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## History of Neurology

# Armand Trousseau (1801–1867), a neurologist before neurology

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### ABSTRACT

Armand Trousseau is the emblematic figure of the prominent mid-19th century clinician, owing to the quality of his teaching and the influence of French medicine, which during his time brought students from around the world to Paris. A student of Pierre Bretonneau (1778–1862), the famous physician from the western French city of Tours, Trousseau carried forward Bretonneau's clinical description of infectious diseases, developing the notion of their contagion and paving the way toward the discovery of their microbial aetiology by Louis Pasteur (1822–1895) at the end of the century. His teachings, *Les Leçons cliniques de l'Hôtel-Dieu*, transcribed by his students, played a role in training young physicians for half a century. In this work, Trousseau covered several neurological diseases such as apoplexy, epilepsy, chorea, Parkinson's disease, and amyotrophic lateral sclerosis. The rich, Balzac-like detail of his clinical pictures would be unthinkable today. While he cannot be credited with any seminal descriptions in particular, some of his observations contain significant nuggets, such as a case of Gilles de la Tourette syndrome, twenty years before the seminal publication. After a biographical account, we will present the main lessons given by Trousseau on neurological subjects. One of Trousseau's little-known contributions is to have invited Guillaume Duchenne de Boulogne (1806–1875) to his department at the Hôtel-Dieu hospital, setting Duchenne on the path to becoming a pioneer of Parisian neurology.

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In France, Jean-Martin Charcot (1825–1893) is considered one of the originators of neurology as a speciality. Diseases of the nervous system have always existed and well before Charcot, physicians had noted some of their symptoms. One such physician was Armand Trousseau (1801–1867), among the most famous clinicians in mid-nineteenth century Paris. After some biographical details, we will review his lessons that dealt with nervous system pathologies.

## 1. Medical studies: Pierre Bretonneau's influence as his teacher

Armand Trousseau (Fig. 1) was born on 14 October 1801 (23 Vendémiaire an X according to the French revolutionary calendar) in Tours, the son of a teacher, Nicolas Trousseau (1763–1812), from Berry in central France. His mother was



**Fig. 1 – Photography from A. Trousseau by Félix Nadar (1861). Frontispiece of the book *Clinique médicale de l’Hôtel-Dieu* (Private collection of the author).**

Marie-Armande Clérant (1769–1845) [1], who was widowed in 1812. With two children from a previous marriage, she found herself in a particularly difficult financial situation. One of these two children, the future general Maxime Jacquemin (1795–1863), would help Trousseau financially during his medical studies. His mother obtained a scholarship for his secondary education, first at a boarding school in Orléans, then in Lyon, where he was a classmate of the future republican historian, Edgar Quinet (1803–1875). Following these initial studies, Trousseau worked as a private tutor in Blois, then in Tours before being named to a position teaching rhetoric at the age of twenty, at a middle school in Chateauroux, in keeping with his father’s wishes [2].

His fate changed course in 1821, when he met Pierre Bretonneau (1778–1862), chief physician at the hospital in Tours. After a brief conversation, Bretonneau urged him: “Become a physician!” Leaving his teaching career behind, Trousseau headed to the medical school in Paris [2]. In 1822, the Abbot Denis Frayssinous (1765–1841), designated “*Grand-Maître de l’Université*” by the King Louis XVIII, would order the temporary closure of this school. Availing himself of the university monopoly created by Napoleon, he enabled the Catholic hierarchy and the Bourbon monarchy to reclaim power over teaching by appointing professors loyal to these groups [3]. Once again Trousseau’s fate took an unexpected turn. Disliking this kind of clericalism, he preferred to return to

Tours, where on 17 January 1823, he enrolled as an *externe* (a non-resident medical student), becoming a surgery resident in 1824 [4]. During his two years in Tours, he studied with Bretonneau who became a kind of father figure as well as a faithful friend. Trousseau was his brilliant successor for the study of both “*dothiémentérite*” (typhoid fever) and diphtheria.

Returning to Paris in 1825 to complete his studies (but not as a resident) in the Paris hospitals, Trousseau attended the hospital lessons of Joseph Récamier (1774–1852), Henri Husson (1772–1853), François Broussais (1772–1838), and François Magendie (1783–1855), as he wrote to Bretonneau: “I’m now in touch with Mr. Magendie and have arranged to be admitted to his experimental physiology lessons [...]. He does rounds at Hôtel-Dieu and I am able to watch him administer morphine, hydrocyanic acid, and all these new medicines [...]. I have ample time to learn how to use Laennec’s cylinder [stethoscope], since only 5 or 6 of us are participating in these clinical lessons” [5]. It was his friend, also a faithful student of Bretonneau, Alfred Velpeau (1795–1867), who presented Trousseau to Antoine-Athanase Royer-Collard (1768–1825), a physician at the Charenton asylum. In October 1825, a month before his death, the latter gave Trousseau a resident position, including food, board, and remuneration. During this period in Charenton, Trousseau regularly spent time at the nearby Maisons-Alfort veterinary school, where “he familiarised himself with using a microscope” and continued his studies of experimental physiology he had begun with Magendie [2]. For a while, he considered passing the veterinary examination, followed by “an apprenticeship with some little blacksmith in the Faubourg Saint-Antoine” in order to learn “those difficult operations of forging and horse-shoeing” which caused him apprehension [5]. He did not end up realising this plan.

Disappointed with Bretonneau’s unfulfilled promises to pass along manuscripts on diphtheria and typhoid fever which he was very interested in, Trousseau took the initiative in 1826 of writing an article for the *Archives générales de Médecine* entitled “*De la maladie à laquelle M. Bretonneau a donné le nom de dothiémentérite*” (On the disease that Mr. Bretonneau has named “*dothiémentérite*” [typhoid fever]) [6]. Trousseau showed the similarities with what Philippe Pinel (1745–1826) had called adynamic fever [7]. Bretonneau’s treatise, *Traité de la dothiémentérite*, would not be published until 1922, by Louis Dubreuil-Chambardel (1879–1927).

Joining forces with Velpeau, Trousseau obtained permission from Bretonneau to publish *Des inflammations spéciales du tissu muqueux et en particulier de la diphthérite, ou inflammation pelliculaire connue sous le nom de croup, d’angine maligne, d’angine gangréneuse* (Special cases of inflammation of the mucous tissue, particularly diphtheritis, or the pellicular inflammation known as croup, malignant angina, and gangrenous angina) [8]. Only in 1855 did Bretonneau accept Trousseau’s suggestion to use the term “diphtheria” in place of “diphtheritis”.

## 2. Thesis, agrégation, and university career

On 19 August 1825, with a jury presided by Joseph Récamier (1774–1852), Trousseau defended his thesis: *Des lividités*

*cadavériques du canal digestif* (Livor mortis of the digestive canal) [9]. As he confessed to Bretonneau: “I started it the day before yesterday in the morning and finished it last night. I made a potpourri de resorption, marsh fever, dothiémentérite, and suggilations which altogether made for 15 printed pages. I was brief, firstly because I didn’t have much time and secondly because printing costs are very high and I don’t have much money. My brother covered all my costs” [5]. He was referring to his half-brother, Maxime Jacquemin.

In 1826, Trousseau passed the *agrégation* exam to enter the path toward professorship: “Here is the thesis subject that I drew this evening: an membranoe mucosoe gastro-intestinalis inflammtio, certis signis, tum in vivo, tum in cadaverer diagnoscutur” [5]. The response was to be written in Latin. He was second-to-last among those who passed the exam, ranking below Adolphe Piorry (1794–1879), François Martin-Solon (1794–1856), Melchior Gibert (1797–1866), Antoine-Laurent-Jessé Bayle (1799–1858), and Jean-Baptiste Bouillaud (1796–1881). He gave his first lesson on 24 November 1827, attended by Jean-Étienne Esquirol (1772–1840) and Étienne-Jean Georget (1795–1828), but by few students.

In 1828, an epidemic of diphtheria broke out in Sologne, to the east of Tours. Bretonneau sent Trousseau to the region, who quickly realised that the cauterisation of the throat recommended by his teacher was ineffective. He tried tracheotomy, a technique invented by Lorenz Heister (1638–1758) in 1739 [10], whereby he fashioned a cannula with a lead bullet and incised the trachea with a pocketknife. The success of this test led to his performing several hundred tracheotomies during his career and broadly disseminating this method [2]. The following year Pierre-Charles-Alexandre Louis (1787–1872) and Nicolas Chervin (1783–1843) sent him to Gibraltar to study the yellow fever epidemic. He came down with the disease himself, struggled to recover, and was unable to complete his mission.

In 1830, he became a physician of the Central Office of the Paris hospitals and stepped in for Récamier at Hôtel-Dieu. He married Geneviève Caillot on 21 October 1830. The couple would have two children. Cholera broke out in Paris in 1832 and Trousseau was one of the first victims: “I was lucky, and my cholera could hardly be called by this name were it not for the fainting spells that made me quite miserable” [5].

Trousseau did not succeed in his bid for the Chair of Physiology in 1833. From 1835 to 1839 he worked at Necker hospital, then at Saint-Antoine from 1839 to 1852 (Fig. 2). In 1837, he once again failed to obtain a chair, this time the Chair of Hygiene. The thesis he defended was entitled: *Des principaux aliments envisagés sous le point de vue de leur digestibilité et de leur puissance nutritive* (Primary foodstuffs considered in terms of digestibility and nutritive power). Finally, in 1839, he was appointed to the Chair of Therapeutic Treatments after defending a thesis entitled *De l’influence de l’habitude sur l’action des médicaments* (The influence of habit on the action of medicines) and after giving an oral lesson on the therapeutic uses of opium. An indication of his temperament, Professor Trousseau became the student of his 1844 *externe* and future successor, Adolphe Gubler (1821–1879), to gain the botanical knowledge he lacked: “My friend, I’d like you to give me lessons in natural history and chemistry” [11]. In his teachings on treatments, Trousseau championed the use of iron for



**Fig. 2 – Trousseau and his students in 1865 (BIU santé, Paris. Public domain).**

chlorosis, quinquina for fever, and most often disapproved of bloodletting. In 1843, he published his first studies on thoracentesis in cases of pleurisy [12].

When Auguste-François Chomel (1788–1858), physician to King Louis-Philippe and a “faithful friend of a banished dynasty”, refused to “swear an allegiance that injured his conscience” [13], which is to say that he refused to swear allegiance to Emperor Napoleon III, Trousseau replaced him in 1852, in the Medical Clinic at Hôtel-Dieu. His teaching in this capacity ensured his renown and he became the most consulted clinician in Paris [14].

Trousseau had a brief political career. After the 1848 Revolution and the fall of the “July Monarchy”, he was elected on 23 April 1848 as deputy of the Eure-et-Loir department for the constituent assembly, along with some thirty republican physicians, including Eugène Dezeimeris (1799–1851), Ulysse Trélat (1795–1879), Louis Laussédât (1809–1878), and Benjamin Buzéaux (1796–1865). He voted in favour of banishing the Orléans family and rejected the prosecution of Louis Blanc (1811–1882). “With his strong, clear voice and his gifts as a professor, Mr Trousseau is an eloquent speaker and may thus find success in the National Assembly” [14]. When General Eugène Cavaignac (1802–1857) lost the election to become president under the 2nd Republic, on 04 November 1848, Trousseau lost his own re-election campaign. This marked the end of Trousseau’s political career [15].

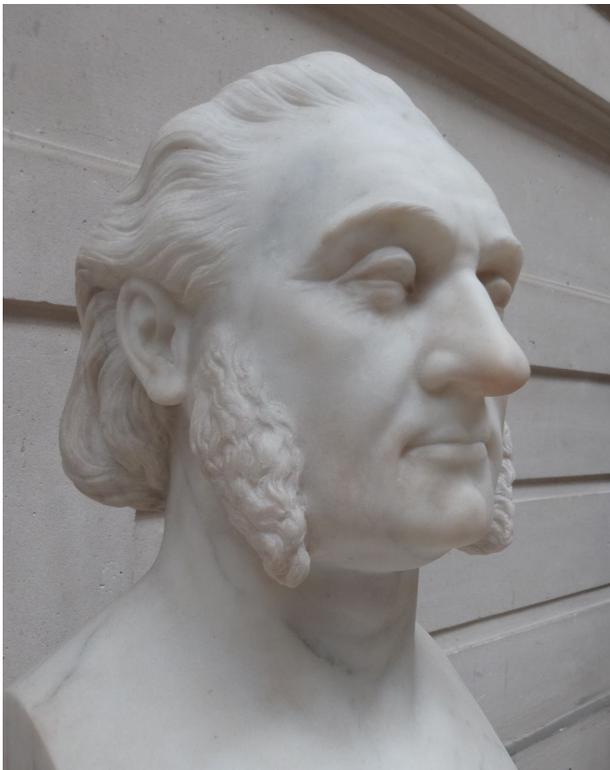
In 1856, he was elected a member of the French Academy of Medicine. But in a letter to Bretonneau describing the positive results of tracheotomy in cases of diphtheria, he had this to say: “I so distrust this institution that I’m tempted to say nothing to them at all. It is, however, my duty to shine light on the truth, so I may throw them this bone and watch them fight over it publicly, in order that you get the recognition you deserve” [5].

Adolphe Bloch was his *externe* in 1864. He painted this portrait of Trousseau: “Tall and slim, he held his head high. His features were handsome: a high forehead, a slightly long

nose, thin lips, and a proud chin. He did not wear a beard but had medium-length sideburns, grey in 1862, and which he often stroked with his fingers as he spoke". As an aside, he added: "I am unaware whether the bust at the Academy of Medicine was modelled after Trousseau himself, but I can affirm that it in no way resembles the original" [16] (Fig. 3). Jules Auguste Bécларd (1818–1887) described Trousseau this way: "With a rare degree of good sense, an ardent imagination, determination combined with flexibility, clarity and accuracy, he had all the characteristics, good and sometimes bad, of an inventive and impulsive mind" [13].

### 3. A few of his publications

Once he had defended his thesis, Trousseau put out publication after publication. In 1826, he prepared a thesaurus for the monumental, nine-volume surgical treatise, *Traité des maladies chirurgicales et des opérations qui leur conviennent* by Alexis Boyer (1757–1833), published between 1814 and 1826. In 1828, he collaborated with Urbain Leblanc (1796–1871) on the *Dictionnaire de Médecine et Chirurgie Vétérinaires* of Joseph Hurltel d'Arboval (1777–1839) [17], who valued the comparative anatomy knowledge Trousseau had acquired at the Maisons-Alfort veterinary school. This was when he was teaching comparative anatomical pathology outside the medical school. During one of his open lessons, he made the mistake of likening human tuberculosis to glanders in the horse. This regrettable confusion was not corrected until 1837, by Pierre Rayer [18]. In his correspondence with Bretonneau, he



**Fig. 3 – Marble bust of A. Trousseau (Academy of Medicine, Paris. Photographed by the author).**

indicated that he had written a treatise on medical-surgical pathology, initially with Frédéric Blandin (1798–1849), then with Jean-Nicolas Marjolin (1780–1850), to be published in 1828. The work was never released and the reason for this remains unknown [5].

In 1833, Trousseau founded the *Journal des connaissances médico-chirurgicales* with Henry Gouraud (1807–1874) and Jacques Lebaudy (1804–?), also Bretonneau's disciples. In 1836, he published the first edition of a treatise on medical treatments and materials, *Traité de thérapeutique et de matière médicale*, written with Claude Pidoux (1808–1882) and corrected by Bretonneau. Then in 1837, he released his practical treatise on tuberculous laryngitis, *Traité pratique de la phtisie laryngée*. In 1851, with the help of Pierre-Oscar Reveil (1821–1865), he added a treatise on prescribing formulations for pharmacists, *Traité de l'art de formuler*, to his lessons on therapeutic treatments [19]. In a letter to Bretonneau, dated 30 December 1843, he wrote that he had personally performed 133 tracheotomies to save children from diphtheria [20].

Trousseau's lessons had a large following. His easy eloquence and gifts of expression made a strong impact on his students' imaginations and memories: "Coughing in croup is hoarse, muffled, and dry, producing a sound comparable to the far-off barking of a young dog"; or, in reference to Addison's disease: "Her face took on a swarthy, smoky tint like the skin of a mulatto". His clinical lessons at Hôtel-Dieu were published starting in 1861 and were reprinted several times, with the final eleventh edition released in 1913. An Italian version was published in 1865, followed by English and German versions in 1868. Several generations of physicians studied these lessons: "His speech was like a bouquet of flowers, and these transcriptions are simply the dried-out remains" [16]. In reality, Trousseau did not transcribe his lessons himself. They were collated by several of his students in succession: Léon Blondeau (1824–1889), Victor Dumontpallier (1826–1899), and Michel Peter (1824–1893). Peter continued to organise the editions published after his death. His favourite student and true successor, in terms of the excellence of the clinical lessons he would later give, was Charles Lasègue (1816–1883) [21].

Trousseau befriended Guillaume-Benjamin Duchenne de Boulogne (1806–1875) and was the first to invite him to work at Hôtel-Dieu. He brought his work to a broader readership, notably that on progressive locomotor ataxia [22]: "The department where he was most often present was that of Trousseau at Hôtel-Dieu" [23]. Bloch crossed paths with him there: "A little old man, dressed in a black frock coat and a white tie, he was pale and thin and, like the Master, wore little white sideburns. He was respectful and said little. A faithful assistant, he was none other than Duchène de Boulogne" [16]. Not the least of Trousseau's contributions was to have realised, before Charcot, the great significance of Duchenne's work in clarifying the diseases of the nervous and muscular systems.

### 4. Lucidity

Trousseau gave up his Chair of Clinical Medicine in 1864 but maintained the Chair of Therapeutic Treatments and

continued to teach for two more years, until his retirement in June 1866. His retirement was brief; in the words of his student Peter: “On this 1 January 1867, when I went to extend my best wishes to him for the new year, Trousseau told me with sad resignation: ‘I’m done for. Phlebitis came on last night, leaving no doubt as to the nature of my ailment.’ Trousseau was right: he was the one who had discovered the links between phlebitis and stomach cancer, and now he was observing this connection in his own body, the reality of his discovery. From then on, his life was nothing but drawn-out torture. The physical suffering depleted his forces without disturbing his serenity; he spoke of his disease like a scholar, and supported it like a stoic” [24]. The Goncourts’ journal started 1883 with an account by Dieulafoy explaining how Trousseau had showed him his leg and spoken of his stomach cancer: “I was hoping for perforation or haemorrhage, but no; this will last some time” [25]. Trousseau died on 23 June 1867 (Fig. 4). He was buried at Père Lachaise Cemetery in Paris [26].

## 5. Neurological diseases taught by Trousseau

Trousseau’s lessons were delivered in the classical form used by most of the medical school professors. A clinical case that students were able to observe and examine in a ward of the Hôtel-Dieu department was used as an example on which Trousseau elaborated, as if he were thinking aloud, in order to make a diagnosis by eliminating various possibilities arising from the clinical examination, which he described, along with other cases from his long and rich experience. We will now review some of the lessons that cover the nervous system [27].

## 6. Cerebral haemorrhage and apoplexy

A patient hospitalised for “pulmonary catarrh” suddenly developed hemiplegia. The paralysis, for which there were no premonitory signs, predominated in the face, was slight in the



**Fig. 4 – A. Trousseau on his deathbed, as drawn by his student Georges Dieulafoy (1839–1911) (Bibliothèque nationale de France, Public domain).**

upper limb, and barely noticeable in the leg: “The man felt his tongue was not working properly, and that he stammered when he attempted to speak. His intelligence was in no way affected”. Trousseau clearly presented the differential diagnosis between central and peripheral facial palsy without ever citing the name of Charles Bell (1774–1842). He noted that the use of “apoplexy” made it necessary to differentiate between cerebral softening and cerebral haemorrhage. Softening was due to “blood congestion” or embolism. He gave multiple examples to show the variety of forms, from slight, regressive paralysis to coma, a sign of eminent death. He credited Récamier with the clinical elements for distinguishing haemorrhage from softening: “Complete absolute paralysis on one side of the body while the patient’s intelligence and sensitivity remain intact; in this case there is brain softening. When, on the contrary, this absolute loss of movement is linked to the loss of sensitivity and intelligence, especially when the individual suddenly falls into a deep coma, significant haemorrhage has occurred”. But he was also “tempted to accept the preliminary softening that Rochoux [28] sees as the organic condition; that is, the pathological work necessarily preceding any cerebral haemorrhage”. Trousseau regretted that the expression “cerebral congestion” was often used abusively: “I have trouble believing in apoplexy in thirty-five-year-old patients, especially when it recurs every two months. What comes immediately to my mind is epilepsy” [27]. In these cases, Trousseau spoke of “epileptic vertigo”. He never mentioned arrhythmia. What we now call a “transient ischaemic attack” was still unknown or considered a form of epilepsy. But he accurately described carotid artery atheroma: “As to damage to the arteries, characterised by the presence of yellowish, cartilaginous plaque encrusted with calcium salts, it does not appear to be an essential condition of cerebral haemorrhage” [27]. For him, the presence of atheromatous plaques did not explain cerebral haemorrhage. He seemed unaware of embolic stroke and did not clearly refer to rupture of the arterial wall, due to hyperpressure in the vessel, as an aetiology of haemorrhage.

## 7. On epilepsy

Trousseau described the “*grand mal*” seizure at length and in detail, highlighting the frequency of nocturnal seizures. Tongue biting was enough to confirm the diagnosis, but any involuntary loss of urine was considered a sure sign of epilepsy. Trousseau admitted that he did not know the cause given the usual lack of a macroscopically visible lesion during autopsy. He described the clinical picture of “status epilepticus”, which frequently precedes death. It is unclear whether Trousseau was describing an absence seizure or cataplexy or a generalized atonic seizure in this case: “A child was brought to me who had this singular form of epilepsy. I was told he had attacks four, five, even six times per hour; as his parents were telling me what they had observed, the little patient fell to the ground before me. He suddenly slipped from the chair where he was sitting and rolled onto the carpet. I examined him attentively and saw nothing that resembled a convulsion [...]. This form of epilepsy consists in simple dizziness and does not seem to have sequelae, not any immediate sequelae

at least; the individual, when he gets up, appears a bit surprised, then continues the interrupted conversation, as if nothing were wrong" [27]. He did not mention the comparable descriptions by François Poupart (1661–1709) in 1705 [29], the "petits accès" of Samuel Tissot (1728–1797) in 1770 [30], the "petit mal" of Esquirol in 1815 [31], or Louis-Florentin Calmeil (1798–1895), the first to use the term "absence" in 1824 [32].

Trousseau recognised in his patient a case of gelastic epilepsy: "During the short time he was in my office, he was overcome by an attack characterised by a fit of laughter. The attack lasted a few seconds, then the patient returned immediately to his senses and seemed very surprised when I asked him why he had laughed in this way. He was totally unaware of what he had just done". This child also had "grand mal seizures" [27]. Trousseau's discussion does not address any particular lesion because there was no autopsy.

But his text does not lack for errors. For example, in his descriptions of "epileptic auras" he brings in angina. The intellectual disorders that he presents as epileptic in nature are often transient acute hallucinations that are currently not linked to epilepsy and are instead considered brief psychotic disorders or transient dissociative episodes. Incidentally, Trousseau mentioned the case of "La Marquise de Dampierre" (1799–1884) [33] without naming her: "Everyone here has heard of a society lady who, when out in the world — at the theatre, at church, or while taking a walk — would suddenly utter the most serious insults, or the most obscene words, of which she was supposedly unaware. She was a respectable woman in every way and of great intelligence" [27]. He saw this as a case of the sudden and irresistible impulses that epileptics experience: "The society lady I spoke of just now, and who, under the control of singular, irresistible influences would utter the strangest words, of which she was supposedly unaware, would express out loud during her attack witty and insightful ideas that, according to convention, were usually kept silent. Even though in this case the impulse was irresistible, the veracity of the response or statement could make it seem, to those unaccustomed to the phenomena of epilepsy, that these words were intentionally uttered" [27]. He recounted the observation reported by Jean-Gaspard Itard (1775–1838) in 1825 [34] and that Georges Gilles de la Tourette (1857–1904) would use as the first example of the eponymous syndrome in his seminal description in 1885 [35].

## 8. Epileptoid neuralgia

Under the name "epileptoid neuralgia", Trousseau described trigeminal neuralgia, known thereafter as "*tic douloureux de Trousseau*", which he treated with morphine. He also asked Auguste Nélaton (1807–1873) to try to cut the nerve, but there was no lasting benefit, no more than for the electric shocks performed by Duchenne de Boulogne. He also recognised "*tic douloureux*", which is neuralgia "accompanied by convulsive movements" with possible blepharospasm or hemifacial spasm which, for him, was "a type of chorea or *danse de Saint-Guy* [St Vitus' dance]" for which he did not mention a treatment [27].

## 9. Tetany

The first description of tetany, under the name "intermittent tetanus", is probably that of Jean-Baptiste Dance (1797–1832) in 1831, in the context of fever in four patients [36]. Trousseau first identified cases of tetany in mothers who had recently given birth and were breast-feeding. He named the condition "rheumatic contraction of nursing mothers". Then he observed it during the 1854 cholera epidemic, and other diarrhoeal conditions such as typhoid fever. Here is how he described the crisis: "The thumb is energetically forced into adduction, the fingers are held tightly against one another and half-flex over the thumb, with flexion ordinarily only occurring in the metacarpophalangeal joint; the hand, with its palm hollowing out by the coming together of the external and internal edges, takes on the form of a cone, or if you prefer, the form the obstetrician's hand when he introduces it into the vagina". This description has become "Trousseau's sign", also referred to as the "obstetrician's hand" [27]. He observed his cases for up to three days. A chance discovery, his treatment consisted in placing a tourniquet at the root of the limb until arterial circulation was stopped and the contraction was released by ischaemia. His discussion as to the origin of these contractions was quite general, and it is strange that he viewed this symptom as a rheumatic complication, despite the diarrhoea and tuberculosis he observed "in debilitating conditions". Aside from a tourniquet, he recommended bloodletting and, as a last resort, the inhalation of chloroform.

## 10. Chorea

Étienne-Michel Bouteille (1732–1816), from Manosque in Southern France, was the first to have performed a study distinguishing between the different types of chorea or "*danse de Saint-Guy*" (St Vitus' dance) in 1810 [37]. Trousseau used the term "*danse de Saint-Guy*" to refer to the chorea of Thomas Sydenham (1624–1689) [38]: "This name seems better than any other, preferable to that of chorea, which, in its generic meaning, encompasses many things and specifies none, whereas "*danse de Saint-Guy*" applies to only one thing and all of it, which makes logical sense" [27]. During this period, it is true that almost all abnormal movements were classified under the name of chorea. However, the "*danse de Saint-Guy*", a name given by Paracelsus (Theophrastus Philippus Aureolus Bombastus von Hohenheim, 1493–1541) for a disease, in fact, known for centuries before him, lacks the specificity that Trousseau ascribes to it, as it also refers to an epidemic of frenetic dances or dancing plague (*manies dansantes*) that are psychogenic in origin. He credited Jacques-Pierre Botrel (1819–?) with having been the first to recognise the phenomenological link between acute rheumatoid arthritis and the "*danse de Saint-Guy*"; this was in a dissertation awarded a prize by the medical school in 1849 and which became the thesis Botrel defended on 25 May 1850 [39]. However, it is usually Germain Sée (1818–1896) who is credited with this link. Sée presented a dissertation shortly after Botrel to the French Academy of Medicine, on 11 December 1849: *De la chorée, rapports du rhumatisme et des maladies du cœur avec les affections nerveuses et*

convulsives (On chorea: links of rheumatism and heart disease with nervous and convulsive conditions) [40]. A remark that Trousseau added was that scarlet fever may also lead to rheumatism, carditis, and chorea. He noted that the appearance of abnormal movements is preceded by changes in “intellectual functions”, which he listed as morosity, anxiety, agitation, attentional deficit, and memory loss. Most often generalised, chorea may in some cases affect only one side of the body and may transform into temporary paralysis, but, in all cases, the patient cannot voluntarily control the motor agitation. He also noted that Louis Victor Marcé (1826–1864) had advanced the possibility of simultaneous hallucinatory episodes during choreic movements, which had previously been described by Bouteille. Trousseau recognised that he had not found evidence of brain lesions during autopsies once the disease had run its course. He did not consider cold baths to be beneficial in any way but did recommend gymnastic movements whereby the patient had to adjust choreic movement to the rhythm of a metronome. He recommended strychnine in progressive doses and sometimes hashish or chloroform, and, as a last resort, a straight jacket!

In his next lesson, Trousseau covered other types of chorea. His description of *chorea festinans* suggests a possible case of corticobasal degeneration or progressive supranuclear palsy: “His body was stiff, bent forward, his two arms extended along his trunk and thighs. He stared fixedly and ran rapidly on the tips of his toes, taking very small steps, like a man who was playing some sort of game”. He explicitly differentiated this chorea festinans from paralysis agitans. Describing different tic phenomenology, he gave this example: “A young Englishman was sent to me from Dieppe. His tic consisted in violent convulsive movements of the head and right shoulder [...]. These tics are in some cases accompanied by a cry, the voice bursting forth more or less loudly, which is characteristic. While on this subject, I shall mention the story that I have recounted several times, of one of my old classmates, whom I once recognised, after twenty years of not seeing him, while he was walking behind me, by the bark-like noise that I had heard him make when we were students together. This cry, this yelp, this burst of voice, a veritable laryngeal or diaphragmatic chorea, may constitute the entire tic. In a few cases, it is not only a bursting forth of the voice, a singular cry; it is an irresistible tendency to always repeat the same word, the same exclamation; and the individual may even reiterate words aloud that it would be better to hold back. These tics are quite often hereditary” [27]. Trousseau provided in this 1862 lesson a complete description of Gilles de la Tourette syndrome, more than twenty years before the seminal article. Georges Gilles de la Tourette (1857–1904) criticised him for considering this patient choreic.

Trousseau went on to mention “writer’s chorea” or “writer’s cramp”, which Duchenne de Boulogne called a “functional spasm”. He gave examples of different types of dystonia as Duchenne had reported them.

## 11. Shaking and “paralysis agitans”

Trousseau taught the difference between active shaking and shaking at rest. For the first: “This shaking is never more

pronounced than when the affected individuals attempt to perform voluntary movement, or when they are subject to mental tension that is out of the ordinary, to a moral emotion. Rest and mental calm diminish the violence”. For shaking at rest, Trousseau did not neglect to mention the initial asymmetry, the slowness and the decrement in speed of movement, without real paralysis: “Something very strange happened to our patient. I asked him to close and open his right hand as quickly as he could. His movements were at first rapid, but not a quarter of a minute had gone by before they slowed, then became impossible” [27]. He did not fail to notice his patient’s difficulty with writing, his stiffness, and the slowness of his gestures: “He stood and walked with his body bent forward, his arm on the affected side half-flexed and strongly held to his body. His centre of gravity was thus displaced, and he had to run after himself, so to speak; he thus trotted and hopped.” He described akathisia: “It is impossible for certain patients to remain sitting for any extended period of time.” As to the progression: “Intelligence, initially intact, ends up weakening, memory is lost, and the patient’s entourage soon realise that the patient has lost his usual mental clarity; senility arrives at an early age”. Later, he added: “Paralysis agitans is an inexorable disease that always leads to death” [27].

Referring to the publication of Charcot and Alfred Vulpian (1826–1887) in 1861 [41], Trousseau distinguished between Parkinson’s disease and multiple sclerosis, providing the progressive clinical description and the corresponding anatomopathological results for the latter.

He made the curious comparison between the muscular stiffness of “paralysis agitans” and what he called “the loss of muscular incitability”. He described asking a eighteen-year-old woman to walk for him: “She arose with purpose and confidence, without wavering, took ten, fifteen, twenty-five steps, then she began to feel weak, and if she could not find a seat, she had to sit down on the floor. After such a minor effort, she was depleted. She had exhausted the dose of incitability allotted to the muscular nervous system. A few minutes of rest were enough for her to regain the aptitude she had lost” [27]. Was this a case of “*myasthenia gravis pseudoparalytica*” as described by Samuel Wilks in 1877 [42], which was then renamed simply “*myasthenia*” by Friedrich Jolly (1844–1904) in 1884 [43]?

## 12. Facial palsy

While Trousseau did not cite Charles Bell (1774–1842) during his lesson on cerebral haemorrhage, he devoted an entire class on Bell’s peripheral facial palsy. Taking two cases observed at Hôtel-Dieu as an example, he described what he called “facial hemiplegia”. He focused on possible causes: “cold action” and “moral emotion”. Among the acute forms, he cited facial palsy in new-borns after forceps were applied, after fracture of the petrous part of the temporal bone, and following parotid surgery. Tracing the anatomical path of the seventh pair, Trousseau explained that any progressive compression of the nerve trunk along this path might cause peripheral facial palsy with slow onset, for example “necrosis or cavity formation with suppuration in this part of the temporal bone” caused by

tuberculosis, frequent at that time, or by the extension of chronic otitis leading to “perforation of the dura mater, and then one sees these abscesses at the base of the skull, these purulent suffusions of the arachnoid” [27]. Drawing on the assertions of Eugène Cazalis (1808–1883), one of Charcot’s teachers, he insisted on the distinction between peripheral and central forms of palsy. Speaking of central palsy: “I have never seen the orbicularis oculi completely paralysed. The eye can always close, whereas in Bell’s palsy, paralysis of the orbicularis oculi is always present, and complete closure of the eye is impossible” [27]. He did not fail to mention “the disturbance to the sense of taste, proof that the chorda tympani is a sensitive nerve, or perhaps taste is modified because this fine nervous fibre governs salivary secretion as demonstrated by Claude Bernard” (1813–1878) [27]. Trousseau did not forget to note that recovery may come with a persistent contraction or may not come at all.

### 13. Labio-glosso-laryngeal paralysis

It is rare for a professor of clinical medicine to publish a lesson in which he admits having made a misdiagnosis. This is nonetheless what Trousseau did in recognising that Duchenne de Boulogne had described an accurate clinical picture for a condition he himself had seen, without realising it was a unique entity [44]. The clinical picture included difficulties with speech, swallowing food or saliva, paralysis of the lips, tongue, or soft palate, whereas intelligence was unaffected. Trousseau regretted not examining the nervous tissue under the microscope for the first cases he encountered, but since then, he had noted atrophy in the damaged nerve roots. And he skilfully analysed the rapid and always fatal progression “by damage to the muscles of respiration”, preceded by progressive paralysis in the limbs. He also explained aphonia: “The lack of tension in the glottis explains the weakness of the voice; moreover, the lesion in the spinal nerve means that there is no voluntary prolonged expiration to support the voice” [27]. Trousseau confirmed the observation of Maurice Krishaber (1836–1883) finding dissociation of laryngeal sensitivity with persistence of touch sensitivity, but loss of “reflex sensitivity” which he interpreted as a precursor sign of the disease [45]. “Several cross-sections of the medulla and pons were examined under the microscope, demonstrating that the fundamental anatomical lesion of this paralysis is located in the nuclei where the bulbar nerves originate. This discovery is due to the anatomopathological research of Mr. Charcot who, in addition, attempted to establish that the anatomical lesion consists in primitive atrophy of the cells” [27]. Trousseau was referring to articles by Charcot [46] and Duchenne de Boulogne published in 1870 [47]. He never relates having seen fasciculation in the tongue.

### 14. Progressive muscular atrophy

Trousseau’s lesson is like a progress report on the growing knowledge about progressive muscular atrophy leading up to Charcot’s summary of anterior horn lesions (atrophy of large

motor cells) and sclerosis in the anterolateral system of the spinal cord during his lesson on 16 July 1870, the same day the Franco-Prussian War was declared, interrupting his research. He would only return to his work in 1874, drawing up the birth certificate of amyotrophic lateral sclerosis [48].

Trousseau gave a complete description of the gradual and asymmetric progression of muscular atrophy, accompanied by the characteristic fasciculation. He did not fail to cite the initial dissertation of François-Amilcar Aran (1817–1861) in 1850 [49], and that of Jean Cruveilhier (1791–1874) in 1853 [50]. However, he hesitated in his interpretation, beginning with this statement: “The morbid process that characterises it occurs in the muscular system, in the structure of the affected muscles”; then later adding, “the lack of peripheral nervous influx seems to result from muscular degeneration” [27]. He dealt at length with the affected muscles and the onset of the disturbances before deploring the progression, most often rapid and leading to death within two years. Discussing the role of heredity, he referred to the presentation by Edward Meryon (1807–1880) in London in 1851 on a family where only “the three boys had muscular atrophy”, adding that Duchenne had reported similar cases [51,52]. Of course, he confused his condition with “fatty degeneration of voluntary muscles”: Duchenne muscular dystrophy or Meryon’s disease.

Trousseau described the clinical symptoms, borrowing heavily from Duchenne de Boulogne, but did not correctly interpret the pathophysiology, whereas Charcot put forward the pathophysiology and anatomopathology [53], explaining the clinical aspects. It was indeed Charcot that unified the spinal damage and muscular atrophy on one hand, and the bulbar damage and glosso-labio-laryngeal paralysis on the other. He thus named this pathology “amyotrophic lateral sclerosis”, employing an anatomopathological rather than a clinical term, as he had done previously for multiple sclerosis (“sclerose en plaques”).

### 15. Progressive locomotor ataxia

Trousseau began his lesson with this homage to Duchenne de Boulogne: “To him we owe our being able to recognise a disease that was previously unidentifiable among a multitude of different diseases” [54]. He did not cite Moritz Heinrich Romberg (1795–1873) for his truly novel contribution [55], which was more significant than Duchenne’s articles. Charcot and Vulpian noted in 1862: “By professing Duchenne’s ideas with his own uncontested authority, Mr Trousseau contributed to their being accepted by a large number of clinicians” [56].

Trousseau gave this clinical picture of ataxia: “They cannot take a step; they throw their legs forward, backward, to the side, in great disorder. If they are told to close their eyes, the disorder is without bounds and the movements are so extravagant that it is impossible to describe”. He insisted on the preservation of muscular force, whereas “the difficulty of movement coordination is even greater when they lack the sense of sight to correct disorderly motion” [27]. Then Trousseau explained the searing pain, often accompanying the onset of ataxia, the urinary incontinence, and the digestive

pain. He did not fail to mention Bell's research on "the muscular sense" [57] in 1826, and paralysis of the "feeling of muscular activity" described by Octave Landry (1826-1865) [58] in 1855; that is, proprioception and its disturbances [59]. Trousseau did not contest the reality of this sense, but rather its name, preferring the term "deep sensitivity". Citing Alexandre Axenfeld (1825-1876) [60] while omitting Charcot and Vulpian and their linking of incoordination to damage in the posterior tracts of the spine, Trousseau revealed, despite himself, his misunderstanding of ataxia. For example, in his long discussion of the pathological anatomy, he said: "In this disease essentially characterised by movement disturbances, and in which sensitivity plays only a relatively secondary role, as it may be more or less completely absent, we might expect to find lesions, not in the posterior tracts, but rather in the anterior tracts. In fact, the reverse is true". He proposed, without certainty, that "the posterior tracts of the spine [were] the centre of voluntary movement coordination" [27].

At the end of his presentation, he briefly mentioned cerebellar ataxia: "This is an opportunity to recognise the priority owed to Mr Bouillaud (1796-1881) in the experimental and clinical study of cerebellar lesions" [61]. But nothing in this lesson helps the student distinguish the cerebellar or proprioceptive origin of ataxia.

For treatment, Trousseau objected to bloodletting but recommended flogging to reduce pain, cutaneous faradisation, belladonna, and turpentine. However, none of his patients improved with the silver nitrate treatment recommended by Charcot and Vulpian, who were following the lead of Karl August Wunderlich from Leipzig (1815-1877) [62].

## 16. Aphasia

A student of Pierre Marie (1853-1940), François Moutier (1881-1961) showed in this 1908 thesis "how, and whether it was his intent or not, Broca fell under the influence of Gall by following Bouillaud: both were localisers, the first with a singularly superficial faculty of observation, the second employing authentic science" [63]. In 1820, Jacques Lordat (1773-1870), used the term "alalia" for loss of speech [64], then described his own case in one of his lessons in 1843 [65].

As for Trousseau, he started his lesson by noting: "In 1861, Broca thought to use the name of aphemia, but as in Greek this means 'infamy', the term is clearly inappropriate. Mr. Chrysaphis, a highly distinguished Greek scholar with Greek origins, thought the word 'aphasia' preferable, deriving it from the 'α', meaning 'not' or 'without', and 'speech'". The physician he refers to is Nicolas Chrysaphis (1830-1896), to whom Gaston Variot paid homage in the *Journal de clinique et de thérapeutique infantiles*, on 3 December 1896: "A singular physician well known in the Paris hospitals. We would see him regularly in the wards of Hôpital Laennec where he spent his mornings meticulously scrutinising incoming patients suffering from nervous conditions. His erudition in matters of neuropathy was immense [...]. It is to Chrysaphis (sic) that we owe the term of aphasia..." [27,66]. This misspelled family name was copied hundreds of times when the origin of the

word "aphasia" was related, such that credit was not actually accorded to Chrysaphis<sup>1</sup>. Trousseau, adopting the proposal, had it validated by René Briau (1810-1886), the learned librarian of the French Academy of Medicine [67] and by the lexicographer Émile Littré (1801-1881). So while "aphasia" is attributed to Trousseau, this is somewhat fallacious.

Among the clinical cases Trousseau depicted for his students was that of Léon Rostan (1790-1866), who described cerebral infarct in 1820 [68] and fell victim to temporary aphasia, as had Lordat. After a long list of observations, Trousseau related the discussions following the publications of Bouillaud, Marc Dax (1770-1837), Gustave Dax (1815-1893), Pierre-Louis Gratiolet (1815-1865), Ernest Auburtin (1825-1895), and Paul Broca (1824-1880). He covered the case of Leborgne in detail. This patient, who would only utter his famous "Tan", died on 17 April 1861. The examination of his brain led Broca to localise language in the third frontal gyrus of the left hemisphere. Trousseau added: "This was a singular idea of Dax and Broca. In an organ as perfectly symmetrical as the brain, to say that one side serves one function to the exclusion of the other, seems to go against physiology and good sense. But however unusual an idea may be, when the facts are in support of it, wisdom dictates we accept the facts and the idea" [27]. Trousseau did, however, contest Broca's conclusions: "Of the 32 facts that I gathered and that are known to Broca, 14 conform to his doctrine and 18 contradict it". He gave this summation of his concept of aphasia: "Aphasia is the loss of a faculty, that of expressing one's thoughts through speech, and in most cases through writing and gesture". Intelligence, and particularly memory, were consistently damaged. "The cerebral location of this faculty appears to be the posterior part of the third frontal gyrus of the left hemisphere. But various lesions of this portion of the third gyrus may lead to aphasia, and I note this to be the case not only for lesions in the neighbouring, deeper parts, such as the Reil insula and the striatum, but also for damage to the middle and posterior lobes of the brain" [27]. He concluded by mentioning the article of Adrien Proust (1834-1903) which held that some cases of aphasia were in fact "verbal amnesia", distinct from other forms such as "mechanical alalia", a concept which had clearly won him over [69].

Trousseau reported on the case of a victim of a dual who survived several months after a bitemporal gunshot wound, made by a bullet that entered one temple and exited the other.

<sup>1</sup> Born on Corfu (Ionian Islands) on 01 July 1830, Nicolas Chrysaphis defended his thesis for his doctorate in medicine on 15 May 1891 in Paris, at age 61, which distinguished him as a veteran at the medical school. The subject: *De la curabilité de la rétroversion utérine par réduction et contention mécanique sans opération sanglante* (Paris, 1891 no 197) (On the curability of the retroverted uterus by reduction and mechanical support without invasive surgery). Professor Le Dentu presided over the jury, which included Professor Farabeuf and Associate Professors Brun and Poirier. Chrysaphis drew from nine observations, included one complicated by invagination. The treatment involved a ball filled with air or the placement of a ring, with the risk of a vaginal fold, observed in three of the cases. But overall, the treatment was beneficial. Chrysaphis figures on the list of founding members of the Société médicale Hellénique de Paris, established on 13 December 1856. He was thus already in Paris and probably already enrolled in the medical school.

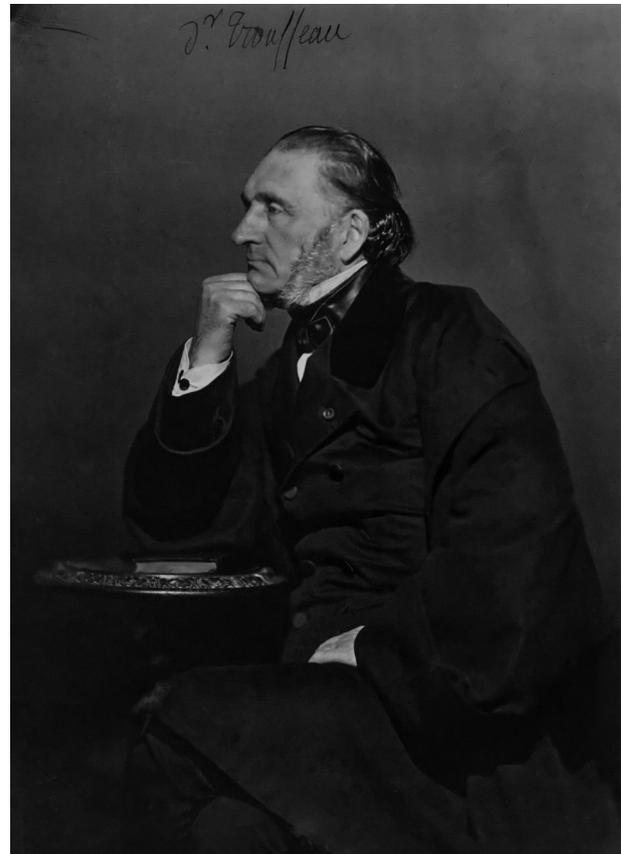
The patient's behaviour is described simply, without the characteristics of frontal disinhibition, recalling the case of Phineas Gage: "He amused the residents with his gaiety, his witty conversation. He spent all his free time acting out comedies and vaudevilles" [27].

Trousseau covered other neurological pathologies, but without originality and sometimes in a confused manner, as in the case of tuberculous meningitis, neuralgia, and "cerebral rheumatism", for which the clinical picture evokes acute mental confusion during severe infections. Following on from his work with his mentor, Bretonneau, he became interested in paralysis in cases of diphtheria and lectured on soft palate paralysis, among other topics.

## 17. Conclusion

According to Lasègue: "Only those who lived close to Mr. Trousseau can truly appreciate him, whereas to appreciate other, equally renowned physicians, reading their books is better than watching them in practice would have been" [70]. However, it must be said that Trousseau did not make the dialectal leap that Claude Bernard did in 1865, with the publication of *Introduction à l'étude de la médecine expérimentale* (An Introduction to the Study of Experimental Medicine). Trousseau's disdain for chemistry and biological physiology bears witness to his reactionary appreciation of the progress made by his contemporaries: "Although chemistry is only of very limited service to medicine in the strict sense, although generally the most eminent figures in the chemical sciences were poor physicians, in the same way real practitioners from all eras have been poor chemists, I still hold that physicians should have more extensive chemical knowledge, if only to underscore the vain pretension of chemists who think they know and can explain the laws of life and medical treatment, just because they know a few of the reactions that can be carried out in limited conditions [...]. Far be it from me to condemn the accessory sciences and chemistry in particular; I only condemn the exaggeration and pretension of these sciences, their awkward and impertinent interference in our art [...]. Let them keep their opinion that they can subordinate, in a more or less distant future, the laws of life to those of the beaker, but until a new order dictates otherwise, I ask them to be modest and not to impose their hopes as proven truths. I readily admit my ignorance as a chemist, but only on condition that they admit theirs as physiologists and physicians" [27]. It should be remembered that Claude Bernard employed the concept of an internal environment and its equilibrium in his lessons at the Collège de France on 09 and 16 December 1857 [71], several years before Trousseau's words (Fig. 5).

The well-known idea that the genius some lack in making discoveries, they make up for in practical application, may thus be used with respect to Trousseau. This "*Chateaubriand of medicine*" [72] was skilled in sharing his knowledge and an astute clinician, even though he wasn't one of the discoverers in neurology, unlike in the field of infectious diseases, where he made important contributions. His own awareness of this fact perhaps explains the admiration and sincere friendship that he showed to the perspicacious and curious Guillaume



**Fig. 5 – Photograph of A. Trousseau by Félix Nadar (1820–1910) in 1861 (Bibliothèque nationale de France, public domain).**

Duchenne de Boulogne, the true discoverer before Charcot and Vulpian.

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