

History of Neurology: French Neurology in the 19th Century – Charcot, his Legacy, and Other Notable Physicians

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A live recording of this lecture can be viewed here:
[RRNMF - Charcot and his Legacy](#)

This History of Neurology segment is about the French neurologist Jean-Martin Charcot and his trainees.^{1,2}

The great Jean-Martin Charcot is really the founder of modern neurology (Figure 1) (*The Founders of Neurology*, p. 420-424 and *Fragments of Neurological History*, p. 324-331).¹⁻⁴ He established clinical neurology as a discipline and became the first chair of diseases of the nervous system. He had very humble beginnings. Charcot was the son of a cabinet maker. He actually had difficulty passing his oral exams to become a professor in the French system, but he ultimately did. Shortly after that, he was named superintendent of the Salpêtrière in Paris. He was 37 at the time.

The Salpêtrière was a large welfare medical institution that housed between five and ten thousand poor patients with medical problems, and it was chaotic. Charcot organized the Salpêtrière. He developed a system to diagnose patients and he performed clinical-pathologic correlations. He focused particularly on diseases of the nervous system, although he had other interests as well, particularly disorders of aging (Figure 2). He became an expert brain neuropathologist as well as an expert clinician.

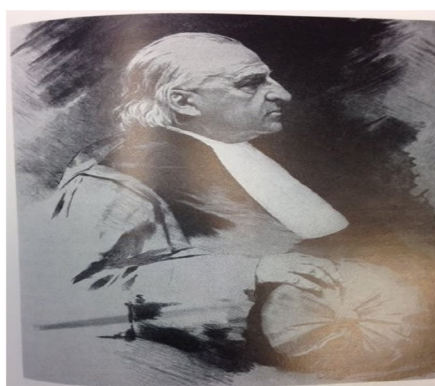
Figure 1

Jean Martin Charcot (1825-1893)

- “The Founder of Modern Neurology”
- Established clinical neurology as a discipline 1882 – 1st chair of disease of nervous system at the University of Paris
- Son of a cabinet maker
- Difficulty passing oral exams
- Superintendent of Salpêtrière, Paris, France at age 37 (housed 5-10k welfare medical patients)
- ALS, MS, myopathy, neuropathy, tabes dorsalis, Charcot Joints, and diseases of aging
- Clinical pathologic correlations
- Classroom demonstrations – Leçons (Tue & Fri)
- Hysteria/Hypnosis later in career
- Anti-animal research



Figure 2



LECTURES OF THE DISEASES OF THE NERVOUS SYSTEM.

DELIVERED AT LA SALPÊTRIÈRE

BY
J. M. CHARCOT.

PROFESSOR IN THE CHAIR OF DISEASES OF THE NERVOUS SYSTEM AT LA SALPÊTRIÈRE, PARIS.
OF THE FACULTY OF MEDICINE OF THE UNIVERSITY OF PARIS.
HONORARY MEMBER OF THE SOCIETY OF MEDICAL PHYSIOLOGISTS OF PARIS.
HONORARY MEMBER OF THE SOCIETY OF MEDICAL PHYSIOLOGISTS OF PARIS.

SECOND SERIES.

TRANSLATED AND EDITED BY

GEORGE SIGERSON, M.D., CH.M.

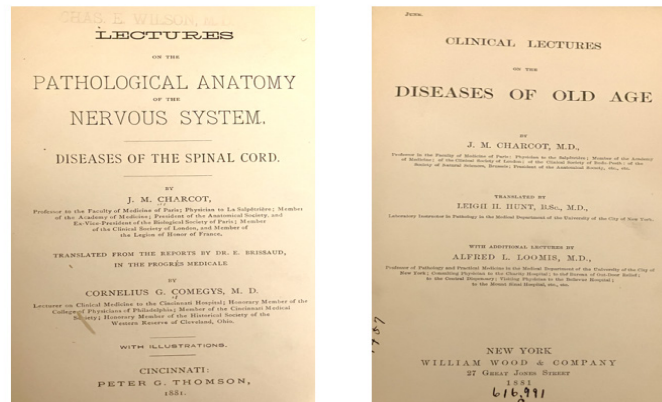
SECRETARY OF THE AMERICAN SOCIETY OF NEUROLOGISTS, LONDON, 1906.
HONORARY MEMBER OF THE SOCIETY OF MEDICAL PHYSIOLOGISTS OF PARIS.
HONORARY MEMBER OF THE SOCIETY OF MEDICAL PHYSIOLOGISTS OF PARIS.

THE NEW SYDENHAM SOCIETY,
LONDON.

MCMXXI.

Figure 3

English Translations of Charcot's books in my library



His fame expanded when he started doing Tuesday, and sometimes Friday, lessons that were very well attended by physicians. He is credited to providing early detailed descriptions of motor neuron disease (called Charcot's disease in France),⁵ multiple sclerosis, peripheral neuropathy, and various myopathies. In 1869, he described cases of progressive muscular atrophy (originally described by Aran and Duchenne-see below) that also had spasticity and he showed pathologically both anterior horn cell degeneration and degeneration of the lateral cord of the spinal tracks.⁶ This is thought to be the first recognition of amyotrophic lateral sclerosis (ALS). In the same year, he described patients with pure upper motor neuron signs that pathologically had predominantly degeneration of the corticospinal tracks and he used the term primary lateral sclerosis (PLS).⁷ The following is a translation of Charcot's original description of what he termed amyotrophic lateral sclerosis and primary lateral sclerosis and he also describes labio-gloso-pharyngeal paralysis or what we now call bulbar palsy.⁷ This translation was published in the biography of Charcot by George Guillain, MD, translated by Pearce Bailey, PhD, MD, pp. 106-107.⁸

We should note that a similar situation obtained before in relation to progressive locomotor ataxia, (tabes dorsalis), and yet the clinical picture outlined by Duchenne from a small series of cases, almost twenty years ago, has not changed. It still comprises today all its essential elements, without having undergone any significant modifications. Could it be that the description I am about to give of amyotrophic lateral sclerosis will have the same good fortune?...A symmetrical sclerosis of the lateral columns of the spinal cord often exists as a primary independent disease. The lesion in these cases is self-contained, so to speak, in the sense that it is not subordinate to any other localized pathological process (tumor, circumscribed focus, etc.), which has developed first somewhere else along the cerebrospinal axis. It is to be placed in a separate category analogous to the primary gray degeneration of the posterior columns (the anatomic substratum of progressive locomotor ataxia, from which amyotrophic lateral sclerosis can be easily distinguished clinically)... This form of symmetrical sclerosis

always affects the posterior part of the anterolateral columns throughout the entire length of the spinal cord. The lesion can be traced to the medulla, where it occupies principally the anterior pyramids, and even to the lower level of the cerebral peduncles... The disease begins with a paresis that progressively affects all four extremities and gradually is replaced by more or less pronounced contractures in which the lower extremities are more involved than the upper ones. In very advanced cases, the spasticity increases, rendering the predominant posture of the affected limbs one of forced extension or semiflexion. It is not rare to see, in the course of the disease, symptoms of progressive muscular atrophy, which involve principally the muscles of the upper extremities. The thenar and hypothenar eminences are sometimes remarkably flattened and the hands may present a claw-like deformity. When such a complication is present, one sees at post-mortem, besides bilateral sclerosis, a more or less marked degeneration of the anterior horn cells, particularly at the level of the cervical enlargement of the spinal cord... Symptoms of labioglossolaryngeal paralysis with atrophy of the muscles of the tongue are often associated with primary lateral sclerosis. In several cases of this kind, degeneration of the motor nuclei of the hypoglossal nerve has been clearly established.

There are at least two uses of the term "Charcot's triad". In neurology, it refers to the signs in multiple sclerosis of nystagmus, intention tremor, and scanning speech. Charcot's triad also refers to the three signs of acute cholangitis: fever, right upper quadrant abdominal pain, and jaundice. In his career, he became interested in hysteria, and some believe he used hypnosis in his practice, which was controversial. Interestingly, he was against animal research.

Charcot authored a number of books. Figures 2 and 3 show the title pages of English translations of three of his books that are in my rare medical book library: *Clinical Lectures on the Diseases of Old Age*,⁹ *Lectures on the Pathological Anatomy of the Nervous System: Diseases of the Spinal Cord*,¹⁰ and *Lectures on the Diseases of the Nervous System*.¹¹ *Lectures on the Diseases of the Nervous System* consists of transcripts of the Tuesday lectures that he gave. This book consists of transcripts of the Tuesday lectures that he gave. Charcot

made extensive notes, and notes were also taken by people in the classroom. His trainees and mentees later put these into book form. Many of his trainees were British, including George Sigerson, who was responsible for getting the English editions of the lectures into print. This is how many in England and the United States, including myself, were able to access Charcot's work.

Figure 4 is a drawing of Charcot examining the brain of a patient who had died. His classic hunched posture has become a famous image. Here is another old neurologist with a hunched posture looking at his cart.

Charcot described the neurologic complications of

syphilis to a great degree, including tabes dorsalis. He talked about the joint problems that patients with tabes develop as a result of sensory deprivation. We now call these Charcot joints.

Figure 5 shows Charcot with his wife at their home, again in the classic profile view.⁴ He was a great artist in his own right and was able to draw patients with neurologic and other problems.

Figure 6 shows some of his notes of a patient with hemiparesis and extension deformities. There is also a picture from one of the magazines in France depicting Charcot. His drawings in the background are his own and appear to show

Figure 4

Two Old Neurologists with Stooped Posture



Figure 5

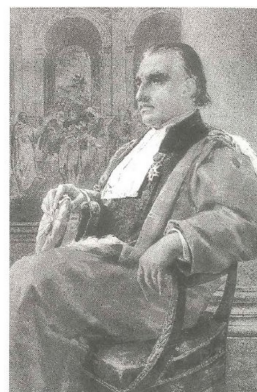
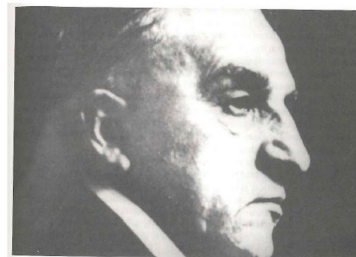
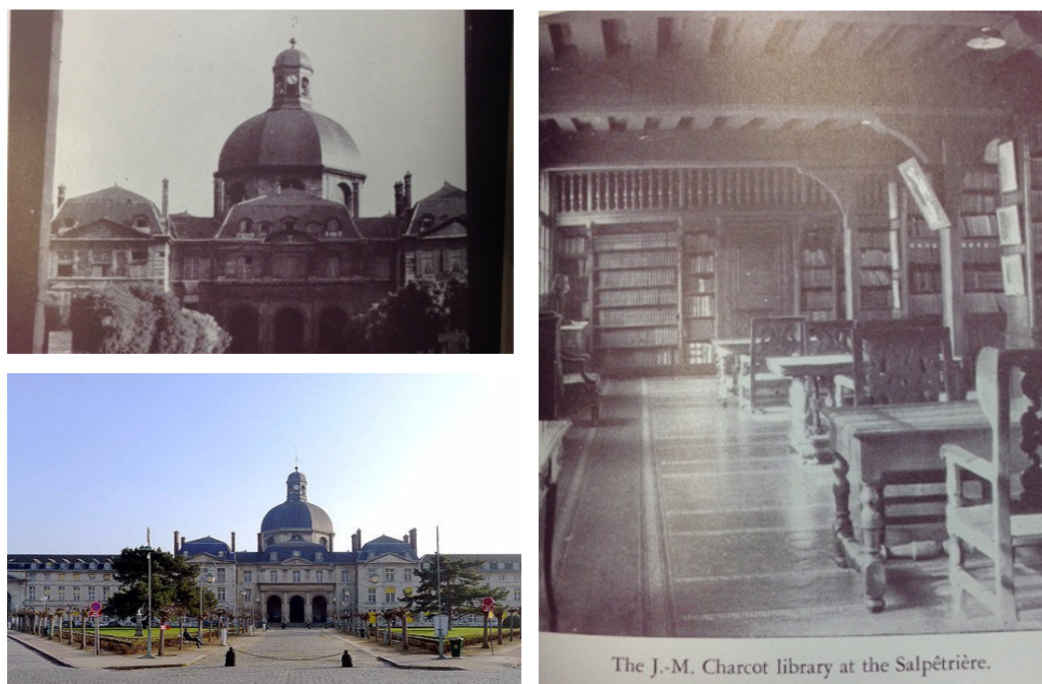


Figure 6



Figure 7



hysterical patients in various contortions.⁴

Figure 7

Figure 7 shows the impressive Charcot library at the Salpêtrière, a photograph of the Salpêtrière in Charcot's time, and a modern image.

Now, let us discuss Charcot's disciples. He trained legions

of neurologists and psychiatrists. Figure 8 shows just a handful of the well-known individuals he trained.

Pierre Marie was his right-hand person for a number of years (Figure 9) (*The Founders of Neurology*, p. 476-479).² He went on to describe cerebellar ataxia and spinal cord diseases,¹² and of course Charcot-Marie-Tooth disease.^{13, 14} He was Charcot's disciple, and in 1886 he wrote the paper describing this condition. Tooth, in England, wrote a similar

Figure 8

Descendants of Charcot

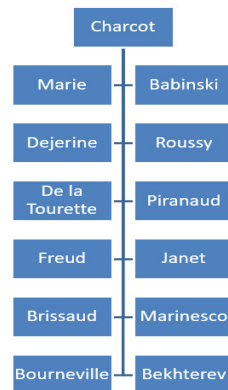


Figure 9

History of Neurology France Late 1800's - Salpêtrière

- **Pierre Marie (1853-1940)**
Paris, France
 - Cerebellar ataxia/spinal AVM
 - Charcot-Marie-Tooth
 - *Revue médicale* (1886)
 - *Lectures on the Diseases of the Spinal Cord* (1895)
- **Joseph François Félix Babinski (1857-1932)**
Paris, France
 - Extensor sign
- **Joseph Jules Dejerine (1849-1917)**
Paris, France (B: Geneva, Switzerland)
 - FSH MD
 - Pain Syndrome
- **Gustave Roussy (1874-1948)**
Paris, France (B: Vevey, Switzerland)
 - Pain syndrome
 - Neuropathy



Babinski



Marie



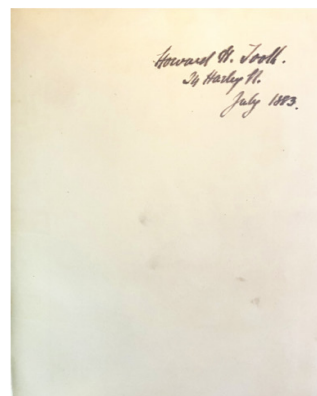
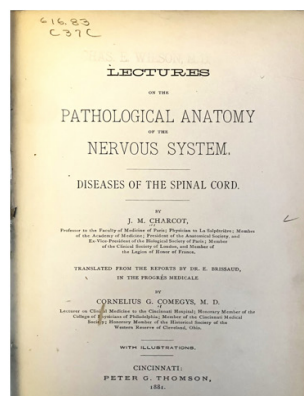
Roussy



Dejerine

Figure 10

Jean Martin Charcot - *Lectures on the Pathological Anatomy of the Nervous System: Diseases of the Spinal Cord* (1881)



paper, and that is why we now call it Charcot-Marie-Tooth disease. Pierre Marie also wrote the famous book *Lectures on Diseases of the Spinal Cord*.¹⁵

Figure 10 shows a photograph of another copy of Charcot's book *Lectures on the Pathological Anatomy of the Nervous System: Diseases of the Spinal Cord* (1881) and one of the inside pages signed by a previous owner of the book.¹⁰ Remarkably, the previous owner of this book was Howard H. Tooth of London. This is the very Dr. Tooth whose name we associate with the disease Charcot-Marie-Tooth. I purchased this book from an antiquarian book seller a number of years ago, but I don't think that the book seller realized it was a signed copy of Charcot's book owned by Dr. Tooth. Tooth published his famous monograph on the hereditary disorder he called *The Peroneal Type of Progressive Muscular Atrophy* as his doctoral thesis in 1886, three years after he added his signature in Charcot's 1883 book! Charcot and Marie's paper on hereditary neuropathy was published in the same year as Tooth's dissertation-1886.¹⁴

Then there is the famous Dr. Babinski, whom we know for the extensor plantar response, or Babinski sign (*The Founders of Neurology*, p. 397-399).^{2,16} Dejerine made many contributions, including a description of facioscapulohumeral muscular dystrophy, olivo-ponto-cerebellar degeneration,¹⁷ and the Dejerine-Roussy pain syndrome (*The Founders of Neurology*, p. 426-430 and *Fragments of Neurological History*, p. 217-220).^{2, 3, 18} Roussy, another disciple of Charcot, also described, with Levy, a hereditary neuropathy with ataxia

(*The Founders of Neurology*, p. 510-513).^{2, 19}

Figure 11 shows more of Charcot's famous trainees. Gilles de la Tourette described tics, and we now call the condition Tourette syndrome. Henri Parinaud described the dorsal midbrain syndrome with vertical gaze paralysis, often due to pineal tumors.²⁰ Brissaud first described the locus nigra as a possible site of the lesion in Parkinson's disease, and he later became chair at the Salpêtrière. Pierre Janet became extremely famous and was one of the founders of psychology. Bourneville described tuberous sclerosis, which we now know as Bourneville disease,²¹ and he was one of the disciples who edited the lessons in French (*Fragments of Neurological History*, p. 391-394).³

These were mostly French disciples from Paris, although some came from outside Paris to train under Charcot. Charcot also trained a number of individuals from foreign countries (See below).

Figure 12 provides more information on Pierre Marie. While working under Charcot, he was chief of the laboratory. At age 60, he left to work at other universities for a few decades, but later returned and succeeded Déjerine in Charcot's chair. Figure 12 shows the title page of his famous *Diseases of the Spinal Cord*, translated into English in 1895.¹⁵

Figure 13 lists a number of eponyms associated with disorders Dejerine described. These include the Dejerine-Roussy pain syndrome mentioned above; the Dejerine medial medullary syndrome; the onion-peel sensory loss of the face; the Dejerine-Klumpke paralysis, a brachial plexus

Figure 11

History of Neurology

France Late 1800's - Salpêtrière

- **Georges Gilles de la Tourette** (1857-1904) Paris, France
 - Tourette's Syndrome – TICS
- **Henri Parinaud** (1844-1905) Paris, France
 - Dorsal Midbrain Syndrome
 - Vertical Gaze Palsy
 - Pineal Tumor
- **Édouard Brissaud** (1852-1909) Paris, France
 - *Locus niger* lesion site in PD
 - Double innervation of Face
 - Chair at Salpêtrière after F. Raymond who succeeded Charcot - 1899
- **Pierre Janet** (1859-1947) Paris, France
 - One of Founding Fathers of Psychology
 - Developmental hierarchy
- **Desire Magloire Bourneville** (1840-1909) Paris, France
 - Tuberous Sclerosis
 - Edited *Leçons*



Figure 12

Pierre Marie



Chef de laboratoire under Charcot

At age 60, he succeeded Dejerine in Charcot's chair

LECTURES ON DISEASES OF THE SPINAL CORD

BY
DR. PIERRE MARIE,
*Député-Professor at the Faculty of Medicine of Paris.
Physician of the Hôpitals.*

CONTAINING TWO HUNDRED AND FORTY-FOUR WOODCUTS.

TRANSLATED BY
MONTAGU LUBBOCK, M.D., F.R.C.P. LOND.

LONDON:
THE NEW SYDENHAM SOCIETY.
1895.

Figure 13

Dejerine Eponyms

- Dejerine's "onion-peel sensory loss"
- Dejerine's cortical sensory syndrome
- Dejerine-Mouzon syndrome
- Dejerine syndrome: medial medullary syndrome
- Dejerine-Klumpke paralysis (Augusta Marie Klumpke was his American wife)
- Dejerine-Roussy syndrome
- Dejerine-Sottas disease
- Dejerine-Thomas olivopontocerebellar atrophy
- Landouzy-Dejerine syndrome

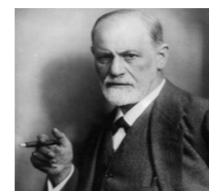
Figure 14

History of Neurology France Late 1800's – Salpêtrière Visiting Scholars

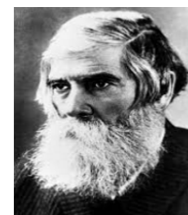
- **Sigmund Freud** (1856-1939)
 - Vienna, Austria
 - Briefly Charcot's visiting "Fellow"
- **Georges Marinesco** (1864-1938)
 - Bucharest, Romania
 - 1897 Chair, Neurology at U. of Bucharest
 - 250 papers
 - Inclusions in substantia nigra
 - Familial amaurotic idiocy
- **Vladimir Bekhterev** (1857-1927)
 - Moscow, Russian
 - Scholarship abroad with Charcot, Meynert, Westphal, Flechig
 - Clinical neurology & experimental psychology in St. Petersburg & Leningrad



Marinesco



Freud



Bekhterev

palsy that De

described.²² She was actually an American physician and one of the early American neurologists to make a major contribution in the field.

Charcot also trained a number of visiting scholars, some of whom became extremely famous in Western civilization (Figure 14). The most well-known is Sigmund Freud, who trained briefly with Charcot. He was only there for a few months in Paris, but it had a profound effect on Freud's development and ultimately on the creation of psychoanalysis. Marinesco from Romania trained with Charcot and later became chair of neurology in Bucharest. He published many papers and described inclusions in the substantia nigra, now known as Marinesco bodies. The famous Russian physician

Vladimir Bekhterev also trained with a number of European neurologists, including Charcot, and later led the clinical neurology and experimental psychology department in St. Petersburg and then Leningrad after the Revolution.

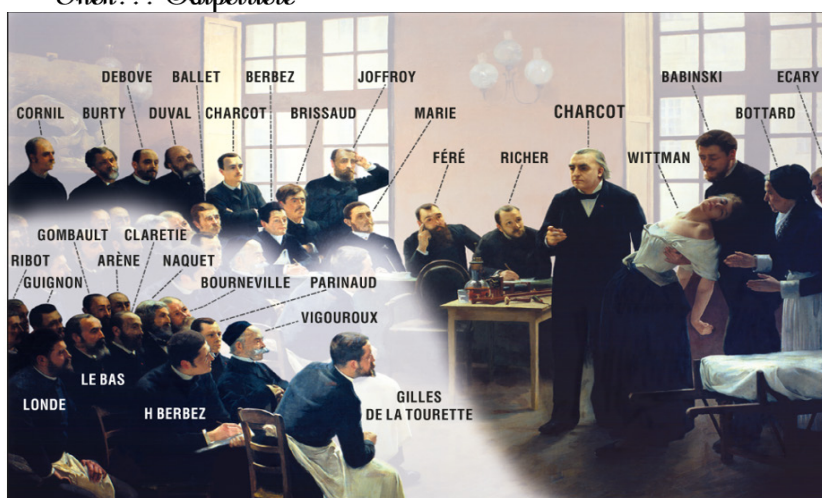
Figure 15 shows the well-known painting *A Clinical Lesson at the Salpêtrière* painted by Andre Brouillet in 1887. The original painting hangs in the corridor of the Descartes University in Paris. This is a modern colorized version, allowing you to see the individuals more clearly. Charcot is demonstrating phenomena in a hysterical patient. Here is Babinski, Gilles de la Tourette, Brissaud, Bourneville, Marie, and a number of other French neurologists and members of the French community.

Charcot's son is pictured in the back row. He was a physician but later became an explorer, which is how he

Figure 15

WAYS PHYSICIANS DISCUSS NEUROLOGY

Then... Salpêtrière



A Clinical Lesson at the Salpêtrière, Andre Brouillet (1887); hangs in corridor of the Descartes University in Paris

Figure 16

Now...



Richard Barohn, Mazen Dimachkie, Mamatha Pasnoor, Jeffrey Statland, Jon Katz, Todd Levine, David Saperstein, Katalin Scherer, Aziz Shaibani, Mike Pulley, Tony Amato, Carlayne Jackson, Osvaldo Nascimento, John Kissel, Sara Austin, Tahseen Mozaffar, Anthony Amato, Gil Wolfe, Matt Wicklund, Jaya Trivedi, Omar Jawdat, Laura Herbelin

spent much of his life. This is how neurologists used to be trained in classrooms. Now we are in the modern era, training neurologists through the internet and videos like this one on YouTube.

Figure 16 shows our modernization of the Charcot lecture hall picture, with someone demonstrating, along with many well-known neuromuscular neurologists from across the country who are involved in the RAF5 and the RRNMF (rrnmf.org).

Notable French Physicians Focused on Neurology that were not part of the Charcot Lineage

This brief review of French neurologists and neuroscientists from the 19th century would not be complete without at least mentioning several extraordinary and famous physicians that were contemporary of Charcot, and who influenced Charcot, but were not part of his group.

The first is Amand Duchenne, who is notable for several contributions (*The Founders of Neurology*, p. 430-435).² He of

course was the first to recognize the hereditary progressive muscle disease restricted to boys with pseudohypertrophy of the calf muscles that we now call Duchenne muscular dystrophy (Figure 18).²³

He described other neuromuscular disorders as well such as the pure lower motor neuron form of motor neuron disease, progressive muscular atrophy, which is also referred to as the Aran-Duchenne disorder. Duchenne assisted Francois Aran, another French physician, in evaluating patients with this disorder. Aran published the cases in 1850.²⁴ Duchenne later described progressive muscular atrophy in great detail in his textbook *A Treatise on Localized Electrization*.²⁵ There appears to have been some dispute on who described the disorder first and Duchenne felt that he should have been given this credit, although it appears from a distance in time that they were collaborators. Debates on who described a medical disorder first have existed for a long time! We also saw this type of

Figure 17

Other Notable 19th Century French Neurologists

- **Amand Duchenne (1806-1875);**
Boulogne-sur-Mer, France
 - Muscular dystrophy
 - Progressive muscular atrophy
 - Glosso-labio-laryngeal paralysis
 - Electrical stimulation
- **Pierre Paul Broca (1824-1880);**
Sainte-Foy-la-Grande, France
 - Motor aphasia, frontal lobe

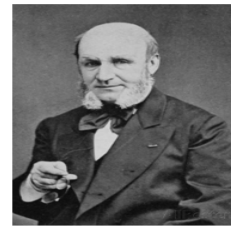


Figure 18

Young Boy with Muscular Dystrophy and Pseudohypertrophy; Harpoon biopsy tool with examples of muscle histology

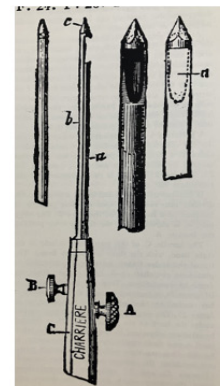
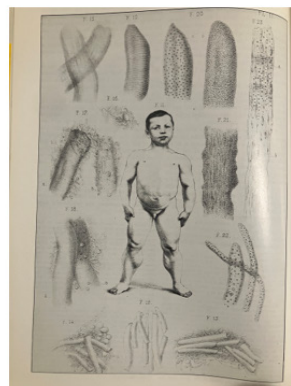
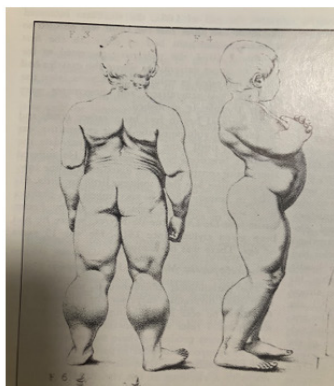


Figure 19

Contribution à l'étude de l'atrophie musculaire progressive, type Duchenne-Aran (1895)

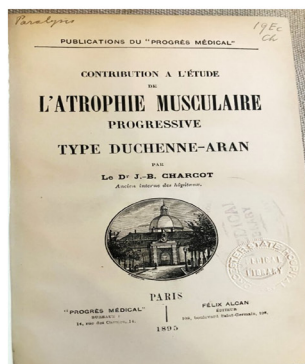
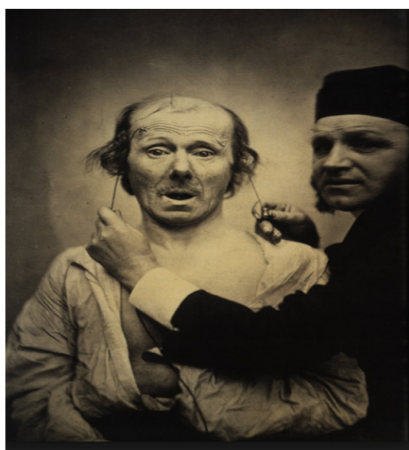


Figure 20

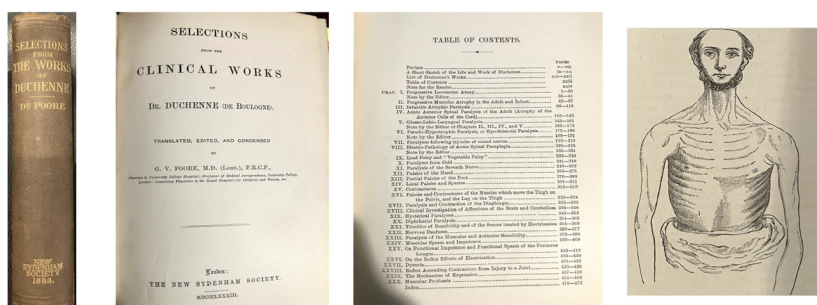
Amand Duchenne Electrophysiology



A TREATISE
OF
LOCALIZED ELECTRIZATION,
AND ITS APPLICATIONS TO PATHOLOGY
AND THERAPEUTICS.
By DR. G. B. DUCHENNE.
TRANSLATED FROM THE THIRD EDITION OF THE ORIGINAL,
By HERBERT TIBBITS, M.D.,
SURGEON OF THE ROYAL COLLEGE OF SURGEONS OF LONDON,
MEDICAL SUPERINTENDENT OF THE NATIONAL HOSPITAL FOR THE PARALYSED
AND DEFORMED.
WITH NUMEROUS ILLUSTRATIONS,
AND NOTES AND ADDITIONS BY THE TRANSLATOR.
PHILADELPHIA:
LINDSAY & BLAKISTON.
1871.

Figure 21

Selections of the Clinical Works of Dr. Duchenne (De Bologne) - Translated by G.V. Poore in 1883



controversy between Charles Bell and François Magendie regarding the organization of motor and sensory pathways into and out of the spinal cord as we discussed in another article in this volume (See *History of Neurology: Charles Bell and François Magendie - British versus French Fights in the Age of Napoleon and the Discovery of the Bell-Magendie Law*).²⁶ Two years after Charcot's death in 1895, an extensive monograph on progressive muscular atrophy was published posthumously in which Charcot cites the pioneering work of both Aran and Duchenne (Figure 19).²⁷

Duchenne also described progressive bulbar palsy, which he called glosso-labio-laryngeal paralysis, and this entity has at times been referred to as Duchenne's disease.²⁸ Duchenne was the first to perform muscle biopsies using a "histological harpoon" and examined the tissue under the microscope (Figure 18). Duchenne was one of the early physicians who used the new technique of photography in his medical publications. Finally, he was a pioneer in the field of electrophysiology, and he was one of the early physicians that utilized electrical stimulation of muscles both to observe the action of certain muscles as well as to provide potential electrotherapy.

Duchenne published his findings regarding electrotherapy and the movement of muscles in three textbooks. The first was *A Treatise on Localized Electrization and its Applications to Pathology and Therapeutics* published in French in 1855. Dr. H Tibbets published the first English translation from 1871 (Figure 20).²⁵

Tibbets only translated the first half of the book on electrical stimulation. Over the years, in subsequent additions, Duchenne kept adding numerous clinical cases to the second half of the book. In 1883, G. V. Poore published these clinical sections in English, and this is when Duchenne's amazing insights and accurate clinical observations of so many neuromuscular disorders became available to the English-speaking world (Figure 21).

His second book published in 1862 was called *Mécanisme de la physionomie humaine, ou, Analyse électro-physiologique de l'expression des passions*. This book was only recently translated into English (in 1990!) and contains many examples of Duchenne's use of photography in his medical publications (Figure 22).²⁹

Duchenne's third important book was called *Physiologie des mouvements démontrée à l'aide de l'expérimentation électrique et de l'observation clinique et applicable à l'étude des paralysies et des déformations* published in 1867 and translated in English as *Physiology of Motion Demonstrated by Means of Electrical Stimulation and Clinical Observation and Applied to the Study of Paralysis and Deformities* (Figure 23).³⁰

Charles Darwin reprinted photographs of Duchenne performing electrical stimulation on humans to mimic various facial expressions in his 1872 book called *The Expressions of the Emotions in Man and Animals*.³¹

It is interesting that scientists in the 1800s were fascinated by facial expressions in both humans and animals and it was

thought that the understanding of facial expressions provided a window into feelings and brain function. Recall that Charles Bell fifty years earlier wrote a book of observations on facial expression in humans and animals that was valued by artists, scientists, and physicians (see *History of Neurology: Charles Bell and François Magendie - British versus French Fights in the Age of Napoleon and the Discovery of the Bell-Magendie Law* this issue).^{26, 32}

Duchenne practiced in Boulogne, where he was born, but then spent the majority of his adult life practicing in Paris. Duchenne never had any official attachment to any hospital, nor did he receive any recognition by the French academy or institute. However, he was well known to Charcot and others as a pioneering observer and diagnostician. Charcot apparently assisted Duchenne to become familiar with the microscopic examination of tissue. He also allowed Duchenne to serve as a physician on his service at the Salpêtrière in 1862. So while Duchenne was nearly twenty years older than Charcot, Charcot had become a leader in French medicine and assisted Duchenne in integrating into the Parisian medical circle. In return, Duchenne taught Charcot how to use photography in medical practice and publications. When I read Duchenne's clinical descriptions of various neuromuscular diseases, which are now so well known to us, I am amazed about his observational accuracy and prescience. Charcot may be considered by many as the father of modern clinical neurology, but Duchenne can rightly be considered the first true neuromuscular neurologist and electrophysiologist.

Another notable French physician from this era who contributed a great deal to neurology was Pierre Paul Broca (*The Founders of Neurology*, p. 12-16 and *Fragments of Neurological History*, p. 70-75).^{2, 3} Broca is of course most known for observing that motor aphasia was produced by damage to the left frontal lobe which contains the primary speech area.³³ While Broca was writing about the frontal gyrus as the motor location for speech, Wernicke was simultaneously writing about the superior temporal gyrus as the localization for understanding speech and where lesions produced a sensory aphasia (see *History of Neurology: German and Austrian Neurology (and some Psychiatry) in the 1800s - A Cautionary Tale* this issue).^{34, 35} Hughlings Jackson in England (See *History of Neurology: Regal Neurology* this issue)³⁶ and Broca corresponded and agreed with one another on brain localization and presented papers at joint scientific meetings. Interestingly, Pierre Marie, who at one point was Broca's student, apparently disagreed with his mentor's brain localization ideas.

Another important physician who contributed a great deal to neurology as well as a variety of other areas of medicine was Claude Bernard (*The Founders of Neurology*, p. 175-178 and *Fragments of Neurological History*, p. 252-255).^{2, 3} Bernard was a pioneer in creating the field of academic experimental medicine by performing research on small animals, observing the effect, and extrapolating the significance to humans.³⁷ Today we call this translational medicine. He often credited his

Figure 22

The mechanism of human facial expression (1862) – First English translation 1990

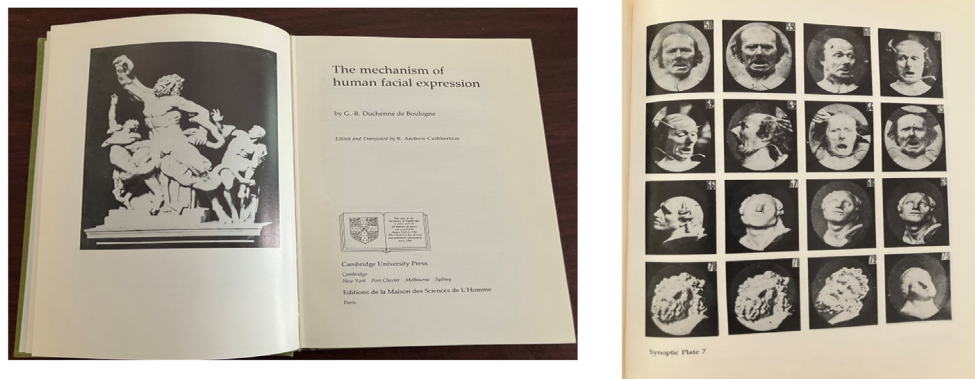


Figure 23

Physiology of Motion Demonstrated by Means of Electrical Stimulation and Clinical Observation and Applied to the Study of Paralysis and Deformities (1949) – Originally published in French in 1867

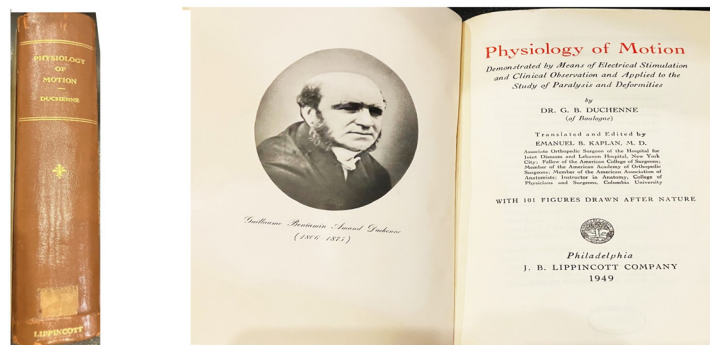


Figure 24

The Expressions of the Emotions in Man and Animals - Charles Darwin (1872)



mentor, François Magendie, as his forerunner of experimental physiology in France (see *History of Neurology: Charles Bell and François Magendie - British versus French Fights in the Age of Napoleon and the Discovery of the Bell-Magendie Law*).²⁶ He performed a number of experiments on the sympathetic nervous system. In 1852, he performed an experiment in rabbits in which he cut the cervical sympathetic nerve and showed that it produced constriction of the pupil, flushing, and rise of temperature in the ear. Subsequently, in 1869, a Swiss ophthalmologist Johann Horner described a man with myosis and ptosis and since then the disorder is either called Horner syndrome or Claude Bernard-Horner syndrome.³⁸ But Bernard is best known for his book called *Introduction à l'étude de la médecine expérimentale* (1865) translated into English by Greene in 1927 as *Introduction to the Study of Experimental Medicine*.³⁹ It continues to be republished in

English and many other languages and is still read avidly by aspiring young medical scientists. This book gives a great deal of wise advice to scientists and physicians about pursuing a career in experimental medicine and is still very readable to this day. Bernard never practiced clinical medicine and devoted his entire career to laboratory research.

The final French physician of note who trained in Paris and spent a great deal of his career in France is of course Charles Edouard Brown-Séquard, who we discussed in a previous history of neurology article (See *History of Neurology: Charles-Édouard Brown-Séquard - The Original International Neurologist and Fragments of Neurological History*, p. 221-227).^{3, 40} While Brown-Séquard traveled across the globe spending time as a physician in Mauritius, Paris, the United States, and London in Queen Square, he both began his career and finished it in France. Brown-Séquard is of course most well-known for his experimental cord hemisections showing

Figure 25

Claude Bernard (1813-1878)

- B: Paris, France
- Student of François Magendie
- In 1852, severed cervical sympathetic nerves in rabbits and produced animal model for what later became known as Horner's syndrome (Described in humans by Horner, 1869)
- *Introduction to the Study of Experimental Medicine* – 1865
 - First English translation, 1927

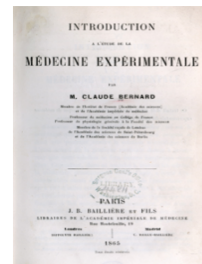
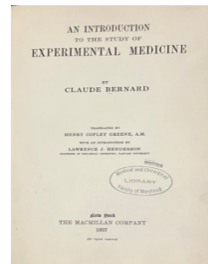
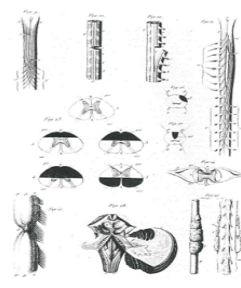
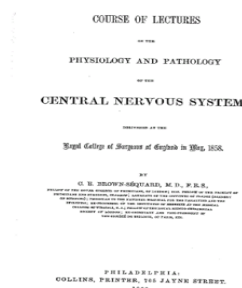
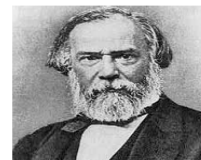


Figure 26

Édouard Brown-Séquard (1817-1894)

- Born: Port Louis, Mauritius
- Travel: Paris/USA/UK-Queens Square
- First international neurologist
- Cord hemisection/crossed pathways



that motor pathways are ipsilateral whereas some sensory pathways are contralateral in the spinal cord and therefore a lesion of half the spinal cord produces what we now call the Brown-Séquard syndrome.

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