakov; see Vein 2011).

Lazar Solomonovich Minor was another student of Kozhevnikov. After graduating from Moscow University, he worked in Paris under Charcot and in Berlin under **Carl Westphal** (1833–1890) and **Emanuel Mendel** (1839–1907). In 1884, after finishing his training, he became a lecturer at the Moscow Clinic of Nervous Diseases. From 1910 until 1932, Minor became the head of the Neurological Clinic of the Moscow Institute for Women, later reorganized as the State Moscow Medical Institute, creating his own scientific school with many prominent followers (Vein 2011).

I. P. Merzheevskii was one of the first St. Petersburg psychiatrists to be trained in Paris, where he spent four years (1872–1875). Being interested in neurology and psychiatry, in Paris he worked not only with Charcot but also with Magnan. (Vein 2011). In 1874, Merzheevskii independently described the giant pyramidal cells that later became known as the cells of Betz, also a Russian neurologist from Kiev.

Vladimir Bekhterev was the most outstanding student of Merzheevskii, and would later hold his chair (Vein 2011; Yakovlev 1953). After Bekhterev defended his thesis, Merzheevskii recommended him for further studies abroad. His training started in Leipzig under **Paul Emil Flechsig** (1847–1929), where he mostly worked on anatomomorphological subjects (Vein 2011). In 1883, Bekhterev arrived in Paris, where he was greeted by Charcot as an old friend, as they had met during Charcot's visit to St. Petersburg in 1881. While in Paris, Bekhterev also worked with the renowned psychologist Pierre Janet (1859–1947). Unlike his Moscow colleagues, Bekhterev became very interested in hypnosis and spent many hours with Charcot during the hypnotic sessions of patients with hysteria (Vein 2011). Back in Russia, he founded the Psychoneurological Institute in St. Petersburg in 1907, where he remained as director until his unexpected death in 1927. Throughout his life, Bekhterev remained Charcot's admirer; he quoted Charcot's works repeatedly (Vein 2011).

Livery Osipovich Darkshevich was yet another disciple of Kozhevnikov, best known for the nucleus and fibers that bear his name. After defending his thesis, *The Conduction of Light Stimulus from the Retina to the Oculomotor Nucleus*, under Kozhevnikov in Moscow, he took a postgraduate course in Vienna, Leipzig, Berlin, and Paris from 1883 to 1887. At

the Salpêtrière hospital, he collaborated with Jules Dejerine. Darkshevicvh had in addition a close collaboration with Freud, whom he met in Vienna and in Paris. Upon his return to Russia, Darkshevich became the head of the Department of Nervous Diseases of Kazan Imperial University and actually founded the prominent Kazan School of Neurologists (Vein 2011).

We would like to cite two more Russian pupils of Charcot. **Vladimir Chizh** (1855–1922) visited Charcot and Vulpian in Paris during the mid-1880s. He was from Tartu, Estonia, a country that was part of the Russian Empire at that time. Chizh went to Europe and studied at prestigious institutes mainly in Germany in addition to the Salpêtrière. He became later professor of psychiatry and the successor of **Emil Kraepelin** (1848–1905) at the University of Tartu during the years 1891–1916 (Kalling 2016). **Alexander Efimovich Sheherbak** (1863–1934), was sent abroad in famous laboratories in Berlin, Leipzig, and also in Paris, where he met Charcot. He became professor at Warsaw University, then moved to Sebastopol, where he developed physiotherapy (Lichterman 2010).

In the context of physiotherapy, Fulgence Raymond (1844–1910), Charcot's pupil and successor, traveled to Odessa in 1883 to learn on the suspension technique developed by **Osip Osipovich Motschutkovsky** (1845–1903) to treat patients suffering tabes dorsalis pain (Walusinski 2013). Thereafter, Charcot endorsed this practice, which contributed greatly to the development of this technique worldwide, even though it appeared an inefficacious and potentially harmful therapy.

Charcot was also on the jury of the medical theses of several Russian students, including Nadia Skwortzoff in 1881; Adèle de Herodinoff in 1887; Jakow Namowicz Onanoff and Azriel Raichline, both in 1892; and Lubia Stojanovitch in 1893 (Walusinski 2020a). Interestingly, French-Russian interaction increased during the late-nineteenth and early-twentieth centuries not only on clinical aspects but also on scientific grounds (Barbara, Dupont, and Sirotkina 2011).

To conclude, Charcot and his collaborators at the Salpêtrière undoubtedly attracted not only the leaders of Russian neurology and psychiatry but also many young Russian neurologists.

Italy

In Italy, neurology has been associated with psychiatry for a long period, as recently reviewed (Koehler 2007; Bentovoglio and Mazzarello 2010; Federico 2011). Psychiatric instruction started relatively early, in relation with the founding of asylums. An important person in that domain was **Vincenzo Chiarugi** (1759–1820), who “freed” psychiatric patients in the eighteenth century. Chiarugi probably taught psychiatry in Florence from 1805. Clinics were founded in cities including Bologna, Padua, Turin, and Rome in the middle of the nineteenth century. Neurology acquired the status of a clinical discipline (as “clinic of mental diseases”) in Italy after its national reunification in 1861 (Bentivoglio and Mazzarello 2010).

At the end of the nineteenth century, eminent figures had a great influence in the emergence of this specialty, including **Andrea Verga** (1811–1895) in Milan and **Cesare Lombroso** (1835–1909), professor in the Lombardy region. Among the first leaders in neuropsychiatry were **Ernesto Belmondo** (1863–1939), professor at Padua; **Enrico Morselli** (1852–1929), professor at Genoa; **Augusto Tamburini** (1848–1919), professor at

Pavia, Modena, Florence, and Rome; **Casimiro Mondino** (1859–1924), professor at Palermo and then Pavia; **Eugenio Tanzi** (1856–1934), professor at Palermo and Florence; and **Leonardo Bianchi** (1848–1927), the latter being appointed professor at Naples in 1890.

Bianchi studied the function and diseases of the temporal lobes and also the link between frontal lobes pathology and dementia (Traykov and Boller 1997). He was important with respect to the organization of Italian psychiatry. Neurology and psychiatry have been treated in the same clinics. Italian psychiatry always had a biological orientation and, in most clinics, histological departments were available. Well-known names with this respect were **Ettore Marchiafava** (1847–1936) from Roma and the celebrated scientist **Camillo Golgi** (1843–1926) (Mazzarello 2009).

Golgi's biography was well summarized by Berger (1998): After his medical studies in Pavia, he first worked as a clinician and then in histology and cell biology. He apparently did not meet Charcot. Between 1872 and 1875, he developed his main scientific achievement—the histological staining method known as the “black reaction,” aimed at visualizing for the first time the fine neuronal network in the Central Nervous System, which represented a major breakthrough for neurosciences. He held the chair of histology and general pathology at the University of Pavia from 1875 to his retirement in 1918.

In 1885, Golgi published the work that had the highest impact, *Sulla fina anatomia degli organi centrali del Sistema nervosa* (*On the Fine Anatomy of the Central Organs of the Nervous System*), which gained him (along with **Santiago Ramon y Cajal** (1852–1934) the Nobel Prize for Physiology or Medicine in 1906. Interestingly, a serendipitous finding by using the black reaction was the discovery of the *apparato reticolare interno* in 1898, the fine intracellular meshwork today known as the Golgi apparatus.

In parallel, the *Società Frenopatica Italiana* (Italian Frenopathic Society) was founded in 1861 at the mental asylum of Aversa, the first neuropsychiatric organization for Italian scientists. The society was founded in Rome in 1873 and had the purpose “to further phreniatric studies, the progress of mental institutions, and the protection and advantage of the alienated.” Psychiatrists and neurologists were organized by this society. From 1874, the society's official journal was published: *Archivio Italiano per le Malattie Nervose e più particolarmente per le Alienazioni Mentali*. In 1907, the *Società Italiana di Neurologia* (SIN) was founded. The Society of Hospital Neurologists (SNO) would split off from the SIN later on. The *Rivista di Patologia Nervosa e Mentale* became the official journal of the society in 1929. Finally, the *Italian Journal of Neurological Sciences* (now *Neurological Sciences*) was created in 1971 and became the official journal of the SIN.

A close link was established in the late-nineteenth century between Italian neurologists and Jean-Martin Charcot. Indeed, several Italian physicians studied under Charcot at la Salpêtrière, and were the first to transcribe, translate, and publish some of his lessons, contributing to the dissemination of Charcot's theories in Italy (Brigo et al. 2020; Brigo, Lorusso, and Martini 2022). Some of these transcriptions are invaluable, as they provide information that cannot be found elsewhere in Charcot's *oeuvre*. Sometimes they had not been personally revised or edited by Charcot himself, and their accuracy cannot be confirmed by independent sources (Brigo et al. 2020).

Gaetano Rummo (1853–1917) was one of the leading medical authorities in Italy at the turn of the century (Basile and Riva 2019). In his youth, between 1881 and 1884, he had studied under Charcot in Paris. When he returned to Italy in 1884, he worked in Naples and wrote a biographic sketch of Charcot, which—although it adds little

information to what is already known about his career—provides an unusually intimate portrait of the French master (Rummo 1884). Rummo translated and collected in a book (preface by Charcot himself) all the 1883 lectures on aphasia given by the French neurologist (Charcot 1884). When still in Paris, he wrote a series of scientific correspondences on his apprenticeship under Charcot. Among them, he published a summary of a lesson, not found elsewhere in Charcot's corpus of works, with a classification scheme of multiple sclerosis based on symptoms and their anatomical location (Charcot 1883).

In 1890, Rummo published a photographic book on hystero-epilepsy, modeled after the *Iconographie photographique de la Salpêtrière*, which was the first detailed visual depiction of this phenomenon and its different phases that appeared in Italy (Rummo 1890). Rummo also published a book with many figures on aphasia titled, *Differenti forme d'afasia: lezioni fatte nella Salpetriere nel semestre d'estate dell'anno 1883* (Charcot 1884). Charcot was identified as a connectionist (diagram-maker), and authored one of the known schemata, “the bell diagram,” which appeared for the first time in his Italian translated conferences (Brais 1993; Charcot 1884).

Charcot's teaching methods, based on patient examinations rather than on theoretical explanations devoid of clinical demonstrations, fascinated many young Italian physicians. **Domenico Miliotti** (1851–1888), who had studied at la Salpêtrière, called Charcot's lessons *lezioni di cose* (lessons through/about things; Charcot 1885a.) He transcribed and translated some of them, which cannot be found elsewhere, on music aphasia and music agraphia without verbal aphasia, astasia-abasia, Friedreich's ataxia, psychic paralysis, prolonged hysterical fits (hystero-epileptic status), and hysterical sleep (Charcot 1885a).

In 1885, **Giulio Melotti** (1857–19?) published a unique transcription of a Charcot lecture on convulsive tics with coprolalia and echolalia, corresponding to the *maladie des tics* investigated in detail by Georges Gilles de la Tourette (Charcot 1885b; Kushner, Luzzatti, and Finger 1999). These cases were later included in a volume (introduction by Charcot) containing a selection of lectures from 1885 and 1886, which appeared in 1887 and discussed, among other things, the topic of male hysteria, the existence of which had been recently acknowledged by Charcot (Charcot 1887b). Giulio Melotti and his Italian colleagues did a great achievement in publishing Charcot's lectures on tics and related signs.

Many other Italian physicians attended Charcot's lessons in Paris and were deeply influenced by him in many ways, as evident from their initial publications, mostly devoted to the description of clinical cases and focusing on anatomoclinical correlation with investigation of neuropathological features. They include **Rosolino Colella** (1864–1940), **Achille De Giovanni** (1838–1916), **Francesco Ghilarducci** (1857–1924), **Pietro Grocco** (1856–1916), **Roberto Massalongo** (1856–1919), **Giuseppe Portigliotti** (1875–1933), **Fabio Rivalta** (1863–1938), and **Ezio Sciamanna** (1850–1905). Also included were **Angelo De Vincenti** (1848–1913), who attended at the suggestion of his uncle, the psychiatrist **Serafino Biffi** (1822–1899), and **Andrea Verga** (1811–1895), who attended the lessons of Charcot (Armocida 2002).

Back in Milan, he founded the neuropathological section in the Ospedale Maggiore. De Vincenti promoted the creation of clinics providing free services for the poor and, indeed, Il Clinico still is an important clinical center of reference in Milan. De Vincenti initiatives were praised by Charcot himself, with whom he always kept friendly relations (Armocida and Serra 2013). Among the Italians attending Charcot's lessons at la Salpêtrière, although

not related to the medical field, it is worth mentioning the Neapolitan painter **Edoardo Tofano** (1838–1920), who in 1881 portrayed Charcot dressed in his academic robes.

The fascination for Charcot in the Italian medical community persisted well beyond his death in 1893 and for years kept attracting Italian physicians eager to acquire extensive experience on neurological disorders by his close collaborators and disciples, such as Pierre Marie and Joseph Babiński (Brigo, Lorusso, and Martini 2022).

Spain

The emergence of neurology in Madrid and Barcelona in the late-nineteenth century is largely due to the pioneering work of three figures: **Luis Simarro Lacabra** (1851–1921), **Santiago Ramon y Cajal** (1852–1934), and **Lluís Barraquer Roviralta** (1855–1928), who combined clinical practice with cutting-edge neurohistology and neuropathology research (Barraquer Bordas 2002; Fernandez and Breatnach 2001; López-Muñoz, Boya, and Alamo 2006; Gimenez-Roldan 2015; De Castro 2019). We present below short biographies of these three pioneers and their interaction with Charcot and Paris neurological and neurohistological leaders.

Luis Simarro Lacabra was the pioneer of neuropsychiatry and neurohistology in Spain (Fernandez and Breatnach 2001; Gimenez-Roldan 2015). He introduced the Golgi method in his country in order to study the nervous system and recalled that the sight of the silver-impregnated nerve cells was the turning point that led him to abandon general anatomy and concentrate on neurohistology. Simarro, who dissipated his free time in trying to improve not only the scientific but also the political world around him, had to leave his country for five years. During his stay in Paris between 1880 and 1885, he learned the methods of experimental histology from Louis-Antoine Ranvier, the histologist remembered for the nodes he described on myelinated nerve fibers in 1878. Jean-Martin Charcot's clinical neurology teaching at the Salpêtrière impressed him greatly, as did the degenerative theories of the alienist Jacques Joseph Valentin Magnan in Sainte Anne Hospital. After his return in 1885 to Madrid from his voluntary exile, Simarro was able to produce exciting Golgi preparations of the cerebral cortex in a small laboratory. He also opened a private clinic for patients with nervous system diseases. Simarro Lacabra taught many talented students, including Gayarre, Achúcarro, and Lafora (Gimenez-Roldan 2015).

As recently recalled (Gimenez-Roldan 2015), Charcot's influence on Simarro's medical training was perhaps best seen in the Marquis de Larios case, a dispute involving a rich aristocrat whose second marriage had been contracted in secret. He was accused of behavioral problems supposedly caused by general paralysis of the insane (syphilis). If this was true, his second marriage would be declared invalid, and his beneficiaries would lose their claim to a substantial inheritance. In 1880, at the age of 60, Charcot traveled to Madrid and Malaga, accompanied by **Alfred Hardy** (1811–1893), to give his views on the case. The investigation that Simarro completed in partnership with two colleagues (Jaime Vera and José Maria Escuder) refuted the conclusions of the French team (Gimenez-Roldan 2015). They considered that there was no pathological disease.

The renowned scientist Santiago Ramón y Cajal graduated in medicine at the University of Zaragoza in 1873 and successively occupied the chair of anatomy in Valencia (1884–1887), and of histology and pathology in Barcelona (1888–1891) and Madrid (1892–1922) (Berciano, Lafarga, and Berciano 2001). Although Cajal did not work with

Charcot, he adopted early in his career the histological French method as a model, especially inspired by Ranvier. Cajal was later much impressed by a public display of the Golgi method by Simarro in Madrid. Starting from the modified Golgi staining method, Cajal published a monumental histology of the nervous system. He created in 1887 and during the following years the revolutionary concept of the neuron doctrine—with the parallel contribution of German scientist **Wilhelm Waldeyer** (1836–1921)—and the dynamic polarization of the neuron (Barbara 2007; Berciano, Lafarga, and Berciano 2001; De Castro 2019; López-Muñoz, Boya, and Alamo 2006). Cajal also introduced new staining methods. He then studied the process of degeneration and regeneration of the nervous system and the fine texture of the neuron and neuroglia (Berciano, Lafarga, and Berciano 2001).

Together with Camillo Golgi (University of Pavia, Italy), Cajal was awarded the Nobel Prize for Physiology or Medicine in 1906 (Golgi shared the award). In France, Dejerine and his spouse, **Augusta Dejerine-Klumpke** (1859–1927), supported Cajal's innovative ideas and imposed the neuron doctrine in the field of neuropathology at the Salpêtrière (Barbara 2007). Cajal did hundreds of drawings of human nerve cells. Thus, his artistic visualization of the human nervous system could equal that of Charcot.

Missing in most accounts of Cajal's work is his longstanding interest in and work on hypnosis and anomalous phenomena (Sala et al. 2008). Cajal thought that Charcot's investigation on "morbid psychology and hypnosis" was subject of criticism (Sala et al. 2008). He interpreted this phenomenon as an aberrant failure of the machinery of the brain. Cajal studied the histophysiological mechanisms of the higher mental functions (thought, intelligence, memory, perception, etc.) (Lopez-Munoz, Alamo, and Rubio 2008). He proposed that the pyramidal cells of the cerebral cortex, which he called "psychic cells," formed the substrate of these functions. Cajal was in advance of his time when speculating on the possibility of a phenomenon of neuronal plasticity in relation to learning processes (Lopez-Munoz, Alamo, and Rubio 2008).

The so-called Barcelona School was launched in 1882 by Lluís Barraquer Roviralta (1855–1928) (Balcells and Cisteré 2013; Barraquer Bordas 1993, 2002). Barraquer Roviralta finished his degree in medicine in Barcelona in 1879. He made several extended visits to Paris between 1879 and 1880, where he met Charcot and many leading figures in neurology who would influence him greatly. The clinical-semiological approach typical of the French school is reflected in all of Barraquer's clinical activity.

In 1881, he left Paris for Barcelona, where he worked as a member of the Medical Corps at Hospital de la Santa Creu. In 1882, he founded in the Catalan city a department known as the Electrotherapeutic Dispensary. Barraquer Roviralta shaped his department at a time when neurology was just beginning to emerge. He published his contributions in international journals and also kept in contact with the most important centers and figures in neurology of his day. His correspondence includes a letter from Charcot. Barraquer Roviralta had a profound knowledge of neuroanatomy, and his main areas of interest were trophic disorders and diseases of the peripheral nervous system. He compiled a vast archive of clinical and anatomical photographs, inspired by the useful presentation of patients' pictures in publications of La Salpêtrière. In this way he could make several pioneering descriptions of the generalised muscular dystonia (1897), of the cephalothoracic lypodystrophy (1906), of the grasp reflex of the foot (1921) and of the diffused hemilateral atrophy of dystrophic-sympathetic pathogenesis (1925) (Barraquer Bordas 1993, 2002).

Belgium and the Netherlands

The development of Belgian and Dutch neurological schools is remarkably presented in a recent review (Keyser 2010).

Belgian neurology was instituted at the turn between the nineteenth and the twentieth centuries, a few years after Charcot's death. There is no clear evidence of a link between Belgian neurology and Charcot. The founder of Belgian neurology, **Arthur Van Gehuchten** (1861–1914), trained mainly in Germany with **Karl Weigert** (1845–1904) and **Ludwig Edinger** (1855–1918) and collaborated with the Spanish Santiago Ramon y Cajal (Aubert 2001; Keiser 2010; Van Gehuchten 1970). He also went in Paris to study with Pierre Marie (Keiser 2010). Later, **Ludo Van Bogaert** (1897–1989), who also trained in Paris with Pierre Marie and **Georges Guillain** (1876–1961), became one of the world's leaders in neurology and neuropathology during the first half of the twentieth century (Keiser 2010; Lowenthal 1998; Van Gehuchten 1970). A strong relationship between Belgian and French neurological societies was established early in the twentieth century and is still operating today taking, in mind that Belgians are *francophone*.

Dutch neurology emerged from psychiatry and internal medicine in the late-nineteenth century. It underwent important influences from the German-speaking countries. Information can be found in the book *History of Neurology in the Netherlands* (Frederiks, Bruyn and Eling 2002) and in an article by Koehler, Bruyn, and Moffie (1998). After study tours to Vienna and Germany, **Cornelis Winkler** (1855–1941), who may be considered the godfather of Dutch neurology, became reader of psychiatry, including neurology, in Utrecht in 1885 (Morrison 1953). Eight years later he became professor of psychiatry and neurology (Koehler 2002; Koehler, Bruyn, and Moffie 1998). In 1897, neurology was added to the name of the Netherlands Society for Psychiatry, founded by asylum psychiatrists in 1871, because psychiatrists feared that a separate society of neurology would be founded otherwise. The first chair of neurology in the Netherlands, independent from psychiatry, was created for **Bernard Brouwer** (1881–1949) in Amsterdam in 1923 (Koehler 2004, 2006; Koehler and Bruyn 2003). Despite the emphasis on German influences, several Dutch physicians visited the Salpêtrière and published in French journals, although they did not become neurologists and therefore did not play important roles in the history of Dutch neurology.

One such figure was **Pieter Klaases Pel** (1852–1919), who studied medicine in Leiden and then visited “the most important foreign clinics in Berlin, Paris and Vienna,” before becoming resident of internal medicine in Amsterdam in 1877. Hardly any correspondence from Charcot has survived, but through the reprints in the Bibliothèque Charcot in the Salpêtrière, one can get an impression of who visited and/or corresponded with him. Two articles by Pel were found in the collection, which suggests that he attended classes with Charcot at the time when hysteria was in the spotlight. Charcot referred to Pel's “Zur Casuistik der Schrecklähmung” (“On the Casuistry of Fear Paralysis”) (Charcot 1887a; Pel 1881). Although Pel became an internist—we may recognize his name from the periodic Pel-Ebstein fever in Hodgkin disease—he had a special interest in diseases of the nervous system. He published at least 60 neurological-psychiatric articles between 1878 and 1915. The topics range from spinal irritation, a popular condition in the nineteenth century, to hysteria, tabes dorsalis, acromegaly, paralysis agitans, ALS, and syringomyelia (Koehler 2012).

Similarly, **Constant C. Delprat** (1854–1934) received his medical degree in Amsterdam in 1881. After training in pathology, internal medicine, and neurology (with Charcot), he was appointed private lecturer in nerve diseases and electrotherapy at the University of Amsterdam in 1886 and *chef de clinique* of the electrotherapy clinic. He studied the effects of electrotherapy in so-called “sleep paralysis” of the upper extremities (radial nerve neuropathy). In a study of 87 patients, he concluded that electrotherapy had neither a better nor faster effect than sham treatment. Disappointed with these findings, he gave up his appointment as a private lecturer in 1893. In the meantime, he became editor-in-chief of the *Nederlands Tijdschrift voor Geneeskunde* (*The Netherlands Journal of Medicine*; see Gorisse and Koehler 2012).

A third Dutch physician—or, rather, student—who received his MD in 1886, and who visited Charcot at about the same time as Freud and who, like him, was influenced by his work on hysteria and hypnotism, was **Frederik van Eeden** (1860–1932) (Fontijn 1990; Koehler 2013). He became one of the Netherlands’ famous novelists. When working in Paris for his thesis on tuberculosis, he became attracted to Charcot’s clinical demonstrations. He was probably introduced to the clinic by **Georges Maurice Debove** (1845–1920), one of the persons depicted on Brouillet’s famous painting *Leçon Clinique à la Salpêtrière*. Not much later, he introduced therapeutic hypnosis in the Netherlands. However, he preferred the method and theory of the Nancy School of **Ambroise-Auguste Liébeault** (1823–1904) and **Hippolyte Bernheim** (1840–1919). He published several articles on psychology and psychotherapy. Years before Freud’s papers, Van Eeden formulated some principles of depth psychology, and a short letter by Freud was found in van Eeden’s *Liber Amicorum* containing the words, “Frederik van Eeden, physician and poet, who anticipated so many of the secrets of the hidden inner life; my friendly greetings on the day on which he steps over the threshold of age” (Koehler 2013).

Finally, **Eduard Hendrik Marie Thijssen** (1856–1932), son of the Amsterdam professor of medicine **Henricus Franciscus** (1820–1915), wrote his dissertation on Nicolaes Tulp, the physician and mayor depicted on Rembrandt’s famous *Anatomical Lesson* of 1632. Thijssen Jr. went to Paris in 1886, where he practiced general medicine. Like his grandfather, who also published on hysteria, Thijssen Jr. took a special interest in the disease. In 1888 he wrote a second dissertation, *Contribution à l’étude de l’hystérie traumatique*, which he dedicated to “Mon cher et vénéré maître M. le Professeur Charcot.” In the dissertation he referred, among others, to the article of his compatriot Pel on “Schrecklähmung” (see above) and, of course, to Charcot, whose patient he was allowed to describe: “We thank Professor Charcot for allowing us to publish this observation, which we shall report as briefly as possible . . .” (Thijssen 1888a, 19).

One of the important conclusions, following the description of two cases, was this: “As hysteria and hysterotrauma can be complicated by other illnesses, it will be possible to isolate their part completely, thanks to the fixity and constancy of their primary symptoms” (Thijssen 1888a, 43). In 1888, Thijssen reported on demonstrations by Charcot of Spasme glosso-labial-hystérique (Paris, March 27, 1888; Thijssen 1888b). “This morning Prof. Charcot found an opportunity, in view of three patients, to further explain himself, about the existence or non-existence of a facial paralysis, due to hysteria.” Following Charcot’s demise, Thijssen wrote an extensive article on him in *Mannen van beteekenis in onze dagen* (*Men of Significance in Our Days*; Thijssen 1893).

Scandinavia and Finland

An excellent review on the history of Scandinavian neurology is presented in Volume 95 of the *Handbook of Clinical Neurology* (Aarli and Stien 2010). Scandinavian neuropsychiatry was primarily influenced by German leaders **Carl Wernicke** (1848–1905) and Emil Kraepelin, even though Charcot's school also attracted young Scandinavian physicians.

Two internists from the nineteenth century dominated the introduction of clinical neurology at the Karolinska Institute in Stockholm: first, **Magnus Huss** (1807–1890), who wrote a monograph on chronic alcoholism; and, second, **Per Henrik Malmsten** (1811–1883), his successor. The first chair of neurology was created in Sweden in 1887 and attributed to **Per Johan Wising** (1842–1912). He had studied neurology and neuropathology with Charcot in Paris, as was the case for many contemporary neurology professors. **Axel Munthe** (1847–1949) traveled many times from Sweden to Paris to see Charcot. **Ivar Wickman** (1872–1914) was a pathologist who had trained with Dejerine in Paris and contributed to the pathological study of poliomyelitis.

In Denmark, neurology developed from 1860 and onward at the Community Hospital of Copenhagen thanks to several pioneers, including **Carl George Lange** (1834–1900), a pupil and admirer of Charcot; **Frederik Kristoffer Hallager** (1849–1941), Denmark's first epileptologist; **Alexander Friedenreich** (1849–1932); and **Knud Pontoppidan** (1853–1916), who studied hysteria with references to Charcot (Møllerhøj 2009). Another Danish important figure in neuropsychiatry was **Daniel Jacobson** from Copenhagen (1861–?) who, after meeting Pontoppidan, became especially interested in neurology and psychiatry (Finger and Sirgiovanni 2024). He visited the National Hospital in London, then went to Paris, where he attended Charcot's lectures for several weeks. He was fascinated by Charcot, who had a significant impact on his career. Importantly, the famous Norwegian painter Edvard Munch (1863–1944), best remembered for *The Scream* (1893), suffered from severe alcoholism and depression and spent eight months in 1908–1909 under Daniel Jacobson's care in a private clinic in Copenhagen (Finger and Sirgiovanni 2024).

In Norway, the key pioneer in neurology was **Christopher Blom Leegaard** (1851–1921) (Aarli and Stien 2010). He had studied neurology and neuropathology in Paris with Charcot and his pupils, and also in Vienna. He became the first head of a department of neurology in 1895 at the Rikshospitalet in Oslo. **Gerhard Armauer Hansen** (1841–1912), known as the discoverer of the leprosy bacillus in 1873, worked with Ranvier in Paris and invested his time in neuroanatomy in Bergen, contributing to describe the muscular end-plate.

Furthermore, **Ernest Aleksander Homen** (1851–1926) became professor of pathological anatomy in Helsinki in 1886. He had first studied in Leipzig and in Berlin, and then performed neuropathological work in Paris in *Collège de France* under the guidance of Vulpian and Ranvier. Homen also followed Charcot's clinical demonstrations. He established the first department of neurology in Finland, modeled in part on La Salpêtrière.

Poland

At the end of eighteenth century, Poland was divided between Austria, Prussia, and Russia and recovered its independence only at the end of World War I. Therefore, during the late-

nineteenth century, Warsaw was under the governance of Russia, and a number of Polish medical students were instructed in Russian universities or attended distinguished German institutions. The pioneers in neurology in Warsaw at the end of the nineteenth century were **Edward Flatau** (1868–1932) and **Samual Wulfovich Goldflam** (1852–1932) in addition to the famous neuroanatomist **Albert Adamkiewicz** (1850–1921), who worked in Krakow (Konieczna and Koziorowski 2020; Lichterman 2010; Poletajew 2012; Triarhou 2007). A close and sustained link was established between Polish neurologists and Joseph Babiński in Paris, who was born in the French capital from Polish parents, spoke Polish, and remained sentimentally very attached to his country of origin.

Edward Flatau graduated from Moscow University Medical Faculty in 1892 (Konieczna and Koziorowski 2020; Triarhou 2007). Kozhevnikov and Korsakov were his neurology and psychiatry professors. Flatau moved to Berlin in 1893, where he would work until 1899 on neuroanatomy, neurohistology, and neuropathology under German leaders as Wilhelm von Waldeyer, **Alfred Goldscheider** (1858–1935), **Louis Jacobsohn-Lask** (1863–1940), and Ernst von Leyden. In 1894, Flatau published his notable book, *Atlas of the Human Brain and the Trajectory of Fibres*. The most important work of Flatau was his great 1912 study of migraine headaches. Flatau's connections were mainly with Russian and German scientists and probably with Babiński. There is no clear evidence that he met Charcot in Paris.

Samuel Goldflam was born in Warsaw to a Jewish family of merchants (Poletajew 2012). He lived in Warsaw most of his life. There, he attended secondary school and later studied at the Medical Faculty of the Imperial University of Warsaw (1870–1875). Goldflam decided to leave the country in 1882 in order to train with the most eminent specialists in neurology of the time. He completed his first internship at the Berlin Clinic (Charité University), a clinic founded and directed by **Carl Friedrich Westphal** (1833–1890). His second internship was completed in Paris at the Salpêtrière Hospital, directed then by Jean Martin Charcot. After his return to Warsaw in 1893, he opened an internal and neurological clinic in his apartment. Goldflam made eminent contributions to urology, internal medicine, and neurology. He was the author of the first documented description of the symptom of muscle power exhaustion, a cardinal symptom of myasthenia gravis.

Charcot attracted Polish medical students including women. He was member of the jury of the medical thesis defended in Paris in 1888 by two Polish women, Helena Goldspiegłowa spouse Sosnowska and Caroline Schultze (Karola Szulc) (Walusinski 2020a).

Bohemia and Hungary

In the late-nineteenth century, Bohemia and Hungary were part of the Austrian-Hungarian Empire and, therefore, German rather than Czech or Hungarian was the common language used in the universities of Prague and Budapest.

In Prague, the pioneer of neurology was **Arnold Pick** (1851–1924), who was born in Moravia (Brown 1953). Pick conducted his medical studies in Vienna, inspired by Theodor Meynert. After his graduation in 1875, Pick went to Berlin and worked with Carl Westphal and Carl Wernicke. He subsequently became professor of psychiatry at the University of Prague in 1886. He is well known for his description of frontal dementia (today called fronto-temporal dementia and linked to amyotrophic lateral sclerosis) and his work on aphasia and other rare diseases. Pick had regular contacts with renowned colleagues from all

Europe, including the French neurologists Jules Dejerine, Pierre Marie, and Fulgence Raymond.

Erno Jendrassik (1858–1921) is considered to be the founder of Hungarian neurology in Budapest (Fine and Darkhabani 1995; Pásztor 2004; Stam 2000). Charcot was his mentor during his stay in Paris in 1884–1885. He worked at the Salpêtrière with Pierre Marie on cerebral hemiatrophy. In 1887, Charcot wrote a letter of recommendation for Jendrassik when the latter tried unsuccessfully to obtain a prestigious professorship in Budapest. This occurred only six years later, when Jendrassik became professor of neuropathology at Budapest University. He is well known today for the description in 1885 of the reinforcement of deep tendon reflexes in the inferior limbs by having patients hook their fingers together, the so-called Jendrassik's maneuver. Jendrassik also described a familial form of progressive degenerative paraplegia and further established the concept of hereditary degenerative diseases in 1902. He was one of the pioneers in using Marey's cinematograph to explore patients with hysteria and epilepsy.

Romania

Romania and France have longstanding cultural ties, much influenced by the contribution of Emperor Napoleon III to the creation of Romania as an independent country in the mid-nineteenth century. There is a tradition of Romanian intellectuals and artists as well as medical doctors in France. Gheorghe Marinescu, also known as **Georges Marinesco** (1864–1938), is an emblematic example of a lifelong Francophile. He was born in Bucharest, Romania (Figure 10) (Buda et al. 2009; Catala and Poirier 2012; Draganesco

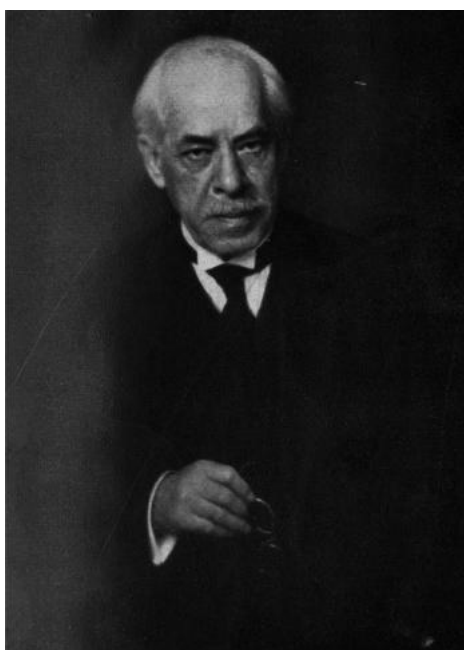


Figure 10. Picture of Georges Marinesco (public domain).

et al. 2021; Timus, Marinesco, and Petresco et al. 1984), attended medical school in Bucharest, and became a pupil of Victor Babès (1845–1926).

Marinesco traveled to Paris in 1888 to undertake postgraduate training in neurology with Charcot, Pierre Marie, Joseph Babiński, Fulgence Raymond, **Paul Oscar Blocq** (1860–1896), and other French neurologists. He spent eight years in Paris and then went to Germany to study with **Carl Weigert** (1845–1904) in Frankfurt-am-Main and **Emil du Bois-Reymond** (1818–1896) in Berlin. In 1897, he returned to Bucharest, where a chair of clinical neurology was created for him. This was the beginning of the Romanian school of neurology. Importantly, as quoted by Catala and Poirier (2012), Marinesco remained faithful to Charcot's memory throughout his life, and he continued to present himself as Charcot's pupil and show admiration for him.

Marinesco's contribution to science is immense. Indeed, he had the astuteness to apply new methods as soon as they were available, especially Roentgen rays, film camera, and the Nissl histology method. He published an important book dealing with the study of normal nerve cells and reparative processes in neurofibrils in the degenerated cells following nerve section. He also studied a new form of familial spasmodic paraplegia with extrapyramidal motor symptoms, clinico-anatomic aspects of the thalamic syndrome, juvenile form of familial amaurotic idiocy (Marinesco-Sjögren syndrome), and degenerative changes in the spinal cord following amputations.

During his long career, Marinesco kept close academic relationships with his colleagues in Paris. With Blocq, he reported a peculiar case of parkinsonian tremor due to a tuberculoma located in the contra-lateral substantia nigra (i.e., Scemmering's locus niger) (Blocq and Marinesco 1893). This description was accurately commented on in his 1894 lesson by **Edouard Brissaud** (1852–1909), a pupil and temporary successor of Charcot. Brissaud suggested that “a lesion of the locus niger could be the anatomical substratum of Parkinson's disease,” which was confirmed by **Konstantin Nikolaevich Tretiakoff** (1892–1958) in his 1919 seminal thesis in Paris (Lees et al. 2008). Marinesco first described the senile plaques with Blocq in 1892 (Catala and Poirier 2012). Marinesco, Blocq, and Babès published an atlas on the pathologic histology of the nervous system (Blocq, Babès, and Marinesco 1892).

Many of Marinesco's pupils in Bucharest also went to learn at La Salpêtrière Hospital and then went back to Romania, thereby keeping an open connection with French neurology. They made several presentations at the meetings of the *Société de Neurologie de Paris* and published some of them in the *Revue Neurologique*. These scholars included **Ion Niculescu** (1895–1957), who worked with Pierre Marie and **Charles Foix** (1882–1927); **Anghel Radovici** (1885–1956), who was a disciple of **Jean Lhermitte** (1877–1959); **Nicolae Ionescu-Sisești** (1888–1954), a pupil of Georges Guillain; and **State Drăgănescu** (1891–1964), a scholar of **Alexandre Barré** (1880–1967).

Charcot's interest to young Romanian medical students is demonstrated by his presidency of several medical thesis defended by Romanian students, respectively in 1877 with Alessandro Boicescou, in 1883 with Christe Bouicli, in 1890 with Alexandre Athanassio, and also in 1892 with Dimitri Michailowski (Walusinski 2020b).

Comments and conclusion

The international aura of Charcot attracted neurologists from all parts of the world, which fosters several comments.

One observation raised by this article is the truly astounding number of foreign visitors and countries they came from: a steady flow of medicine's best and brightest of the young generation of neurologists from Britain and Ireland; Western, Central, Southern, and Eastern Europe, plus Russia; as well as the Americas for the better part of three decades. This article establishes that this period truly was "the Age of Charcot" in world neurology. There is no other example during the nineteenth century of such an outstanding leader in French medicine and physiology like Charcot, apart from René Théophile Hyacinthe Laennec, Claude Bernard, and Louis Pasteur.

Did the fact that visiting Charcot in addition to teaching commitments entailed a trip to the great French capital heighten the appeal? Undeniably, Paris in this *fin de siècle* period was seen as the most glamorous, stylish, artistic, and modern metropolis in the world, as suggested by the German philosopher Walter Benjamin in his 1938 essay, reprinted later (Benjamin 1991), entitled "*Paris, capitale du XIXème Siècle*" ("Paris, Capital of the Nineteenth Century"). These travelers got to visit the Haussmann boulevards, cafés, cabarets, courtesans, posters, electrified streets, avant-garde paintings, international expositions, the newly completed Eiffel Tower (1889), and on and on. Sigmund Freud's letters from his Left Bank hotel back to his fiancée in Vienna during the winter of 1885–1886 include observations about the city parks, the Louvre, Paris street fashions, and even the Boulanger Affair (Freud 1979). Even today, we are more inclined to attend an annual conference if it takes place in such an exciting location as Paris.

Besides, instructing so many medical students and hosting all these foreign visitors must have taken an immense amount of Charcot's time. Why did he do it? Love of teaching and of young adults, of course; but part of the motivation may also have been that all of this teaching and travel spread his ideas, expanded his reputation, and (not least) got his work translated into other learned European languages.

The notoriety and prestige of the Salpêtrière school established by Charcot continued with his successors—notably, Edouard Brissaud, Fulgence Raymond, Jules Dejerine, Pierre Marie, Joseph Babiński, Georges Guillain, Jean Lhermitte, **Raymond Garcin** (1897–1971), **Théophile Alajouanine** (1890–1980), and many others—who received a large number of foreign young neurologists. This trend persisted over 50 years after Charcot's death. Importantly, in many cases, Charcot's foreign disciples became the founders of neurology back in their home countries.

Outside France, one should keep in mind that other neurological centers in Europe attracted a huge number of visitors and pupils in the late-nineteenth and early-twentieth centuries, notably Berlin, Vienna, and London. Could neurology as an emergent knowledge field and a professional discipline first began to globalize due to the high score of students and visitors in Paris, as well as in Germany, Austria, and Britain? Over time, this must have generated—to a much greater degree than ever before—an extensive network and exchange of ideas, knowledge, correspondence, and personalities. This is corroborated by the increasing number of international medical congresses that took place in Europe between the 1880s and 1910s, with thousands of physicians, particularly the leaders of their discipline. Even though international meetings were covering all aspects of general medicine, the congresses in London in 1881, Paris in 1900, and again in London in 1913, taking a few examples, favored fruitful exchanges between a great number of neurologists from all European countries, Russia, and North America (Broussolle and Reynolds 2021).

The Salpêtrière School Golden Age culminated in the 1890s and was called “the Mecca of neurology” during the first decades of the twentieth century. However, its international authority tended to fade with time. This may be explained by different factors.

First, the Salpêtrière and at-large French neurology was progressively challenged by German neurology, whose leadership reached its highest point during the 1910s, and then by British and U.S. neurology in the subsequent decades. It is worth mentioning that Georges Guillain, one of the most talented disciples of Pierre Marie, traveled during several months in the United States in 1902 at the age of 26. As mentioned by Goetz (1998),

Guillain visited New York, Chicago, Boston, Philadelphia and Baltimore. He studied hospitals, outpatient departments, laboratories, and universities, comparing them with institutions in his native France and other European capitals. Guillain was particularly struck by the creative energy of American neurologists, the broad-ranging programs in research and patient care, and the strong financial support provided by local philanthropists, universities and governments. Guillain clearly foresaw the rising international role of American neurology and the prominence it would gain by the end of his career in the 1950s. (p. xx)

Second, an example of the retard in the development of neurological sciences in France is related to neurosurgery, which was launched as a new discipline in England, Germany, and the United States in the late-nineteenth century, whereas it was initiated in France in the 1900s–1910s (Broussolle and Reynolds 2021). Likewise, in a report of his travel to the United States and Canada in 1926, Jacques Forestier (1890–1978), a French neurologist, was impressed by the fact that American neurological institutions included in the same department the neurosurgical and neurological services (Forestier 1926).

Third, although the transatlantic crossing of young neurologists was for a long period of time mainly from the United States to Paris and more generally to Europe, it turned the other way after World War II, due to the enormous development of American neurology and neurosurgery (Boller et al. 2019).

Fourth, World War I and especially World War II had a significant negative effect on the Salpêtrière leadership and generally on French neurology. The occupation of France between 1940 and 1944 had a major scientific damaging impact. Considering the discipline of neurology, interaction with foreign colleagues, notably from Britain and North America, was no longer possible. Fortunately, the progressive recovery of European economy after World War II and the globalization of the world economy and science in the late-twentieth and early-twenty-first centuries facilitated the development of new influential leaders and techniques at the Salpêtrière and in a number of European neurology centers.

We would like to make a last comment on the most important interactions that took place between Charcot and his overseas visitors and pupils. Particularly emblematic among the renowned foreign scientists who met and/or learned from Charcot is **Charles-Edouard Brown-Séquard**, who had interactions with Paris University and contributed to the early development of British and American neurological schools; this makes it difficult to understand his peripatetic career and to know in which country to place him, as he moved around so much between France, Britain, and the United States. Also emblematic were **John Hughlings Jackson**, who was admired by Charcot and influenced French neurology similarly as Charcot did on British neurology; **Silas Weir Mitchell**, the pioneer in U.S. neurology; **Sigmund Freud**, who was trained by Charcot to study patients with hysteria and then, back in Vienna, founded a new discipline, psychoanalysis; **Aleksej Yakovlevich**

Kozhevnikov and almost all the founders of the Russian institutes of neurology who trained in Paris; and **Georges Marinesco**, who established the Romanian school of neurology and made major contributions thanks to his valuable relation with Charcot and French neurology.

To conclude, Charcot is considered in the context of medical history as one of the most talented clinical teachers who produced a kind of double diaspora of students. Undeniably, he mentored two generations of young French neurologists who went on to staff the leading hospitals across France. Simultaneously, he met and inspired for the remainder of their careers an additional, even larger group of foreigners from across the whole of the Western medical world, Russia, and also Latin America, who then returned to their own countries enriched by this first-hand experience of the French neurological tradition.

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