Historical background of the Gilles de la Tourette syndrome

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1. What is a tic?

Motor tics, or expressive mimic movements without motivation, and vocal tics are manifestations that are repetitive, stereotypical, arythmic, sudden (clonic) or prolonged (dystonia), and simple or complex (series of behaviors), with the potential to be inhibited by will and concentration, often followed by relief through a rebound of explosive overexpression. Tics can persist during sleep. They fluctuate over time, may disappear for a few days or months, then reappear. Suggestion hastens their occurrence. These unwanted motor acts are involuntary, i.e., automatic without conscious effort.

Although described since antiquity, they were not medically recognized before the nineteenth century. The word "tic" itself emerged in the seventeenth century, as a sort of onomatopoeia, a monosyllable interjected in a brief and sudden movement. The first descriptions viewed it as a form of chorea. As part of the "danse de Saint-Guy" (St Vitus' dance), the Czech Joseph Bernt (1770–1842) (Bernt, 1810) and the French researchers Michel Bouteille (1732–1916) (Bouteille, 1810) and Claude Foulhioux (1803–1873) (Foulhioux, 1847) distinguished localized forms in a few muscles of the face or the limbs, which they named false chorea, pseudo-chorea, or irregular chorea; these movements can now be recognized as tics.

In fact, the term "tic" comes from veterinary medicine (Bouley & Reynal, 1892). This term can be tracked to a posthumous work of the horse specialist Carlo Ruyni (1456–1530) from Bologna in Italy. The work was published in Venice in 1598 (Ruyni, 1598). It employs this term in the section on "Spasmo delto tico mortale" to distinguish the con-

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tractions secondary to tetanus from dystonic spasms observed in certain horses: “Et en differenza del ticco secco, il quale a più tosto vitio che male.” That is, he observes that, unlike tetanus, the dry (isolated) tic is brief, without fatal consequences. This is referred to as a “tire-sec,” a brief sharp pulling movement. The French physician Jean Jourdin (16?–17?), translated Ruyni's book in 1647 (Jourdin, 1647): “A tique, according to Ferrare, results from retractions of the nerves originating in the brain and is caused by excessive heat or cold or by an immoderate flow of blood. The signs of this disturbance are when the horse twists its head and its ears stand up, when its eyes roll and its mouth locks and its tail extends and its flanks are sunken, and when it presses its teeth into the feeding trough and damages the trough by arching its neck …” Ruyni was referring to Giovanni Battista Ferraro (1528–1569) who had described a spasm in a horse with tetanus, said to be suffering from a “tiro mortale” (Ferraro, 1602). When a horse experiences discomfort, it may pull on its halter by arching its neck abruptly, a “tire-*sec*.” It is why the origin of the word “tic” does appear to be Italian: “tiro-secco,” similar to the French “tire-sec” above, became “ticchio” (“caprice” from “capra” [goat] in Italian) by abbreviation; the French became “tique,” “ticq,” and finally “tic.” The same root of this onomatopoeia can be found in other languages. In German: *Zucken, zugen, tucken, ticken* (to lightly touch), tick. In English: tug, tick, tic. And in Spanish: *tico*. In 1903, Fernand Rudler (1874–1910), a military physician, and Claude Chomel (1860–1946), a military veterinarian, confirmed the existence of tics in animals, particularly in horses, this established a parallel between tics in horses and tics in people (Rudler & Chomel, 1903).

Confusion developed when André Nicolas (1704–1780) described in 1756 the “tic douloureux de la face,” designating what is currently known as trigeminal neuralgia (André, 1756). Thereafter numerous authors, notably Alexis Pujol (1739–1804) in 1787 (Pujol, 1787), used the name of “tic douloureux.” Only the sudden onset of pain is somewhat comparable to a tic, since the grimace accompanying the pain is variable and inconstant. (The same description had been proposed in 1671 by Johannes Laurentius Bausch (1605–1665) in Germany (Dewhurst, 1957) and by John Fothergill (1712–1780) in 1773 in England (Fothergill, 1773). In the famous Panckoucke dictionary published in 1821, the tic is first distinguished from trismus, a symptom of tetanus, and is then defined as follows: “The name “tic” is given to neuralgia, either of the face, in general, or of certain parts of the face. Since this disease is often ac-

companied by intense pain, it is known especially as 'tic douloureux.' More often, the name 'tic' is applied to unnatural habits in the movement of body parts, strange attitudes, singular gestures, a vicious manner of speaking, etc., the rectification of which often requires a great deal of treatment as well as perseverance, which may not always suffice in obtaining a cure" (Société de Médecins, 1821). Finally, Armand Trousseau (1801–1867) gave the name of epileptoid neuralgia to trigeminal neuralgia, which he clearly distinguished from the simple tic, "a type of chorea, and moreover clearly distinct from the danse de Saint-Guy [St. Vitus dance]" (Eboli, Stone, Aydin, & Slavin, 2009; (Trousseau, 1873)).

François Boissier Sauvages de Lacroix (1706–1767), a famous physician in Montpellier and author of the first medical nosography, which he wrote in 1763 in Latin, described what were "spasms for the Greeks" and "convulsions for the Romans" or "better yet, cacokinesis, depraved, local movements of the muscles" (Boissier de Sauvages, 1771). "These movements affect only the upper & lower limbs, the head, the eyes, the tongue, and the jaw." The sonorous word "cacokinesis," from the Greek "kakos" meaning bad and "kinesis" meaning movement, must have included different types of convulsions, notably those characteristics of Jacksonian epilepsy and dystonia. Tics appear in his classification among partial tonic spasms, along with strabismus, torticollis, contractions, cramps and priapism, tetanus, and other abnormal movements. Is a ticcer afflicted with "depraved movements"?

To gauge the state of knowledge on tics prior to the work of Gilles de la Tourette and Charcot, the 1883 "tic" entry of Maurice Letulle (1853–1929) in the *Jaccoud Dictionnaire de Médecine* is a useful source. It distinguished between convulsive tics, which we continue to consider tics, and coordinated tics, which encompassed banal movements automatically and subconsciously repeated (smoothing one's hair, licking one's lips, and so forth), and probably included dystonia (Letulle, 1883). The entry stated that the pathophysiology of tics was completely unknown, but noted with certainty the contagious nature of tics, along with the role of imitation and "bad habits" in their triggering.

2. Chorea

Chorea had a millennial history (Lanska, 2010). For most physicians during the nineteenth century, all abrupt, isolated, or repeated movements, whether psychological or organic in origin, were referred to as "chorea," to which was sometimes added an adjective, as in chorea lasciva, chorea imaginativa, malleatory chorea, chorea festinans, procursive chorea, dancing chorea, or saltatory chorea. Charcot's Tuesday Lesson on January 17, 1888, included this caricature: "What did Dr. de Granville call your disease? The patient: Chorea. Charcot: This word 'chorea' really seems to resolve the entire question. I ask you how the condition, before you, resembles chorea. To make it fit into the category of chorea, it would be necessary, alongside the already existing Sydenham's chorea and rhythmical chorea, to create a ticcing chorea." Indeed, chorea was identified by Thomas Sydenham (1624–1689), and its link with acute rheumatic fever and rheumatic heart had been established since the work of Bouteille (1810) later by Jacques Pierre Botrel (1819–1914) (Botrel, 1850) and Germain Sée (1818–1896) in 1850 (Sée, 1850). Sée coined the term "chorée rhumato-cardiaque." It was confirmed in 1889 by William Osler (1849–1919) (Osler, 1887).

In his 1857 dictionary, Robley Dunglison (1798–1869) gave about 15 synonyms for the danse de Saint-Guy, but confused matters by including chronic chorea, which could be partial, and "tic gesticulatoria" (Dunglison, 1857). Trousseau continued in this vein, calling Sydenham's chorea the danse of Saint-Guy to distinguish it from "writer's cramp, or writer's chorea (chorea scriptorum)," i.e. the "functional spasm" of Guillaume Duchenne de Boulogne (1806–1875) or dystonia (Duchenne de Duchenne, 1872).

In 1850, the Hungarian physician David-Didier Roth (1800–1888), seeking, as Bouteille had, to clarify what the term "tic" covered distinguished "the irresistible muscle activity or abnormal chorea" and divided it into "irresistible muscle activity for locomotion and stationary irresistible muscle activity." For the latter, he assigned "the name of tics, involuntary movements that do not move the entire body and occur in a stationary way." He listed under this term of tic essentially what we call forms of dystonia, either cervical or oromandibulary dystonia. His example of the simple and brief tic was the eye-blinking tick or "nictation."

He did not fail to notice that certain tics can be associated with "involuntary ventriloquy": "Imitation more or less perfect of the sounds of living beings, dog barking, cat meowing, etc., or the imitation of the sound of inanimate objects, such as that of the saw, the plain, rain, etc" (Roth, 1850). This depiction is apt insofar as what defines the motor and phonic tics of Gilles de la Tourette syndrome, namely the association of abrupt muscular movements accompanied by a noise, is similar to a horse's sudden movements and eructated sounds, described by Jourdin and Ferraro.

After an observation published in 1856, in which the French Pierre Bosredon (1804–1893) referred to "barking delirium" (Bosredon, 1856), a noisy form of manifested hysteria, Étienne Ancelon (1806–1886) responded to him in 1857, referring to chorea of the larynx. Barking consisted of phonic tics associated with motor tics: "Barking chorea always starts with convulsions of the face which in most cases dissipate, leading to sudden jerks that are frequently repeated"; that is, tics (Roth, 1850). Ancelon in 1857, like Roth (1850), described cases of Gilles de la Tourette syndrome. In his clinical lessons, Trousseau also used the term of "laryngeal or diaphragmatic chorea that may constitute the entire tic. This involves not only a vocal outburst or a strange cry; it is also a singular tendency to always repeat the same word, the same exclamation. The individual also says words out loud that he would rather keep silent."

3. How Gilles de la Tourette ended up studying tics

In 1881, while still a medical student, Gilles de la Tourette translated an article by the American alienist George M. Beard (1839–1883), "Experiments with the 'Jumpers' of Maine" (Beard & Gilles de la Tourette, 1881) which had been published in 1880 in *The Popular Science Monthly*, a periodical for the general public (Beard, 1880a). When he began his third year of residency in 1884 with Charcot, Charcot knew of this translation. He encouraged Gilles de la Tourette to study abnormal movements and, in particular, to clarify those classified without distinction under the term of "chorea." Beard's writings were the starting point for this work.

3.1 Jumpers of Maine

Beard's name remains associated with the description of neurasthenia in 1879 (Beard, 1879). In 1878, Beard told his colleagues at the fourth annual meeting of the American Neurological Association that French-Canadian woodsmen from northern Maine would jump or strike when excited. The corresponding report was 24 lines long in the *Journal of Nervous and Mental Disease* (Beard, 1878). In his presentation, Beard described an exchange with his friend William Augustus Croffut (1835–1915). While traveling through northern Maine, Croffut observed lumberjacks who, when taken by surprise, began to jump around excessively, hence the name of "Jumpers." "It is a psychological and not a pathological state. It is not a nervous disease. It is the result of a psychical condition among a people of a low order of intellectual development." As they jumped, they hit themselves or their entourage violently. They seemed incapable of refraining from this type of sudden, vehement reaction. Since many subjects reacted this way in this region, Beard viewed the phenomenon as a surviving example of "an epidemic of habits" from the Middle Ages. Gilles de la Tourette never mentioned this 1878 presentation and its summary report, also published in London (Anonymous, 1878). In fact, 20 years before Beard's depiction, the *Boston Daily Advertiser* published on February 15, 1861, an article titled "Jumping Frenchmen of Madawaska," referring to French immigrants in Québec. Madawaska is located in Aroostook County in northern Maine on the border with New Brunswick (Canada). The article's author, Rev. M. R. Keep, estimated that from one-fourth to one-third of the French-speaking men in the Madawaska region were "jumpers" or "Jumping Frenchmen." When startled, men with this affliction would lose control of themselves and would obey sudden commands, such as to throw whatever was in their hands, including tools like axes, occasionally injuring bystanders. Beard subsequently traveled to the Moosehead Lake region of Maine to observe firsthand the "Jumpers" or "Jumping Frenchmen." Beard presented his findings on this syndrome in a paper at the sixth annual meeting of the American Neurological Association in 1880, and they were published in both the Journal of *Nervous and Mental Disease* (Beard, 1880b) and *Popular Science Monthly* (Beard, 1881).

Many authors refer to an article published by Beard in the *Journal of Nervous and Mental Disease* when they cite the source used by Gilles de

la Tourette. In fact, Gilles de la Tourette himself is the cause of this error. In a note in his seminal 1885 article, he wrote: "Beard's report was published in *The Journal of Nervous and Mental Disease*, vol. VII, p. 487. We published the translation in No. 5, vol. II, of *Les Archives de Neurologie*, 1881, pp. 146–150." But as he had indicated in his 1881 translation, the source text appeared in *The Popular Science Monthly*! Some have contended that Gilles de la Tourette did not translate faithfully and that he considerably embellished the material. The reality is that Gilles de la Tourette did in fact translate the first-person text written by Beard in *The Popular Science Monthly*, adding a French literary style, cutting out a few sentences, and omitting several proper names given by Beard. The only one that Gilles de la Tourette included is misspelled: Beard wrote Dr. Edward Steese, which Gilles de la Tourette transcribed as Dr. E. Stewe. The article published in the *Journal of Nervous and Mental Disease* is a third-person account of Beard's findings. It reads like a condensed version of the previously cited article but was published in a prestigious medical journal. Gilles de la Tourette was thus more or less faithful to the original, but not the text commonly attributed to Beard, a text that Beard probably did not write himself, even though it is the most often cited.

Beard described young men who startled in an excessive way at the slightest stimulation but behaved normally and appropriately outside of surprising situations. They would jump and cry out at "any sound from behind that was sharp and unexpected… These phenomena suggest epilepsy, particularly in their explosive character and in the nature of the cry. The hands strike or throw with a quick, impulsive movement, which is very hard to imitate artificially. They go off like a piece of machinery; it is more like the explosion of a gun than the movement of the limbs of even an angry man; and the cry suggests that which we hear in hysteria and in epilepsy." Aside from their violently emotional startle reflex, these men were calm and well-balanced; Beard described them as "modest, quiet, and retiring." The complete description associated an exaggerated startle reflex in the Jumpers with raised arms, a piercing scream, and violent hitting, most often of themselves, with the hand directed against the head or chest. This movement was then repeated several times. This sequence occurred most often after receiving an order with sudden violence or hearing an unexpected noise. The Jumpers were lumberjacks with little education or capacity to verbalize their emotions. Beard noted similarities with hysteria: the psycho-contagious and familial aspects of the

phenomenon. He also suggested a hereditary aspect. Beard did not explicitly highlight the idea of immediate and involuntary imitation, aside from the repetition of the order before its execution (Lanska, 2018). It is very strange that Gilles de la Tourette did not highlight Beard's idea that the symptoms observed were probably hysterical in nature. Several American journals contained Beard's work and accounts of the jumpers appeared for about 10 years in the United States. Mark Paul Richard has suggested that these articles highlighted the significance of Canadian immigrants, French in origin, to the United States after 1870 (Richard, 2018).

3.2 Latah of Malaysia

At the Académie des Sciences, Charcot made the acquaintance of Armand de Breau de Quatrefages (1810–1892), a physician, zoologist, and anthropologist in 1884. He said to Charcot: "Look, I have something for you!" Quatrefages showed him an article, then gave it to Gilles de la Tourette. It was written by a businessman and traveler, H. A. O'Brien, who described the "Latah" of Malaysia. O′Brien's text was published in 1883 (O'Brien, 1883), with additions made in 1884 in an obscure journal founded by a group of British colonial administrators. Gilles de la Tourette translated this revised document (O'Bren, 1884). In a new article (Gilles de la Tourette, 1884), he introduced extracts from O′Brien's writings and from a very recent publication by an American neurologist and former U.S. surgeon general, William Hammond (1828–1900): "Today, we have the account of a similar state [to the Jumpers of Maine] which exists not in America, but in Asia, specifically Malaysia. The narrator, Mr. O'Brien, is not a physician, just someone acting on curiosity; nevertheless, he gives a good report of what he observed, abstaining from commentary. Instead of the American 'Jumping,' the term used in the Malay language is 'Latah' which may designate either the affected individual or his special state."

Gilles de la Tourette highlighted the similarities between the Jumpers of Maine and the Latah described by O'Brien: "Persons of a peculiar nervous organization, ranging from those who, from their mental constitution, seem absolutely subservient to another's will; to those who appear merely of a markedly excitable temperament." The word "Latah" can be translated by "ticklish." Upon hearing a loud or unexpected noise, a Latah will startle violently and exclaim in a manner that O'Brien charac-

terized as always obscene. He or she often exteriorizes a state of panic after a sudden unforeseen stimulation. According to O'Brien, these individuals imitate the words, sounds, or movements of those around them, without being asked, all while enjoying a perfectly regular mental state in the intervals between fits. This propensity for involuntary imitation emerges as the dominant trait in O′Brien's descriptions, unlike the accounts of Beard who never mentioned imitation. “I have met a man several times lately who is a very strong Latah subject. He is cook on board a local steamer, and is naturally (alas, for human nature!) the butt of all the crew, who daily and almost hourly exercise their clumsy wit—the wit of sailors and Orientals—at his expense. All of this skylarking, however, had a tragical ending the other day, which illustrates the point of which I am speaking. This cook was dandling his child forward one day; one of the crew came and stood before him with a billet of wood in his arms, which he began nursing in the same way as the Latah was nursing his baby. Presently he began tossing the billet up to the awning and the cook tossed his child up also, time for time. At last, the sailor opened his hands wide apart and let the wood fall upon the deck, and the cook immediately spread out his hands away from the descending child, who never moved again after striking the boards.” While the Jumping in Maine seemed only to occur in men, O'Brien told of women subjects, and most often older women, who suffered from Latah. He wrote that without any effort on his part, they “completely abandoned themselves to [his] will and powers of direction.”

3.3 Miryachit in Siberia

Gilles de la Tourette recopied most of Hammond's article: “These singular facts are not limited to America or Malaysia, countries where the climate is warm; they can also be observed in Siberia, as Dr. Hammond relates with examples from the accounts of American officers.” Hammond was at that time a professor of nervous and mental diseases at New York University and is still known for his seminal description of athetosis in 1871 (Hammond, 1871). Gilles de la Tourette referred to the text published in Paris in the journal *L'Union Médicale* (Hammond, 1884c), entitled “Miryachit, nouvelle maladie du système nerveux.” The translator is not named, but apparently translated an Italian version (Hammond, 1884b) of the original article, which was published in English in the *New York State Journal of Medicine* (Hammond, 1884a). Whereas Hammond

spelled the name of the condition "Miryachit," Gilles de la Tourette wrote "Myriachit," which means "to act stupidly." The description of the condition is based on an account, published in 1883 (Buckingham, Foulk, & McLean, 1883), of a voyage undertaken in 1882 by three American Navy officers, the lieutenant Benjamin H. Buckingham[a] (Zapffe, 1978), the ensign George Clayton Foulk (1856–1893),[b] and Walter McLean (1855–1930).[c] These three officers observed the unusual propensity of certain individuals in the Amur River basin in eastern Siberia to imitate the motor behavior or speech of those around them, in an involuntary manner. Hammond seemed unaware that he was not the first to describe the Myriachit. It was, in fact, the German physician and botanist Georg Wilhelm Steller (1709–1746) (Nuttal, 2004) who first wrote of the phenomenon, after observations during a northern expedition from 1729 to 1731 (Steller, 1774). He referred to "hysteria" and cited the various appellations used by the peoples of the Russian Far East where these involuntary imitation behaviors were observed: "amurakh" (Yakuts), "olan" (Tougouses), "irkunii" (Yukaghirs/Yukagirs), "menkeiti" (Koryaks/Koriaks), and "imu" (Ainus/Aynus). Hammond drew parallels between these accounts and Beard's observations: "From this description it will at once, I think, be perceived that there are striking analogies between 'Miryachit' and this disorder of the 'Jumping-Frenchmen' of Maine. Indeed, it appears to me that if the two affections were carefully studied, it would be found that they were identical, or that, at any rate, the phenomena of the one could readily be developed into those of the other… There is another analogous condition known by the Germans as *Schlaftmukenheit* [sic] …" For this condition, Hammond gave examples

[a]Lieutenant Benjamin H. Buckingham was part of an American military delegation that came to test the qualities of iron-nickel alloys developed by the Schneider-Creusot steel mill in 1891 and later used in American weapons due to their superiority over the alloys available up to that time.

[b]George Clayton Foulk (1856-1893), a navy officer and diplomat, first served in Asia from 1877 to 1883, then represented the U. S. at the American legation in Korea from 1883 to 1885. He went on to serve as chargé d'affaires until 1887. After being discharged from the army, he settled in Japan where he represented American companies from 1888 to 1890. From 1890 until his death, he was a professor of mathematics at Doshisha University in Kyoto (The United States in Asia: A Historical Dictionary).

[c]Walter McLean (1855-1930) would serve as the commander of the Norfolk Naval Shipyard from Novembe 25, 1915, to February 4, 1918. He is known for having inspected several German warships and for holding them prisoner in American ports until the end of World War I (Wikipedia).

of confusional states, occurring when the person was purposely awakened, and for which we see no link with the stress-related startle reflex and the imitation behaviors reported above. His descriptions suggest a sort of parasomnia categorized as "confusional arousals" of which the subject has no memory; such phenomena are frequent in children but may persist in 1–2% of adults (Mainieri, Loddo, & Provini, 2021). Hammond concluded: "They all appear to be due to the fact that a motor impulse is excited by perceptions without the necessary concurrence of the volition of the individual to cause the discharge. They are, therefore, analogous to reflex actions and especially to certain epileptic paroxysms due to reflex irritations. It would seem as though the nerve-cells were very much in the condition of a package of dynamite or nitroglycerin, in which a very slight impression is competent to effect a discharge of nerve-force. They differ, however, from the epileptic paroxysms, in the fact that the discharge is consonant with the perception—which is in these cases an irritation—and is hence an apparently logical act; whereas, in epilepsy, the discharge is more violent, is illogical, and does not cease with the cessation of the irritation."

Gilles de la Tourette continued: "We will not attempt to interpret this bizarre state: Jumping in Maine, Latah in Malaysia, Myriachit in Siberia, and perhaps Schlaftrunkenheit in Germany. We prefer to make our own contribution to this series of related observations. In the department of our teacher, Professor Charcot, there is currently a case in many ways similar to this singular state. The subject is a 15-year-old boy, intelligent, perfectly capable of reasoning, of sound constitution, who suffers from extreme hyperexcitability, specific tics, jolting movements of the head and trunk, after which he almost invariably and loudly pronounces the word of Cambronne [shit]. Moreover, if we speak in front of him, he faithfully echoes the last two or three words of the sentence just pronounced. This is a source of observations nearly unexplored and whose interpretation cannot be attempted until a great many facts, carefully studied, without preconceived ideas, have been collected." Gilles de la Tourette added this note: "Since the writing of this article, we have had the good fortune to come across another subject; the corresponding observation and three others from Mr. Charcot will be described in a forthcoming text on this matter" (Gilles de la Tourette, 1885).

4. Beard, O'Brien, and Hammond: Valid introductory material?

Gilles de la Tourette's personal behavior, as described by his contemporaries, suggests that he himself may have identified with these hyper-reactive individuals who jump at the slightest stimulation. Incidentally, Gilles de la Tourette indicated that he went to London to question two famous English neurologists, Sir William Henry Broadbent (1835–1907) and John Hughlings Jackson (1835–1911), and that he met "numerous physicians of diverse nationalities" at the international conference of medical sciences in Copenhagen in 1884. They "told us they had never observed similar cases, nor read descriptions of this disease."

Turning to the articles of Beard, O'Brien, and Hammond, was Gilles de la Tourette correct in viewing them as a valid introduction to his own publication? Jumping, in the sense of startling, is a universal, stereotyped, phylogenetically old behavior that can be observed in all vertebrates. It is a reflex response to a sudden, intense, and unexpected stimulation and serves the purpose of protection or preparation for fight or flight (Hale et al., 2002). In humans, this natural mechanism can be modified through cultural learning. Anxiety states, withdrawal from alcohol or other legal or illegal psychotropic substances, post-traumatic stress disorder, and certain affective states may increase the startle reflex, but this does not constitute a specific disease. In 1918, the Austrian pediatrician Ernst Moro (1874–1951) described a reflex present in newborns that disappears before the age of 4 months. Known as the "reflexe de Moro," the clasping reflex, Moro reflex, or "Umklammerungs reflexe," it entails an extension of the four limbs, followed by their sudden flexion, after a noise, a sensation of falling, or air blown abruptly onto the face or belly (Moro, 1918, 1920). In 1936, Carney Landis (1897–1962) and William Hunt (1902–1981) described the "startle response," which appears in humans as the clasping reflex and eventually disappears (Hunt & Landis, 1936, 1937a, 1937b). These reflexes, said to be archaic, are physiological reactions and resemble, in their manifestation, the response of the Jumpers in America, Asia, and Siberia (Goldstein et al., 1938).

Reuben Rabinovitch (1909–1965), a neurologist in Montréal, wrote a personal account of his childhood in 1965 that is also a medical account. In it, he described the arrival of lumberjacks in his childhood village in

the Laurentides region north of Montréal. These men would go into the forest to cut down trees with 30 or so horses, which would sometimes kick in response to violent yelling. The lumberjacks would overcome their shock by jumping, which became a strange and comic habit. Rabinovitch agreed with physicians in the region accustomed to this behavior that it was a cultural form of hysteria (Rabinovitch, 1965). In 1967, Charles Kunkle examined 15 Jumpers entirely comparable to those described by Beard. All of them underwent a neurological examination and were found to be normal (Kunkle, 1967). His analysis highlighted the closed, masculine communities where they lived and their lack of education. Kunkle's diagnosis was collective neurosis.

In 1986, a team of Montréal neurologists studied eight Jumpers from the Beauce region of Québec who worked in the winter as lumberjacks in the nearby forests of Maine. Although all of them described themselves as shy and ticklish, they felt quite violent by nature. In particular, they would startle when teased by others, and this reflex was always accompanied by aggressive movements directed at the tormentor. Fatigue and anxiety were found to accentuate the symptoms. They lived in groups, isolated in the forest for several months and without other social contacts, in very primitive conditions without individual beds, without changing their clothes or washing. They had little in the way of schooling. The "jumping" had started in adolescence. Several of the Jumpers had ascendants who were recognized Jumpers, but none of their own children were affected. The authors filmed the Jumpers during a "fit" and the very same behavior described by Beard can be observed. No signs of echolalia, echopraxia, or coprolalia were observed. All of them underwent a neurological examination and were found to be normal. Today, the "Jumpers of Maine" seem to have completely disappeared. This is apparently due to the fact that the poor socio-economic conditions under which the lumberjacks once worked no longer exist. Quebecer neurologists believe that psychological and material poverty, along with a rudimentary lifestyle, explain the phenomenon of jumping and its related manifestations. They consider it a form of conversion hysteria, a form of psychocultural conditioning in response to stress (the hysteria of Charcot and Gilles de la Tourette!). No neurological organicity has been found (Saint-Hilaire & Saint-Hilaire, 2001; Saint-Hilaire, Saint-Hilaire, & Granger, 1986). Jumpers have been identified in different regions and in other socio-cultural groups of various ethnic origins in the U.S. which nonetheless have similar lifestyles (Kunkle, 1965). The phenomenon

has nothing to do with motor tics; rather, it is a psychopathological condition based on cultural factors (Bakker & Tijssen, 2010).

In 1980, the American Joseph Hardison recalled that in his youth, the term "goosey" was applied to people who were ultra-sensitive to being tickled or teased. "Goosey" is a familiar English word but is not without special significance. "To goose" means to push, shake, tickle, incite, or tease. Hardison drew a parallel with the Jumpers of Maine (Hardison, 1980; Massey, 1984). In 1992, a review of the medical literature examined all of the psychiatric pathologies in which excessive startle reactions may occur. The list included schizophrenia, post-traumatic stress disorder, drug withdrawal, and hysteria (Howard & Ford, 1992).

Holman Francis Day (1865–1935), a writer and filmmaker born in Vassalboro, Maine, penned a short story in 1902 fictionalizing the life of the jumping lumberjacks in Maine. Their miserable living conditions were made unrealistically appealing, but their behavior during jumping fits and their violent outbursts, often involving their spouses, were faithfully portrayed (Day, 1902).

5. Differential diagnosis

Startle is a universal and phylogenetically ancient stereotyped reflex response to sudden stimulation, which can be exaggerated in a wide variety of neuropsychiatric disorders, including culture-bound syndromes, e.g., jumping, Miryachit, and Latah. There is also a rare form of epilepsy characterized by an abnormal startle reflex. Hereditary hyperekplexia, hyperekplexia (Suhren, Bruyn, & Tuynman, 1966), Kok disease (Kok & Bruyn, 1962), familial startle disease, or stiff baby syndrome is characterized by "an exaggerated startle reflex." About 150 cases have been identified (Thomas, 2015). This pathology does not apply to the Jumpers.

William James West (1794–1848) s described in 1841 a syndrome in his son, James Edwin West (1840–1860), who showed the first symptoms at the age of about 4 months. The syndrome he described was called West syndrome (West, 1840-1841). The name initially given in France, "Salaam tic," may be the cause of possible confusion with common tics (André, 1892). In fact, it is a form of myoclonus epilepsy with onset in infancy, characterized by seizures involving the muscles of the neck, trunk, and limbs, with nodding of the head and flexion and abduction of

the arms as typical features. Mental retardation is associated in most cases. The condition has nothing in common with true tics.

In 1955, Théophile Alajouanine (1890–1980) and Henri Gastaut (1915–1995) described "startle epilepsy" (Alajouanine & Gastaut, 1955). It occurs in children with brain damage in the motor cortex, most often subsequent to neonatal anoxia, and the corresponding symptomatology is stereotyped (Alajouanine & Gastaut, 1958). Again, this has nothing to with Jumpers.

6. Historical and current interpretations of Jumping, Latah, and Myriachit

The word "Latah" seems to have appeared for the first time in Malay literature in the fifteenth century, as a metaphorical form interpreted as either "love sickness" or "tickle"! (Winzeler, 1984) Many cultures share the idea of a startle, and the language for it expresses the agreeable-disagreeable ambivalence of games and contact, the first steps toward the physical closeness of lovers: "Imu" in Japan, "Ikota" in Siberia, "Mali-mali" in the Philippines, "Yaun" in Vietnam, "Orgamci" or "Belenci" in Mongolia, and so forth (Yap, 1967).

Knowledge of Latah by Europeans dates from the middle of the nineteenth century and is based on the accounts of John Turnbull Thomson (1821–1884), an English engineer involved in infrastructure projects in Malaysia (Thomson, 1864), and of Frederik Johannes van Leent (1829–1895), a physician and head of the Navy medical department in the Dutch East Indies (van Leent, 1867), one of the first to attribute beriberi to a nutritional deficiency (van Leent, 1880). A more precise description was written in 1885 by Henry Ogg Forbes (1851–1932), a Scottish ornithologist and explorer who observed "that curious affection called by the natives 'Latah.'" His servant would jump like a jack-in-the-box upon seeing a caterpillar. Terrorized, cursing loudly, he would go into a "trance." Forbes attributed the nervousness of the inhabitants to the climate in order to explain his observations (Forbes, 1885). By the end of the nineteenth century, there were many medical descriptions, such as that of John Desmond Gimlette (1867–1934), who highlighted a mix of superstition and religious fervor. He saw Latah as a manifestation of hysteria expressed with local cultural acquired acceptance: "In both cases, self-control being lost for the time being, the attention is occupied mainly

by a single idea, in the 'Latah' woman by an uncontrollable desire to imitate, in which the servile portion of human nature is unconsciously displayed; in the amok man, by a reckless drive to kill, in which man's wild, animal side dominates" (Gimlette, 1897). In the twentieth century, authors underlined colonialism's role in inciting this behavioral reaction (Murphy, 1982). Robert L. Winzeler, of the University of Nevada in Reno, published in 1995 a complete ethnographical and medical study on Latah, which stands as the reference work on this subject (Winzeler, 1995).

An assistant to Russian neuropsychiatrist Sergei Korsakoff (1854–1900), Ardalion Ardalionowicz Tokarski (Ардалион Ардалионович Токарский, 1859–1901), after having observed numerous cases of "meriatschenje" in Siberia, published two observations of pathological imitation behavior in 1890 (Tokarski, 1890). In addition to his own observations, he included that of a Russian military physician, Nicolai Ivanowich Kaschin (1825–1872), who in 1868, around Lake Baikal, was confronted with a military corps that simultaneously repeated all of the orders received, illustrating behavioral contagion. For Tokarski, myriachit had nothing in common with the echolalia and echopraxia of what came to be known as Gilles de la Tourette syndrome but were included with other conditions under the terms "artic hysteria" or "Siberian hysteria" (Tokarski, 1891). Nikolaï Nikolaevich Bazhenov (1857–1923), chef physician at the Preobrazhenskaya psychiatric hospital in Moscow, submitted a review to *Les Archives de Neurologie* in 1911 entitled "Myriatchenié et Klikouschisme," which the authors qualified as psychoneurosis described by Kaschin and Tokarski (Bagenoff, 1911). The "Klikouschis," meaning those who cry out—because they are "possessed by the demon" or "have been cursed"—exhibited attacks of *grande hystérie* (hysteria major) as described by Charcot, which Bazhenov likened to the epidemics of demonopathic convulsionaries, exemplified by the Ursulines of Loudun.

An ethological analysis of Jumping, Latah, and Myriachit describes these involuntary and automatic behaviors as a reaction to a visual, auditory, or tactile stimulus, which can be schematically described as "startle and imitate" with the addition, in some cases but not all, of echopraxia and echolalia. No form of tic can be likened to these startle reflexes (Joseph & Saint-Hilaire, 1998). This jumping, or inversely a frozen immobility or behaviors of avoidance or aggression, is an immediate and single reaction to a stimulus, whereas tics occur without an exterior trig-

gering factor and are by definition repetitive. The activity of mirror neurons, a substrate for imitating behaviors and decoding intentionality that was discovered by Giacomo Rizzolatti's team at the University of Parma, explains this innate and involuntary capacity in Latahs and Myriachits to mime motor action (Rizzolatti, Fogassi, & Gallese, 2001; Rizzolatti & Sinigaglia, 2016). The imitation behaviors observed in a Latah fit are accompanied by cursing directed at the tormentor. Latah seems to affect shy and introverted people whose cognitive, motor, and social development is nonetheless normal, especially middle-aged women who reproduce the movements and gestures of their mothers (Kenny, 1990). Latah can thus be likened to hysteria, with specific manifestations that reflect the subjects' culture Myriachit is similar because of the behavioral imitation, but there is no cursing. It seems currently accepted to view all of these behaviors as psychiatric disturbances where the acceptance and tolerance of the social group in which they occur acts as reinforcements and favors social integration in the group. These historical documents are considered particularly valuable as anthropological studies of psychiatric conditions and how culture influences their expression (Simons, 2013).

In 1965, Harold Stevens noted that strangely, publications on the Jumpers disappeared after 1912. He raised the issue of translation errors in various articles that could have led Gilles de la Tourette to consider the jumping in Maine, Latah, and Myriachit as the same disease he was trying to isolate, whereas Charcot drew a clear distinction (Stevens, 1965). In none of the cases do these brief and isolated startle reflexes, secondary to a triggering factor outside the individual, resemble motor and phonic tics. Is the cursing the same thing as coprolalia? It is indeed, in the medical and anthropological opinion of Ronald C. Simons (Simons, 1994). The imitation behaviors are harder to analyze in the accounts, but there are many situations in normal life where bodily attitudes are imitated, such as a yawn or laughter, without this necessarily constituting the echopraxia and echolalia present in Gilles de la Tourette syndrome (Chapel, 1970).

It is unfortunate that Gilles de la Tourette was unfamiliar with the original thesis of the alienist Prosper Lucas (1805–1855), defended in 1833, which subtly analyzes all of the phenomena of “contagious imitation” and in which Gilles de la Tourette could have found ideas relevant to the behaviors of the Jumpers, Latahs, and Myriachits: “Acquired similarities result from the habit of the same acts, the same feelings, the same sensations, the same ideas, in a word from one's upbringing, which over

time imprints the entire organism with this character that Lavater called, in the traits and movements, the 'secondary physiognomy.' In these sympathetic propagations of nervous affection, women and those individuals they pass through like an electric shock are almost always not only controlled by the same organic conditions, but also under the yoke of the same opinions, the same superstitions, the same daily impressions, and all of the same life circumstances" (Lucas, 1833). A physician in Lyon, Claude Sigaud (1862–1921), defended in 1889 his thesis entitled *De l'échomatisme*, which was subsequent to Gilles de la Tourette's seminal article, with a meaning close to Charcot's echokinesis. He gave a psychophysiological explanation of these automatic imitation phenomena, seeing them as a cerebral automatism secondary to "psychological poverty." He drew on the work of multiple authors, including Paul Sollier (1861–1933), Alfred Binet (1857–1911), Pierre Janet (1859–1947), and Théodule Ribot (1839–1916).

7. The predecessors

At the beginning of his seminal article, Gilles de la Tourette mentioned the innovative book of Étienne-Michel Bouteille, "*Traité de la chorée ou Danse de Saint-Guy*" (Bouteille, 1810). This physician, trained at the Faculty of Medicine of Montpellier (in southern France), clearly distinguished between Sydenham's chorea and "pseudo-chorea or false chorea," the latter predominated by "involuntary movements of different body parts and grimace-inducing convulsions of the face." Gilles de la Tourette noted that "the disease we are going to study would have fallen into this complexus," which was to say that the disease he was going to describe was chorea. He went on to indicate that the first description of involuntary movements accompanied by involuntary grunting and cursing was given in 1825 by Jean-Gaspard Itard (1775–1838) (Itard, 1825). Itard, who was appointed physician in 1799 at the National Institution for Deaf Mutes, was concerned essentially with the hearing organ, its diseases, and related investigations. His reputation throughout Europe at the time was related to his attempt to educate, from 1801 to 1806 the "Wild Boy of Aveyron," who likely had autism (Itard, 1801). In any case, the article that interests us is devoted to various abnormal behaviors and movements that today seem to lack any specific link, aside from a possible psychic cause. It was his tenth case that interested Gilles de la

Tourette, who presented it as the first observation of his article, highlighting it as a prototypical case of the disease he wanted to describe. Before Gilles de la Tourette, aside from David-Didier Roth, already mentioned, Stanislas Sandras (1802–1856), a physician at Hôpital Hôtel-Dieu in Paris and professor *agrégé* at the Faculté de Médecine, wrote in 1851 a book entitled *Traité pratique des Maladies Nerveuses*, one of the first practical treatises on nervous diseases. He also copied Itard's observation, classifying it among the "partial forms of chorea" (Sandras, 1851). Sandras never used the word "tic," and this chapter of his book only seems relevant for having helped disseminate Itard's work, but with no new information.

8. The first described clinical case of Gilles de la Tourette syndrome

Itard's patient was Mme de D., who had suffered since the age of seven from movements that "were involuntary and convulsive, with participation of the shoulder, neck, and face muscles. The result was extraordinary contortions and grimaces. The disease had continued to progress and, the spasm affecting the organs of the voice and speech, this young person would utter bizarre cries and words devoid of meaning, but never in a state of delirium, without any disturbance of the mental faculties." After a few years of progression, she spent nearly a year in Switzerland for treatment and returned much improved, with only the occasional tic. "She was then married. But the marriage, rather than strengthening and completing her cure as had been hoped, caused her disease to return quite rapidly. Mme de D… did not have any children and was thus deprived of the favorable opportunities of the physical and moral transformation ordinarily produced by motherhood." Itard was especially struck by the phonic tics: "Among the continual and chaotic movements resulting from these morbid contractions, those affecting the organs of the voice and speech are the only one worthy of our attention, as they represent an exceptional phenomenon, and constitute a most disagreeable inconvenience that deprives the patient of all of the joys of society. The disturbance they create is due to the pleasure the subject takes in social interaction. For example, in the middle of a conversation in which the subject is most interested, she suddenly, without being able to restrain herself, interrupts what she is saying or hearing with bizarre cries and words that are even

more extraordinary and contrast deplorably with her intellect and her distinguished manners. These words are mostly vulgar curses, obscene epithets, and, what is no less embarrassing for her and others listening, blunt expressions of judgment or unfavorable opinions of those present in society." Itard concluded with the idea that this pathology could be classified as chorea: "Between this neurosis and the one at the center of this dissertation, there is certainly no essential difference justifying a separate category amongst the numerous diseases of the brain." The observation of Mme de D. was reproduced in theses on chorea as the prototype of "partial chorea," for example in the 1857 thesis of Émile Quantin (Quantin, 1857).

In 1859, Pierre Briquet (1796–1881), in his *Traité clinique et thérapeutique de l'hystérie*, mentioned "a remarkable disturbance of phonation in hysterics," referring to Itard's observation in which he likened it to fits of involuntary laughter (Briquet, 1859). Armand Trousseau told the story of Mme de D. in 1862 in his medical department at Hôtel-Dieu hospital, considering her condition a form of epilepsy: "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, behavior of which she seemed unaware. She was a respectable woman in every way and of great intelligence." He saw this as a case of the sudden and irresistible impulses that epileptics seemed to 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 seemed unaware, would express out loud during her attack witty 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" (Trousseau, 1862).

A young Italian, Giulio Melotti (1857–19?), who graduated from the University of Bologna in July 1882, spent 2 years in Paris from 1884 to 1886. Melotti transcribed one of Charcot's lessons on tics and jumping, the *Lezione quattordicesima*, published in Milan in 1887 (Charcot & Melotti, 1887). There is no trace of this lesson in Charcot's complete works, and it is likely that Melotti, rather than transcribing an actual lesson, compiled several he had heard into one, using information from Gilles de la Tourette himself to give a detailed clinical picture of the tic disease to his Italian readers. He wrote, among other things, that Charcot

had examined Mme de D., giving credence to this oft-repeated error. Here is what Charcot did say, on Tuesday, December 13, 1887: "In Parisian high society, there was a person of the most aristocratic circles who was known for uttering filthy words. I did not have the honor of knowing her, though I met her one day on my way up the stairs from the Salon and I was surprised to hear her suddenly say 'shit' and 'fucking pig'" (Charcot, 1887).

9. Madame D. or Madame La Comtesse Picot de Dampierre

Strangely, the true identity of Mme de D., known throughout the nineteenth century as the Marquise de Dampierre, has remained a mystery until 2020. None of the authors mentioned above explicitly named this patient.

In their journal dated January 27, 1860, Jules de Goncourt (1830–1870) and Edmond de Goncourt (1822–1896) were apparently familiar with the singularities of speech of this aristocratic woman, referring to the fine account by the painter Paul Gavarni, a pseudonym of Sulpice-Guillaume Chevalier (1804–1866): "As to the way in which Mme de Dampierre barks and spits out her thoughts, he is frightened by these utterances that toss thought out before the mediation of the will: 'It is like a fearsome leakage'" (Goncourt de & Goncourt de, 1891).

Articles in the Parisian daily press in July 1884, after the death of La Marquise de Dampierre, provide some clues. On 17 July 1884, Gil Blas reported anecdotes on the unusual personality of the "Comtesse Picot de Dampierre": "During high mass at the Madeleine, it was not uncommon to hear such perfect barking that one might have believed a pack of hounds belonging to the Duchess of Uzès was present in the church. It was, in fact, Madame de Dampierre, during the Elevation. This good, witty, charitable woman, well-bred by all accounts, could not keep her condition silent at certain times. Having a remarkable talent for producing artificial flowers and decorative frames, cut from cordovan leather, for example, she was awarded a first-class gold medal at the horticulture exhibit which took place at the Champs Élysées and the Carré Marigny under the Second Empire. The Emperor presided over the awards ceremony. When she heard her name called, Mme de Dampierre stepped up to receive her medal. But as an old Bourbon royalist, finding herself for

the first time in the presence of the nephew of the "Corsican Ogre," she totally forgot the good Catholic history of Father Lariquet that she had learned as a child. Instead of receiving a large medal from the Marquis de Bonaparte's nephew, Lieutenant-General of the Royal Armies, she saw only the usurper, the despoiler of Orléans properties ["Orléans" suggesting the king and the royalty], and in response to the Emperor's courtesy, stupefying all present, she proffered a volley of insults and barking that none of the spectators were likely to forget, even twenty-five years later" (Anonyme, 1884).

So, La Marquise de Dampierre was in fact "Madame La Comtesse Picot de Dampierre." Who was she? Her birth name was Ernestine Émilie Prondre de Guermantes, born on August 22, 1800 ("4 Fructidor an VIII" according to the Revolutionary calendar) at the Guermantes family castle in Seine et Marne, east of Paris. The public registry indicates a name stripped of any link to the French nobility, owing to the French Revolution. On 02 March 1798, her father, Emmanuel Paulin Prondre de Guermantes (1775–1800), married Eulalie de Brisay (1779–1866). The young couple had their first daughter, Albertine Adélaïde (1799–1819), on June 02, 1799. In poor health (tuberculosis?), the father died at only 25 years old, on November 03, 1800, when his daughter Ernestine was only 3 months old. A widow at age 24, Eulalie de Brizay remarried Jean-Baptiste de Tholozan, Marquis de Vernon, on November 21, 1802 and had two more children, Eulalie de Tholozan (1804–1889) and Ernest René de Tholozan (1808–1890).

Ernestine was a source of worry for her mother and step-father due to her homeliness and her behavioral problems, which Itard described as follows: "At age 7, she was overcome with convulsive contractions in the muscles of her hands and arms, especially when she was practicing her writing and would abruptly move her hand away from the letters she was forming. After shifting her hand, its movements became regular and could be controlled voluntarily, until another jolt once again interrupted her work. At first this was considered a sign of vivacity and harmless mischief, but since the behavior was repeated over and over, adults around the girl began to respond with reprimands and punishment. Soon, however, they became convinced that these movements were involuntary and convulsive, involving the shoulder, neck, and face muscles. The result was extraordinary contortions and grimaces. The disease continued to progress, and with the spasm spreading to the organs of the voice and speech, this youngster would make bizarre cries and utter words devoid

of meaning, but never in a state of delirium, without any disturbance of the mental faculties." Physicians offered the hope that her condition might improve with puberty, but this did not happen. After a stay in Switzerland that seemed to bring temporary improvement, "either because of the spa treatments or because she enjoyed her time there in the mountains," she relapsed after returning home.

Her physicians advised her mother to find her a husband, since marriage was an ancestral treatment for hysteria. Eulalie de Brisay-Tholozan selected a first cousin, Louis Augustin Picot de Dampierre (1780–1841), as a potential son-in-law capable of accepting this young woman as his wife, despite her natural defects. A brave soldier under Napoleon who was wounded at the Battle of Friedland and survived the retreat from Russia, he was made "Baron d'Empire" and, at 36, aspired to a peaceful life. Thus, the fortune of the Prondre de Guermantes was nothing if not attractive to him, given his mountain of debt. Since he was Ernestine's third-degree relative, he had to request a dispensation for the marriage from the Bishop of Meaux, in these terms: "The most pressing reason is this young woman's health: for several years, she has suffered from an acute nervous and convulsive disease. All the medical remedies used by physicians in Paris, Brittany, and Switzerland have not improved her constitution. Her doctors agree that only a change in her civil status can bring an end to the accidents she experiences. In this situation, it is improbable that she should rapidly find a husband appropriate to her rank and birth, and the idea of a delay in the consummation of the union proposed to her and approved by her, or of some other obstacle, may worsen her condition" ((Archives de Seine-et-Marne, 1817). Authorization was granted and the marriage contract approved by King Louis XVIII. The marriage was celebrated at the Guermantes castle on 07 December 1817.

Ernestine's older sister died on March 23, 1819, leaving her as the sole heiress to the Guermantes fortune. Gradually she established her dominion over the castle and its occupants, being the only one to possess a master key to every door, including the gates to the grounds. The Count of Dampierre was only too willing to grant his wife this authority, a role that tied her to the castle and left him free to frequent the Parisian salons, without her and her uncontrollable speech problem. He died in Paris, on February 11, 1841. Ernestine would survive him by more than 40 years. She died in her Paris residence, at 191 Boulevard Saint-Germain (less than 200 m from Charcot's home) on July 08, 1884, at age 83, in the

presence of her nephew, the Baron Henri Baillardel de Lareinty (1824–1901), a French senator from 1876 to 1901.

Ernestine's coprolalia consisted extreme outbursts of language, shocking for an aristocratic woman born during the French Revolution. Her vocabulary was at times filthy, borrowed from working class speech. Within the family, it was seen as a transgression, a comic form of the caustic judgments heard in Parisian salons. In 1847, Eugène Billod (1819–1886) provided a number of details not found in the writings of Itard. Among others, he reported that Mme de D. was sometimes able, with great effort, to restrain her compulsion to curse: "She would sometimes interrupt herself and cut off a sentence to direct an epithet at some society person, always something unsuitable and often obscene. These words of course came with a struggle, evidenced by the shame and reddening of her face, her lowered eyes, and an embarrassed, speechless demeanor in this poor lady. The onslaught of these words, for a moment withheld by an effort of will, came rushing out like an arrow released from a bow's supple cord. Thus, after having said, "*Vous êtes un foutu cochon*," [you're a fucking pig] she remained for some time in this struggle without pronouncing the injurious words which were soon deflated like a surge of feeling […]. It is natural to suppose that this ability to only express ideas considered proper, this control of the intelligence over phonation, was impaired in this lady. The result of this impairment was that the expression of certain ideas was forced upon her; her will, this force subjected to other forces, rose up in insubordination, something that the patient wanted in spite of herself. Furthermore, this condition was not limited to the expression of certain words she could not withhold. One sometimes sees Mme de D. could at times be seen shouting, imitating the barking of a dog, or pinching or kicking her neighbor" (Billod, 1847). Gilles de la Tourette omitted to mention Billod's quotation in his seminal article.

Actually, some of her reported behaviors would not be regarded as coprolalic but would correspond to what has been described as non-obscene socially inappropriate symptoms (NOSIS) (Eddy & Cavanna, 2013; Kurlan et al., 1996). There are significant social and emotional sequelae to living with tics and NOSIS, which can adversely affect the quality of life. However, these inconveniences do not seem to have hindered Ernestine's social life, in particular after her husband's death. She may have suffered, however, from physical consequences such as discomfort from the repetitive movements and the stigma of her severe, vio-

lent, or socially inappropriate movements, vocalizations, or perhaps actions, not reported by contemporaries. Some ticcers have low self-esteem or poorer psychosocial functioning. It seems that this was not the case with Ernestine. Unfortunately, we did not find any personal handwritten testimony that could inform us about her psychological state and her own perception of her illness.

At any rate, it may seem surprising that in the accounts of Ernestine de Guermantes' eruptions in high-society circles, there is no mention of a medical diagnosis. This reality is confirmed in the *Journal inédit* of the Count Alfred of Gramont (1856–1915), a diplomat made famous by the Ems Dispatch: "This morning, General de Vacquières came for breakfast. He is very agreeable and told us many amusing stories, especially about the famous Countess of Dampierre, whom everyone used to know before her death in 1884. Deaf and always spitting, she was high-spirited and couldn't keep herself from saying what she thought out loud." Alfred de Gramont also related the exclamation "Tambour! Tambour!" that Ernestine uttered to Madame Santerre, recalling the order of Antoine Joseph Santerre (1752–1809) for a drumroll to drown out the voice of King Louis XVI on the scaffold. There was also Ernestine's introduction of three priests to her guests in her salon: "Un cu…, deux cu…, trois cu…rés de village!", where "curé" means priest, but "cu" hints at "cul", slang for ass. Other exclamations seem to lay bare an inner thought. To the Baroness of Rothschild, her neighbor who was hosting her along with other guests at her castle in Ferrières, she said: "I have an entire castle; this is merely a boutique!" (Mension-Rigau, 2011).

The Madame D. observed by Itard was thus not the Marquise de Dampierre, but a countess. Her real name was Ernestine Émilie Prondre de Guermantes, and she married the Count Augustin Louis Picot of Dampierre. This toponymic addition to her name resulted in the confusion that has surrounded her identity since 1825 (Walusinski & Féray, 2020).

10. Trousseau's depiction: 12 years before Gilles de la Tourette

Gilles de la Tourette mentioned very clearly that Trousseau had described a clinical case while treating "several types of chorea" in 1862, referring specifically to tics: "Once again, I was recently consulted by a

young Englishman sent to me from Dieppe whose tic consisted in convulsive, violent 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 recognized, after twenty years of not seeing him, while he was walking behind me, by the bark-like noise 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 also 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" (Trousseau, 1862). Trousseau precisely described a chronic disease associating multiple motor tics, and stereotyped phonic tics, given that he was able to recognize them 20 years later. He noted their familial and hereditary character, but also that this condition did not reduce life expectancy. Gilles de la Tourette vehemently criticized the diagnosis of chorea proposed by Trousseau: "Laryngeal chorea, diaphragmatic chorea—the false interpretation is too prejudicial for a description that, as we shall see, is accurate in many details." Charles Handfield Jones (1819–1890) of Liverpool also copied Trousseau's description in 1870 without adding any new elements (Handfield-Jones, 1870).

11. Gilles de la Tourette's observations

Among the other eight clinical cases described by Gilles de la Tourette, the second case was an observation by Pierre Marie (1853–1940), at that time *chef de clinique* (senior house officer or resident) in the La Salpêtrière department (1883–1884). The eighth case was observed by a former Charcot resident who became a professor in Bordeaux, Albert Pitres (1848–1928). The ninth case was recounted by Charles Féré (1852–1907), a Charcot *interne* 3 years before Gilles de la Tourette. In other words, Gilles de la Tourette prepared five observations himself. The article reveals a surprising fact concerning the geographical origin of the patients. Five lived in Le Havre, and one in Evreux, both cities in the French region of Normandy. Gilles de la Tourette noted that the patients described in observations II and VI were treated by Dr. Gib-

ert in Le Havre. Joseph Gibert (1829–1899), founder of the journal *La Normandie Médicale*, would publish seven articles describing attacks of hysteria, between 1891 and 1893, using expressions such as "passionate attitudes"; he came to be known as the "Charcot of Normandy." His was regularly in contact with Charcot. When Dr. Gibert's son became a student of the philosopher Pierre Janet (1849–1947), Janet began to spend time at Gibert's hospital where he examined Léonie Leboulanger, a "somnambulant hysteric." The study of Leboulanger was an important part of Janet's thesis, *L'automatisme psychologique, essai de psychologie expérimentale sur les formes inférieures de l'activité humaine*. It was also Gibert who presented Janet to Charcot, which led to a fruitful collaboration. Rather than indicating a higher incidence of the disease in Normandy, this geographical concentration is more likely due to the fact that Gibert, a subtle and attentive clinician, played the discreet role of referring physician, and sent or recommended sending these ticcers to the master at La Salpêtrière. In his lesson on January 17, 1888, Charcot noted with irony: "*I don't know why the ticcers are almost always from the seaside. We have had several from Le Havre and Rochefort*." Gilles de la Tourette went to Le Havre himself, on July 15, 1884, to evaluate the progression of the disease in a young male patient examined by Pierre Marie (obs. II) and released from La Salpêtrière a year prior. Three days earlier, during the same voyage, he had re-examined a boy who only had simple tics (obs. V). Probably on the way home, on July 20, 1884, he saw another boy already seen by Dr. Gibert, who had advised rest at the boy's grandfather's home in Rouen. This boy would not see Charcot at La Salpêtrière until October 1884.

12. "Motor incoordination"

Gilles de la Tourette's writings give the impression that he avoided using the word "tic," preferring the strange terms of "motor incoordination" or "contortion": "Muscular jerks limited to muscular groups of the face and one or both upper limbs." Was the term tic "too trivial for the rather extravagant character of Gilles de la Tourette"? As Georges Guinon (1859–1932) would note, "the involuntary movements of these patients are neither absurd nor incoordinated. On this matter, we thus cannot share the opinion of Gilles de la Tourette. What, precisely, is motor incoordination? It is still called ataxia, that is, impaired arrangement

of movement… Do we find anything of the sort in our patients and can the muscular jerks that we see in them be compared in any way to these highly characteristic motor problems? No, the patients are never awkward in their voluntary movements. They flex and extend their legs forcefully, hit the ground squarely with their feet, are perfectly solid on their legs, and never miss a step. While it is true that they may stop walking to execute a tic, they do not throw their legs out to the sides, and they do not entangle them to the point of falling to the ground… The patient's movements are not incoordinated; furthermore, they are not even illogical. Overall, and in their invariable repetition, they present an arrangement that one can truly call systematic" (Guinon, 1886). Guinon's criticisms are perfectly well founded. There can be no doubt that Gilles de la Tourette proposed this regrettable term of "motor incoordination" to bring his description closer to the cases of Jumping, Latah, and Myriachit. For example, in observation II, which included all of the clinical signs of the disease, Gilles de la Tourette used the word "movements" with special emphasis (referring only once to "tics"), while highlighting the fact that "all of the emotions act very keenly on [the patient]. He jumps when called." In other words, he based his framework on the articles of Beard, O'Brien, and Hammond, and he wanted his descriptions to fit this framework as precisely as possible. Gilles de la Tourette employed the word "tic" only four times in his comments on the nine observations—a paradox, as tics were the subject of his paper.

13. Evaluating the initial description

Do the nine observations proposed by Gilles de la Tourette describe the syndrome named for him? (Kushner, 1995). In fact, no! Observation IV was a description of obsessive problems (the patient, a 24-year-old male, felt compelled to repeat a word or phrase when he attended a lecture and relieved this compulsion by repeating the word or words aloud when alone). The patient made a few involuntary movements (Gilles de la Tourette referred to jumping), but had no real tics, nor any echolalia or coprolalia. Observation V described simple isolated tics that tended to disappear spontaneously. Observation VII told the story of a young man who had felt anxious since the traumatic events around the siege of Paris in 1871 and who exhibited a few transient tics. He would startle when surprised, similar to the Jumpers of Maine, but nothing more. As to the

ninth and last observation, it involved delayed pubescence, a case of "infantilism" according to Gilles de la Tourette, with rhythmical movements that did not resemble tics and with no echolalia. Sometimes this male patient would utter curse words, but without real coprolalia.

The first three observations, particularly the one recounted by Itard concerning Mme D., perfectly described the pathology that Gilles de la Tourette was attempting to introduce in the neurological nosology, with all clinical signs present: motor and phonic tics, associated echolalia, echokinesis, and coprolalia. For Itard, the symptoms he described did not merit a separate disease classification and he assumed that, with his general framework, the case of Mme D. expressed a clinical form of chorea. Although Gilles de la Tourette appropriated Itard's depiction of Mme D. as the first example of the disease he wished to construct, his conclusions were the opposite of Itard's. He argued that Mme D. merited a distinct classification from chorea.

The observation taken from Pitres was also entirely characteristic, but oddly enough, Gilles de la Tourette spoke of choreoid tics and thus muddled, involuntarily of course, the demonstration by which he hoped to isolate "his disease" from chorea. For observation VI, Gilles de la Tourette used the word "tic" twice in his description for eye blinking. The child would say "oh, oh!" but without any other symptoms, and the progression seemed spontaneously favorable. So, this case may have been nothing more than simple transient tics.

In total, four of the observations were indisputably cases of Gilles de la Tourette syndrome. In his discussion, Gilles de la Tourette perfectly described the childhood onset: between the ages of 6 and 16. He highlighted the "utterly slow and insidious" progression, with its periods of remission and exacerbation. He also clearly reported the capacity of patients to temporarily inhibit the exteriorization of their tics, and the subsequent rebound: "He could refrain from all his abrupt movements and stop them completely. But, immediately following this cessation, which required of him the most violent constraint of mind, the movements would return with unusual violence." Gilles de la Tourette insisted on the echolalia: "This is one of the most constant symptoms of their condition, and one that, in particular, most impressed the foreign authors. It is one of the first symptoms to appear after the motor incoordination and seems to be one of the last to persist during quiescent periods…. This faculty of imitation, this echolalia of movements and actions is thus, in certain cases, very complete in these patients." For the involuntary imitation of a

movement, Charcot coined the term "echokinesis." Pierre Marie spoke of "echomatisme." A clinician from Lyon, Claude Sigaud (1862–1921) drew on the work of the Russian Ivan Mikhaïlovitch Setchenoff (1829–1905) "on the reflex actions of the brain (Сеченов Setchenov, 1871), and focused in this thesis defended in 1889 on showing that echomatism was an automatic brain function (Sigaud, 1889). He compared it to a reflex in the motor domain, thereby presaging the recent discovery of motor neurons and the function of decoding intentionality that they enable (Hurley, 2005).

Gilles de la Tourette insisted on the pathognomonic nature of coprolalia (his coinage) stating that "it is never observed in other conditions… Not only do patients utter obscene words; it also seems that they may also exhibit echolalia, which they are often reliant on. However, "coprolalia is not found in all subjects, in the same way that echolalia is not always present." Finally, "the tics are often hereditary," implying "degeneration," which caused neurological diseases according to the Salpêtrière School (Walusinski, 2020). For the prognosis, Gilles de la Tourette expressed a pessimistic view, but he could not, at that time, understand the progression over a lifetime: "We have never seen the disease disappear completely; it may improve, but patients are not cured, and furthermore, an improvement may merely be the prelude to a new exacerbation."

14. Championed by Charcot

On July 19, 1885, Paul Le Gendre (1854–1936), a colleague and friend of Gilles de la Tourette, gave readers of the journal *L'Union Médicale* a complete description of the disease, entitling his piece "Gilles de la Tourette disease." He began as follows: "As the ancient proverb says, 'It is not for every man to go to Corinth'… and it is even less the common fate to bring a new disease to the baptismal font. While we do not know whether our colleague Gilles de la Tourette has been favored in the first case, in the second, he has most certainly deserved his good fortune, by his skillful historical evaluation and his wise clinical studies in which he pulled from the chaos of chorea a distinct morbid entity, claiming for it a place of its own in the nosography. Mr. Charcot—and there is no better judge in such matters—declared in a clinical lesson this year that the nervous disease described by Gilles de la Tourette in *Les Archives de Neurologie* has special characteristics definite enough to legitimize the

naming of this disease after our friend. It would be disrespectful on our part not to adopt the master's position, regardless of whether one is of the opinion that naming diseases for the person who first described them, or who appears to have done so, may be problematic, and we are among those who hold this opinion" (Le Gendre, 1885).

15. Georges Guinon, the forgotten co-author

Georges Guinon (1859–1932) took Gilles de la Tourette's place as Charcot's resident for 1885 (Walusinski, 2021a). As early as January 1886, just 1 year after his predecessor's seminal publication, Guinon published four new observations in *La Revue de Médecine*. Charcot's fundamental role, albeit hidden, cannot be denied; the master sought to enhance the description of this new entity and situate it precisely in the neurological nosology: "We wish to thank Mr. Charcot, who was the inspiration for this work and helped us with his generous advice." Two cases were seen by Charcot during 1885 and were reported by Melotti.

Who was Guinon? His career was surprising. The meeting with Charcot was crucial, as it was for Gilles de la Tourette. Léon Bernard (1872–1934) wrote in his 1932 homage to Guinon: "In all aspects of his person and his emotional as well as his intellectual being, Guinon had been absorbed by the famous personality, whose esteem he considered as the honor of his life. Its memory remained alive for him, like the memory of a great love. Guinon was a simple and straightforward soul. When Charcot suddenly passed away, he faltered. Everything he had planned, all high hopes for his life came crashing down; he left" (Bernard, 1932). The deep bereavement gave his career an unexpected and unique turn, which was unusual for a brilliant student of Charcot. Shortly after his teacher's death, he left for Normandy where he worked as a family physician. Later he set up his practice near the Douarnenez harbor in Brittany, where he was known as a discreet and extremely devoted physician until 1919, comforting families that had lost their loved ones during World War I. In 1919, he joined Léon Bernard and the fight against tuberculosis by becoming a medical inspector for the office of public hygiene in the Paris region; the new Léon-Bourgeois law had set up such offices in every French département. Guinon had defended his thesis on the agents that provoke hysteria in 1889, with Charcot presiding over the jury (Guinon, 1889). He wrote up the master's lessons from 1889 to 1893,

succeeding Gilles de la Tourette as Charcot's personal secretary. In 1887, he wrote the article on convulsive tics in the monumental *Dictionnaire Encyclopédique des Sciences Médicales* of Amédée Dechambre (1812–1886) (Guinon, 1887a). In it, he noted that Gilles de la Tourette "did in fact describe the convulsive tic disease, as we have shown in a work on this condition"; he did not refer to motor incoordination. Guinon clearly stated: "What is found, most often in isolation, are firstly eye blinking and then the alternating opening and closing movement of the mouth." He then insisted on the systematic nature of involuntary movements: "In everyone, we find a few identical tics, such as touching one's beard and spitting."

16. "Idea tics"

Acting on Charcot's wise clinical advice, Guinon added to Gilles de la Tourette's description the frequent presence of "idées fixes," which Charcot called "idea tics": "Mr. Charcot called our attention to the existence in our patients of a series of psychic phenomena that we have not found noted in other, similar observations and that, if we refer to the cases we have studied, must be quite frequent in the serious forms of the tic disease. These phenomena are *idées fixes*. In absolute terms, outside the condition that interests us, *idées fixes* constitute a chapter of mental pathology, as is well known. The extent to which they can vary is common knowledge, and to cite just a few examples, we mention *la folie du pourquoi* where the patients cannot resist asking the reasons for absolutely insignificant things; *la folie du doute avec délire du toucher*, which differs slightly from simple *idées fixes* in that it leads to truly delirious ideas; arithmomania or the mania of numbers and calculations; and onomatomania, recently described by Mr. Charcot and Mr. Magnan" (Charcot & Magnan, 1885). In 1838, Jean-Étienne Esquirol (1772–1840) had included these symptoms together with delirium in a large group: *monomanie raisonnante* or intellectual monomania (Esquirol, 1838). *La folie du doute* was isolated from "monomania" by Henri Legrand du Saulle (1830–1886) in 1875 (Legrand du Saulle, 1875) and corresponds to modern-day obsessive-compulsive disorder. Guinon intuited a common pathophysiological mechanism for the disease's various symptoms: "It is now easy to understand the link between all of these phenomena—tics, involuntary words, *idées fixes*. All three appear to be

of the same family. The cause is the same; it is merely a question of degree: (1) simple convulsive or impulsive motor representation producing facial grimaces or tics in the limbs; (2) a more complex convulsive motor representation resulting in utterance of a sound or pronunciation of a word or phrase; and (3) ordinary convulsive or impulsive ideas, either resulting in more or less complicated actions, such as counting and arranging objects on a table, or remaining limited to a conscious fact without external manifestations, such the perpetual feeling of unmotivated fear, which we have noted in one of our patients." Through and with the help of Guinon, who added to the initial work of Gilles de la Tourette, Charcot built the complete clinical picture of the disease as we know it today. When he was finished, Guinon proposed a new term: "Convulsive tic disease, the name which, according to Professor Charcot, would be most appropriate for this condition." This brief remark is colored by the thinly veiled spite that Guinon felt after Charcot initially named the disease for Gilles de la Tourette.

Guinon would discuss the disease again the following year, but this time he formulated a personal opinion, inspired by Briquet, as a sort of challenge to Charcot (Guinon, 1887b). Tic disorder and hysteria could be associated and could be difficult to distinguish, given the points they had in common: "Hysteria, among its numerous manifestations, also includes involuntary movements, in which we may include coughing, hiccupping, barking, and involuntary exclamations. These, as we have shown elsewhere, are nothing other than slightly more complex motor phenomena … If we compare these phenomena to those observed in the convulsive tic disease, it is easy to see that objectively, the difference between them is far from distinct. Furthermore, as with tics, hysterical involuntary movements recur in fits…. It is not the movements themselves that will provide the nosological characteristic for classifying each case appropriately, but rather the phenomena of all sorts that accompany them most of the time. These phenomena are all different depending on whether the subject is a hysteric or suffering from convulsive tics. Echolalia, observed in the two diseases, constitute an exception. And in the tic disease, coprolalia is often noted, along with *idées fixes, folie du doute*, etc., which characterize delirium in hereditary degenerates. On the contrary, in hysteria, the well-known mental state of the patients is entirely different; most especially, neurosis will have left its mark on the patient in more or less of a lasting way. The observation of hysterical stigmata is thus critically important." Guinon presented three new obser-

vations, including one given to him by Charcot (Guinon (1887b). He prepared the two others during his year as a resident under Émile Troisier (1844–1919) at Hôpital Saint-Antoine in 1886. The first involved a hysteric girl with anarchical movements followed by prolonged lipothymia. The second and third cases were clearly convulsive ticcers in whom Guinon observed inappropriate emotional states and hemianaesthesia accompanied by a reduced visual field, which to him indicated hysteria. The age of onset, much earlier for tics, together with the fact that they progress over a much longer period, are arguments for differential diagnosis. "Here we have the convulsive tic disease in hysterical subjects. And why couldn't these two neuroses be associated? Heredity, which creates in and of itself the tic disease, plays no small role in the etiology of hysteria. Moreover, don't we see similar morbid associations every day? Epilepsy often combines with hysteria to form the disease called 'hysteroepilepsy with separate crises.' Similarly, there are cases in which hysteria or the convulsive tic disease develops where the other already exists."

17. Later publications in France

Maurice Lannois (1856–1942), a native of Lyon and founder of the Société française d'Oto-Rhino-Laryngologie, published his thesis on the nosography of chorea in 1886 (Lannois, 1886). In a chapter entitled "pseudo-chorea," he gave a complete, accurate clinical picture of the disease and added an observation from La Salpêtrière of a little girl whose explosive movements started at age 7: "She is constantly crying out with a little, contained 'hum!' During fits, there is a moment where she cannot utter anything, then suddenly a barrage of words ushers forth and she has to cry out, unable to prevent herself, such that she is heard throughout the house. At this point, she sometimes cannot stop vulgar language from slipping out, the word 'shit,' for example." Lannois wrote very clearly that it was Charcot who enriched the initial work of Gilles de la Tourette by his description of "idea tics," making no mention of Guinon.

18. Clinical cases presented during Charcot's lessons

The *Leçons de Charcot*, published in 1893 and compiled by Guinon, included an "appendix" transcribing two lessons from 1886 that

were omitted from the third volume of the master's works. One of them, on "hysterical sounds," included a clarification on the differential diagnosis of hysteria, convulsive tic disorder, chorea, and paramyoclonus (Charcot, 1893). The two briefly described cases of convulsive tic disorder, already presented to students on an earlier occasion, were probably those that Melotti referred to in his article. Shortly thereafter, Charcot incorporated young patients with the disorder in his Tuesday lessons. On December 13, 1887, Charcot presented "a young fellow aged 12 or 13," noting that he had a tic. "In front of you, he is holding back, but from time to time, he blinks and has contractions in the lower limbs which result in certain involuntary movements. Now and again, he strikes the ground with his foot. If he only did that, it would be nothing serious, but sometimes he makes a sort of grunting noise: hugh! hugh! hugh! And he presents the phenomenon of coprolalia. What is coprolalia? If you are a little ticklish regarding the value of certain words, cover your ears. Coprolalia is the irresistible urge to pronounce the word that Victor Hugo put in the mouth of Cambronne at Waterloo and which, according to him, should take the place of the heroic phrase popularized by the legend; that is to say, the word: … [shit]. What does this mean? you ask. Hasn't this child been raised to be polite? But of course, he has been raised as children should be. This word, he has heard it pronounced, but then, in the street one hears so many words not of one's vocabulary! Indeed! He utters it continually, in spite of himself, by impulsion. We have often seen this condition in children. Mr. Gilles de la Tourette and Mr. Guinon have dealt with the question; this is the tic disease. When someone suffers from this disorder, he develops a series of phenomena—some of them psychic, others physical—that we have observed to combine with each other" (Charcot, 1887).

On January 17, 1888, Charcot examined a 17-year-old boy—another native of Normandy! Making the boy write and execute several movements, Charcot lectured on the differential diagnosis between "vulgar" chorea and convulsive tic disorder. His treatment consisted in hydrotherapy, "*teinture de Mars*," (*teinture de Mars de Zwefler* or aromatic tincture of iron acetate), and "*vin de Colombo*." On Tuesday, January 24, 1888, Charcot briefly presented those in attendance with two other adolescents. On February 21, 1888, Charcot began by telling a 21-year-old man who suffered from tics, "Moreover, you know that having tics in a family is not without consequences. Tics are a special mark." What followed was a thorough interrogation on personal and family antecedents.

The patient, it turned out, also had a *folie du doute*, characterized by the fear of rabies at the sight of an animal. He had two brothers and a sister with tics: “When there is one ticcer in a family, it is rarely an isolated case.”

In his Tuesday lesson on October 23, 1888, Charcot clearly contradicted Gilles de la Tourette: “The movements of ticcers, however complex and bizarre they may be, are not always and essentially disorganized, incoordinated, or contradictory, as is too often believed. On the contrary, they are generally systematic, to the extent that they always recur in the same way in a given subject. Moreover, very often at least, they reproduce, albeit exaggeratedly, certain automatic physiological movements that have a purpose.” During this lesson, Charcot credited Gilles de la Tourette with the coinage of the word coprolalia: “This is the remarkable phenomenon, among all of the others, that Gilles de la Tourette, in his interesting work on the tic disease, ingeniously designated using the term ‘coprolalia.’” At the Tuesday lesson on June 4, 1889, Charcot refined the semiological description: “The complex tic movement is not absurd in itself. It is absurd and illogical because it is executed outside of a context, without an apparent reason. The act of scratching oneself occurs without an itch, the eyes blink in the absence of any foreign object, and so forth. In addition, tic movements are abrupt, rapid, momentary, and do not have, for example, the slowness of choreic gesticulations. They are not continuous but supervene by fits repeated at greater or lesser frequencies and lasting for shorter or longer periods, fits that patients can often, for a time, stop by an effort of will. It is also often the case that while jerking and grimacing, patients utter exclamations and entire words, quite often filthy words. You will have accumulated such specific clinical characteristics that you will be able to distinguish with certainty the tic disease from all other types of convulsive conditions” (Charcot, 1889).

The last Tuesday lesson during which Charcot mentioned “convulsive tic disease” took place on June 4, 1889. He was once again teaching the difference between tics and chorea by presenting the students with a ticcer alongside a chorea patient (Huntington's chorea), both female. By way of introduction, he declared: “You see to what extent the electric jerks of the ticcer differ profoundly from the slow and permanent gesticulations of subjects with Sydenham's chorea. Between tics and chorea, the distance is vast: do not forget this since these conditions are sometimes wrongly given the same name and the prognosis is quite different.”

Charcot showed the opposition between the speed of the movements and highlighted the constancy of choreic writhing, whereas tics stop intermittently. The chorea patient made no sounds, whereas the ticcer "makes, from time to time, expressive laryngeal noises." The movements of the latter were chaotic and unpredictable, whereas in the former, everything was rhythmical, regular, and systematic. The ticcer started having tics at the age of 12, whereas the other patient was "over 51" at the time, with an age of onset at 33. "Chronic chorea is considered an incurable disease; its outcome is fatal, and the therapies are unable to stop its relentless progress, not even for a moment. This is not quite the case with the tic disease. It is also one of the most difficult conditions, to the extent that we cannot say if we ever actually cure it, but we can count on periods of cessation, often quite long, and on a certain waxing and waning, either spontaneous or brought about by appropriate therapy. Hydrotherapy, rational gymnastics, and isolation are among the approaches that may be helpful in such cases. You can now recognize the value of learning to distinguish between these two morbid states, for which the prognosis is so different."

19. Breitman introduces degeneration theory

On November 28, 1888, Grégoire Breitman (1859–1914), a physician from the city of Ananyiv, a part of Moldavia at the time, currently in the Ukraine (160 km north of Odessa), defended the first thesis on Gilles de la Tourette syndrome since the seminal article's publication, with Charcot presiding over his jury: "Alienists such as Magnan and his students Legrain and Saury see echolalia, coprolalia, and echokinesis as an episodic syndrome of *la folie des dégénérés*" (Breitman, 1888). Paul-Maurice Legrain (1860–1939) and Honoré Saury (1854–1906), disciples of Valentin Magnan (1835–1916), introduced the concept of *bouffée délirante* (brief psychotic disorder) into the psychiatric nosology. This was after both had done work on *la folie des dégénérés* (insanity in degenerates), Legrain writing his thesis (Legrain, 1886) on the subject and Saury a book (Saury, 1886). Breitman, a student alienist at the Vaucluse asylum near Paris (currently the Hôpital de Santé mentale de Perray-Vaucluse, in Epinay sur Orge), wanted to study the heredity of involuntary imitation symptoms in order to clarify the role of "dégénération" in their genesis. This had been the accepted etiology of neuropsychiatric diseases

since the work of Bénédicte-Augustin Morel (1809–1873): "As the semiology of hereditary degenerates grows more detailed, exact, and manifest, we are relegating the search for the original flaw in the various forms of alienation to a secondary position"; given that "the aim is to find out whether, by studying the semiology of each psychic state and by grouping the signs into syndromes, we can, by deduction, demonstrate the manifestly degenerative hereditary origin." He explained that "under the combined influence of peripheral and central excitations, we will see degenerates, these future candidates for mental alienation, executing a series of bizarre actions, designated as 'Latah, Jumping, and Myriachit' by foreign authors." Breitman showed, based on several observations he had collected, that echolalia, coprolalia, and echokinesis can be seen in various types of mental alienation, especially in delirium. He coined *égoécholalie* and *égoéchokinésie* for when a patient would respectively speak to himself in front of a mirror and control his movements while watching himself. For Breitman, these symptoms were related "by the fact that they were impulses arising from an obsession." And he categorically concluded that "echolalia, coprolalia, and echokinesis with tics can constitute a perfectly independent morbid syndrome with a determined course, that is, tic disease or Gilles de la Tourette disease. Patients with this disease are degenerate" (Walusinski, 2020).

20. "Enhanced Habit Formation"

In 1888, Ferdinand Burot (1846–1921), a Navy physician, member of the Académie de Médecine, professor at the École de Médecine de Rochefort, published his essay on the treatment of convulsive tic disorder by persuasion. He treated the young female patient studied and described by Pitres, Charcot, and Gilles de la Tourette (obs. VIII). This was the beginning of the psychiatrization of the disease. Burot concluded: "Convulsive tic disease is the result of a specific cerebral excess. It is a psychic condition almost exclusively in the domain of moral treatment. This entails training the brain to operate using special instruction and brain exercises. Persuasion, which is nothing other than suggestion without sleep, is an important therapeutic agent, albeit a methodical one. It acts by increasing tenfold the will of the subject, who is then able to moderate and dominate his impulses" (Burot, 1888a) A few months later, Burot reported on the effect of his treatment, which he considered very success-

ful, with the near-complete disappearance of all symptoms: “The purpose of moral gymnastics is to destroy these vicious associations, these organized habits, to moderate the activity of the automatic sphere, and to shift the balance to benefit the psycho-intellectual sphere, which should predominate” (Burot, 1888b).

On November 16, 1888, in Bordeaux, Jean Urbain-Joseph Chauvreau (1863–?), a student at the École de Médecine de la Marine in Rochefort, defended his thesis, focused on Burot and Pitres, the latter presiding over the thesis jury (Chauvreau, 1888). He started by describing Pitres's observation, then presented the case of a youngster he had personally observed. The child's multiple motor tics began at age 3 and his echolalia and coprolalia, entirely characteristic, at age 5. Chauvreau's third observation had been presented in Toulouse, at the 1887 conference of the Association française pour l'Avancement des Sciences, during the discussion following Burot's presentation on his attempts to use persuasion treatment. During this conference, Émile Duplouy (1856–1896), a Navy physician, later director of the Navy health department in Rochefort, reported on the case of a distinguished navy officer whom he had treated for 4 years. “Even before entering the École Navale, this officer had a convulsive tic characterized by the sudden and involuntary projection of the upper limb, with convulsions in the pharynx muscles and a guttural cry in all ways similar to a bark. These phenomena would occur when the officer approached one of his superiors, which led them to slap him frequently, at which point inappropriate words would escape the officer's lips. Hydrotherapy completely failed against this convulsive tic. The patient, always very energetic, was only able to overcome it with time. Without wishing to discourage Mr. Burot in the treatment by suggestion he is pursuing with praiseworthy perseverance that has already been rewarded by notable improvement, it is Mr. Duplouy's opinion that the aforementioned officer's cure is above all due to his advancing age. Very pronounced in adolescence, the disease, which Mr. Duplouy readily linked to one of these most bizarre manifestations of hysteria that are sometimes observed in men, improved as the subject grew closer to the middle period of his life, and ended as soon as he had passed it” (Burot & Duplouy, 1887). Chauvreau then included two observations provided by Gilles de la Tourette, and that of Itard concerning the Marquise de Dampierre. After reviewing the clinical methods developed by Gilles de la Tourette, Guinon, and Charcot, he discussed at greater length

echolalia, also observed “during minor nervous accidents” and in hysteria, accompanied by cries and “barks.”

21. Catrou, Gilles de la Tourette's student

On March 6, 1890, with Charcot presiding over the jury, Jacques Catrou (1865–?), a former non-resident medical student, defended his thesis on convulsive tic disorder, in which he included Jumping, Latah, and Myriachit (Catrou, 1890). He started by summarizing (nearly copying) the entire beginning of the seminal article, then cited Charcot's lesson “recorded by Mr. Melotti of Bologna” from June 1885: “In lesson XIV, after reviewing the history as we have already done, Mr. Charcot validated the word ‘coprolalia’ coined by Mr. Gilles de la Tourette and replaced the term ‘motor incoordination’ by ‘convulsive tic.’ ‘There are,’ he stated, ‘three main elements in Gilles de la Tourette disease: the tic, echolalia, and coprolalia’… Mr. Charcot also introduced in the description, a symptom of prime importance, involving the mental state of the subject. In these patients, one very often observes what he calls an ‘idea tic,’ such as *la folie du doute*, *le délire du toucher*, misophobia, arithmomania, and so forth.” Catrou added 28 unpublished observations that Charcot and Gilles de la Tourette had sent him. He then proceeded to analyze all of the 45 observations published to date. His first observation was taken from the letter of Yankowsky in the Russian medical journal *Vratch* (“the physician”). Yankowsky noted that he had worked in eastern Siberia. There he read an article on the “Miryatschenye.” “The word ‘miryachit’ or ‘meryajet’ means in ordinary language ‘to act foolishly.’ The person who acts in this manner is called ‘meryascha.’” He recounted that one evening, he examined 14 soldiers “in bizarre positions. Some were walking, others were lying down or sitting, and all of them continued doing so, even in my presence. I asked them, ‘What's wrong with you?’ and all of them said in unison, ‘What's wrong with you?’ I asked them, ‘Are you sick?’ Response: ‘Are you sick?’ and so on. All of them answered each question together, repeating the same question. The commander of the company then arrived and noted that all of these soldiers had eaten potatoes with hempseed oil [hempseed oil is thought to contain only very small quantities of euphoria-inducing substances] purchased from an inhabitant of Korea. Hearing the word ‘oil,’ all of them began to repeat ‘oil, oil, oil,’ in different tones. Neither exhortations nor orders

could prevent the patients from repeating the words pronounced by anyone present." In addition to the general hilarity, Yankowsky noted either mydriasis or miosis in the patients' pupils. He began to suspect the oil, then learned that four soldiers, who ate the same oil but had no symptoms, did not see the oil seller, who, he was informed, was a 'meryascha.'" This explained for him the epidemic of behavioral problems, "which proves that 'miryachenie' is contagious." This account confirms the hysterical nature of Myriachit (spelling used by Gilles de la Tourette). Catrou then reviewed all of the symptoms described by Gilles de la Tourette, but his thesis took a highly original turn when he argued against the theories attributing the etiology to "degeneration": "We do not subscribe in any way to the current opinion whereby all nervous pathology falls under mental degeneration, aside from conditions where a physical lesion has been demonstrated."

22. Publications outside France

Thomas Carlton Railton (1844–1922), in Manchester, published an observation in April 1886 of a man approximately 40 years old with abnormal movements since the age of seven, making him an entirely typical case of the condition: "When the lower extremity was attacked, he often kicked the toe of his boot vigorously into the ground, and usually tapped his forehead with his right hand and turned up his eyes at the same time. On other occasions he would perform the following series of movements: first, holding out his right hand, he supinated and pronated the forearm two or three times, digging his elbow into his side with each supination; then he raised his right knee and patted it several times; and lastly, he struck his nose, forehead, or the top of his head with his hand, opening his mouth and turning up his eyes, and accompanying each tap with an inarticulate cry…. During this period, the cry was perfectly inarticulate: sometimes it was almost a squeak, sometimes like ahem, as in a clearing of the throat. It never occurred except at the time of one of his involuntary movements. The movements varied greatly, but a particular set seemed to predominate for a certain time, then give way in turn to another series. For some time, he was in the habit of making a peculiar noise with his tongue and lips, like the sound of spitting out some small thing from between the lips. Probably the disease had slowly reached this stage in the course of over 20 years, and it remained much the same for

the succeeding 3 years of my acquaintance with him, sometimes seeming worse, the movements being larger, more perceptible, and more frequent in their occurrence; sometimes they improved, amounting to only to a slight occasional jerk of the hand, or a tapping of the forehead.

"In 1882, I observed that a new phenomenon had supervened, rendering his complaint much more seriously inconvenient. Instead of the inarticulate cry, the movements were accompanied at times by a muffled sound, the gist of which could not be distinguished when it was first heard, but which became resolvable by its repetition into words never used in polite society. He would be painfully conscious of the effect upon his audience of the word or words he used and would endeavor to turn off the obnoxious sound by continuing it either into a humming of a bar of music, or as a strenuous cough… Such attacks formed a most painful contrast to his surroundings and to his manners, which were those of a cultivated gentleman, who, in conversation, never made use of obscene or improper language. Mr. de la Tourette, who has collected nine cases of this disease, has applied the term 'coprolalia' to this symptom, from copro = filth and lalia = to talk; and he considers that it is pathognomonic of the disease" (Railton, 1886).

In September 1885, Dimitri Yankowsky published a note in the journal *Vratch*. Jacques Roubinovitch (1862–1950), born in Odessa and a resident in asylums around Paris at the time, translated the note for Gilles de la Tourette, as Jacques Catrou noted in his thesis. In July 1886, two American physicians, C.L. Dana and W.P. Wilkin, reported the first American case (Dana & Wilkin, 1886). Incidentally, they referred to another Russian publication: "In March 1886, Dr. I. I. Pautynkhoff reported (*Russkaya Meditizina*, March 16) 'a case of imitative disease,' resembling that of Tourette's, the patient showing echolalia and echokinesis (imitation of speech and movement). The patient had deficient intelligence." They started with a discussion of echolalia and coprolalia: "It was then noticed that when sitting quietly he would suddenly and involuntarily burst out into expressions of the most profane and obscene nature; repeating them rapidly for a few movements and then stopping. A surprise or sudden noise of any kind was liable to bring on an outburst. He did not seem to understand the significance of the words used… The word he used oftenest, repeating it rapidly and automatically, was the equivalent of the French word 'merde,' which is the word quoted by Tourette as most frequently expressed by his patients. He used to be much worse mornings, and before or during his toilet would regale the

house with his automatic blasphemies so loudly as to disturb the neighbors." They continued with a description of the abnormal movements: "When examined by us he was observed to be anemic, but fairly well grown and nourished. He has choreic movements in the face, and slight convulsive movement in legs and arms. When he is making a strong effort to repress the obnoxious words, or when he is under any restraint, the movements are more prominent. The choreic movements, as stated, affect his face and shoulders most. He had also a kind of expiratory spasm, producing a noise like a half-developed cough. If more marked, it might be put down as an illustration of laryngeal chorea." The authors then gave the complete clinical picture of the disease as Gilles de la Tourette described it in his article and repeated one of his key points: "The coprolalia is pathognomonic of the disease, according to Tourette." As early as 1886, Gilles de la Tourette's name was being amputated by North American authors!

On July 27, 1889, at the Friedrich-Wilhelms-Universität in Berlin, Otto Müller (1865–?), a student of Hermann von Helmholtz (1821–1894) and Emil du Bois-Raymond (1818–1896) defended his thesis on tics, with as jury president Cölestin Slawyk, from Spandau, a pioneer in lung surgery (Müller, 1889). He noted that the work of Gilles de la Tourette had generated little interest in Germany, aside from a thesis defended in 1885 by Theodor von Färber, a student of Hermann Oppenheim (1857–1919) (Färber, 1885). Müller presented four cases of motor and phonic tics. He elaborated on Guinon's discussion of the link with hysteria and considered tics as a disease of the will, for which he recommended the use of morphine and arsenic.

Heymann Hirschfeld (1860–?) described three patients with motor and phonic tics associated with echolalia and echokinesis in his thesis defended in Berlin in 1891 (Hirschfeld, 1891). His discussion centered on the differential diagnosis of chorea, hysteria, and paramyoclonus multiplex, a pathology described in 1881 in Germany by Nikolaus Friedreich (1825–1882) and analyzed by Pierre Marie (1853–1940) in *Le Progrès Médical* in 1886. Parmyoclonus multiplex is a pathology similar to Morvan's fibrillary chorea (myokimias explained by the presence of antibodies disturbing the functioning of potassium channels) (Walusinski & Honorat, 2013).

Richard Rawdon Stawell (1864–1935) studied at the National Hospital for Diseases of the Nervous System, Queen's Square, and the Great Ormond Street Hospital for Sick Children in London. In 1895, Stawell

used the expression "habit spasm" coined by Richard Gowers (1845–1915) to described two cases of convulsive tics (Stawell, 1895): "These movements are not choreic in nature." He maintained that "correction of errors of refraction and the removal of post-nasal growths have completely been successful in putting a stop to the disordered movements." For him, it was important to stop these types of movement disorders as soon as possible because following late treatment "the prognosis of this affection is uncertain; it does tend, however, to be bad."

In 1899, Georg Köster (1867–1932) provided two entirely characteristic observations (Köster, 1899). And in the 1899 medical treatise directed by the Englishman Sir Thomas Clifford Allbutt (1836–1925, inventor of the clinical thermometer), James Samuel Risen Russell (1863–1939), born in French Guiana, paid homage to Charcot, Gilles de la Tourette, and Guinon in his chapter on tics, completely supporting their point of view (Risen Russell, 1899)

23. North American contribution

The Canadian William Osler (1849–1919) gave a lesson at Johns Hopkins Hospital in Baltimore, published on October 11, 1890, during which he presented a remarkable observation of a 13-year-old girl with all of the symptoms described by Gilles de la Tourette, including coprolalia, but not obsessional ideas. Osler, nonetheless, described them using a word coined by Charcot, arithmomania, and suggested *la folie du toucher*. He pointed out the difficulties of translating expressions that are apparently similar but have different meanings in French and English: "There is a curious disease or perhaps, more correctly, symptom group, met with chiefly in children, to which attention has been called of late by French writers, which is characterized by irregular, spasmodic movements, the utterance of involuntary explosive sounds or words, and mental defects of various sorts. It is not a very common affection in this country, and I take this opportunity to bring to your notice a case which we have been studying for the past few weeks. The cases have usually been described as chorea, or 'habit-spasm,' both of which conditions are simulated very closely by the irregular movements; certain instances also have been reported as hysteria. Unfortunately, Charcot and his pupils, Guinon and Gilles de la Tourette, have given to this affection the name "Maladie des tics convulsifs." I say unfortunately, for here and in Eng-

land we use the term Convulsive Tic to characterize a totally different affection, involving usually the facial muscles and of either central or peripheral origin, but not necessarily coming on in childhood and not characterized by the other features presented by the disease of which we are at present speaking; and thus it happens that if we turn to the recent editions of French books we find under "tic convulsif" a disease very different from that described by the same name in English and American works" (Osler, 1890).

In 1897, James Cornelius Wilson (1847–1934) from Philadelphia published the case of a school-boy 15 years old who presented a series of movements recurring at short intervals: spasmodic twitch of the muscles of the face, rapid opening and closing of his, "bending forward, grasping a convenient chair or table for support, or more frequently resting his hands upon his knees. His head is drawn forward, his body strongly curved, his thighs and knees flexed, his feet separated. His hands tightly grasp the object upon which he rests, or the lower part of his thighs just above his knees. His head and the upper part of his body are violently moved backward and forward. After a series of such oscillations, numbering from five to eight, each accompanied with an inarticulate sound h-m, h-m-m, h-m-m-m and during which respiration is very shallow and incomplete, he straightens up, regains his breath, and the paroxysm ends with a long, sighing inspiration" (Wilson, 1897). Wilson's conclusions supported the demonstration proposed by Gilles de la Tourette: "This case belongs to the group of nervous disorders which include the "Jumpers" described by Beard, the Latah of Malays, the Myriachit of Siberia and which were demonstrated by de la Tourette in 1884 to be one and the same affection."

Otto Lerch (1855–1948) of New Orleans (Louisiana) after comprehensive definitions of what were new words at the time (convulsive tics, echokinesis, echolalia, and coprolalia) submitted an observation of a German emigrant, unusual due to the age of the disease's onset. This man, 55 years old, residing in the U.S. for 21 years, had demonstrated "spasm" for 3 years: "The patient opens and closes his eyes and rolls his eyeballs. His strongly drawn backward to return with ease to the natural position. Now and then the movement is so violent that the whole trunk becomes involved and is twisted to the right or the left. The motions are frequently accompanied by loud, noisy, belching, especially morning and night" (Lerch, 1901).

24. Elsewhere in France

Grégoire André (1844–19?), chief physician at the Toulouse hospital, noted in 1891, "Charcot added an important chapter to the symptomatology of convulsive tics, showing that in severe forms there were specific psychic phenomena, or *idées fixes*. These are what Mr. Grasset calls the 'psychic stigmata of the tic disease' or 'psychic tics.'" André described a man of 45 with motor tics in one arm, which he did not complain about, but he was very disturbed by his obsessional ideas, by "searching for accurate names" or onomatomania [a term coined by Charcot and Valentin Magnan (Charcot & Magnan, 1885)], and by hypochondriacal ideas. The clinical picture was clearly and primarily psychiatric. While Guinon was cited, Gilles de la Tourette was not mentioned (André, 1891).

In 1892, Raoul Brunon (1854–1929) from the city of Rouen, a friend of Charles Féré, proposed five observations of ticcers in the journal *La Normandie Médicale*. He wanted to show that many cases could be cured using a treatment that involved, every morning, "cold lotion all over the body then rubbing with a massage glove and pills containing belladonna extract and reduced iron (in increasing doses, up to 12 centigrams per day); a laxative every three days; physical exercise out of doors; and fewer hours of study at school." However, his succinct descriptions leave one to suspect that none of his patients had Gilles de la Tourette syndrome (Brunon, 1892).

The alienist Jacques Roubinovitch published an observation in 1893 of a female patient hospitalized in the department of Auguste Voisin (1829–1898) at La Salpêtrière who exhibited the complete clinical picture of Gilles de la Tourette syndrome. She had a large callus on her forehead from striking herself involuntarily. Her obsession was to break objects, driven as she was by irresistible clastic impulses. Roubinovitch named her condition "krouomania." He subscribed to Tokarski's idea whereby compulsive tic disorder and Myriachit were two distinct pathologies (Roubinovitch, 1893).

Julien Noir (1866–1948), a student of Bourneville and, like him, an editor for *Le Progrès Médical*, defended his thesis in 1893 with Victor Cornil (1837–1908) presiding over the jury. The thesis examined tics in children considered to be "degenerates, imbeciles, and idiots" and con-

tained numerous illustrations and photographs (Noir, 1893). Noir gave 73 observations of youngsters with mental disabilities, some of whom had tics, with echolalia, coprolalia, and echokinesis in certain cases, but these three mimetic behaviors sometimes existed without tics. Using a purely descriptive nosographical approach, he proposed four families of tics: simple motor tics; coordinated tics observed in cases of mental retardation, that is, repeated rhythmical movements (rocking, *krouomania*, etc.); Gilles de la Tourette syndrome, Jumping, Latah, and Myriachit (including echolalia, echokinesis, and coprolalia); and finally, "purely psychic tics," that is, *idées fixes*, obsessions, impulses, and so forth. None of his observations were characteristic of Gilles de la Tourette syndrome. Aside from the descriptive interest of this thesis and its underlying intellectual approach, indicative of the humanity Noir and Bourneville showed in caring for these poor patients, the work is a manifesto by colleagues of the Salpêtrière School in support of the recognition and isolation of Gilles de la Tourette syndrome, which faced opposition from detractors such as Magnan and his students, André Lemoine and Nicolas Lemaire, who considered "convulsive and psychic tics as simple stigmata of degeneration," refusing to give them their own place as a morbid entity, contrary to Gilles de la Tourette, whose ideas Catrou defended in his thesis. Noir also presented novel ideas in the area of etiological description and research concerning repetitive and rhythmical movements having no purpose, frequently observed in people with mental disabilities. Paul Sollier (1861–1933) had initiated this study in his 1890 thesis also directed by Bourneville, with Cornil presiding over the jury (Sollier, 1890). The Franco-American Édouard Séguin (1812–1880) ((Séguin, 1846)), a student of Itard and Esquirol (1772–1840), had not mentioned tics in his pioneering work on the treatment of "idiots." By contrast, Paul Moreau from the city of Tours (1844–1908), in one of the first pedopsychiatric treatises, entitled *La folie chez l'enfant*, had described the simple and isolated tic form, citing anecdotes from Prosper Lucas and Charles Darwin (1809–1882) and agreeing with them on the role of heredity as a predisposing factor ()(Moreau de Tours, 1888).

In 1893, Louis Chabbert (1862–1945) from Toulouse published four observations of patients with motor tics in *Les Archives de Neurologie*. The complete clinical picture of Gilles de la Tourette syndrome, with the association of phonic tics, echolalia, and coprolalia, was only present in the third observation. Chabbert observed Charcot's echokinesis, but preferred the term "echocinesis." Apparently acknowledging the grounds on

which Gilles de la Tourette syndrome had been described, he not only argued, in case after case, for the role of heredity, but also sought to highlight all possible links with hysteria (Chabbert, 1893). His approach is reminiscent of that of Guinon.

Defended in 1894 with Jacques-Joseph Grancher (1843–1907) presiding over the jury, the thesis of Casimir Janowicz (1859–1918), born in Kamyanets-Podilsky in what was then Poland, covered the differential diagnosis of convulsive tics, paramyoclonus multiplex, and electric chorea (Janowicz, 1891). After describing two cases of simple transient tics, Janowicz explained the difficulties posed by the inaccurate descriptions of paramyoclonus and electric chorea—simple syndromes, still poorly defined, involving muscular spasms—whereas convulsive tic disorder had a well-established clinical picture. For Janowicz, paramyoclonus and electric chorea had a psychic origin suggesting a form of hysteria, whereas Augustin Morvan (1819–1897), in his 1890 description of fibrillary chorea ("myokimias"), explicitly described a neurological disease that is now recognized as an autoimmune channelopathy known as Morvan's syndrome (Walusinski & Honnorat, 2013).

Ezio Sciamanna (1850–1905), an Italian alienist and student of Charcot and Moriz Benedikt (1835–1920), constructed a pathophysiology in 1898 around 10 ticcing patients that combined tics and paranoia. Tics, for Sciamanna, were impulsive movements aimed at removing some imaginary danger. These pointless, non-adaptive actions became, by his definition, a delirium, influencing all of the individual's behaviors, preparing the way for paranoia (Sciamanna, 1898).

In 1899, Constantin Oddo (1860–1926) in Marseille set out to help practitioners differentiate tic disorder from Sydenham's chorea, but the resulting clinical picture had atrocious implications, , for the poor patients. While chorea required hereditary nervous problems to develop, "the same cannot be said for ticcers, whose hereditary past is burdened in another manner, whose flaws are more pronounced. Theirs is not only a hereditary neuropathy, but degeneration, in its most severe form… If the ticcer is not yet a degenerate, he will be, he is marked to become one… Chorea patients are almost always cured; the ticcer is never cured." The entire article is in this same vein (Oddo, 1899).

25. Gilles de la Tourette's final contribution

Aside from the observations he gave Catrou for his thesis, Gilles de la Tourette never published any other data on the disease named for him during Charcot's lifetime. It was not until 1899 that the transcript of one of his lessons at Hôpital Saint-Antoine was published (Gilles de la Tourette, 1899). A 22-year-old woman came "to ask for treatment for chorea, which seemed to explain, at least in appearance, the agitation of the muscles of her face and the left side of her body." The abnormal movements began when she was 80 years old. Periods lasting a few weeks to a few months alternated with calm periods, without "muscular incoordination," but with a few residual tics in her face, nonetheless. Gilles de la Tourette once again employed this awkward expression, as if not to back down, all while disowning it in the lines that followed! All of the physicians consulted had diagnosed chorea and prescribed arsenic and antipyrine. In addition to her motor tics, she had phonic tics (hum! hum! or oh ah!). "When she grows irritated with her little boy, who is very agitated, her jerks worsen and she calls him 'pig, ass,' often including the word of Cambronne [shit] in her interjections… I was now sure; the unanimous diagnosis of chorea should be replaced by a diagnosis of convulsive tic disease with coprolalia." This young woman also exhibited some phobias. In his commentary, Gilles de la Tourette then recognized the contributions of Guinon and Charcot to his initial description and gave this recommendation: "If you wish to read a good survey of the question, I urge you to consult the thesis Mr. Catrou, my student, prepared in 1890 on the convulsive tic disease, based on twenty-six unpublished observations I sent to him." Gilles de la Tourette admitted at this point that the expression "motor incoordination" was unsuitable and acknowledged the validity of Guinon's "convulsive tics": "Jerks, or tics, to use what has become the established expression." There followed a long section on coprolalia and echolalia, "which can truly be deemed psychic stigmata." While the patients could be considered to belong "to the unbalanced group," Gilles de la Tourette said he "did not care for this expression." For him, the use of arsenic had no place in their treatment. After discussing differential diagnosis, especially regarding chorea, Gilles de la Tourette vigorously contested the view of Brissaud (see below), expressed in the thesis of his student Georges Patry (1869–?) describing

"the variable chorea of degenerates": "In my opinion, I shall say so immediately, this condition cannot be differentiated from the convulsive tic disease." Fourteen years after the initial article, this clarification in 1899 presented the disease's clinical picture and course in a comprehensive fashion that remains relevant today. It was an occasion for Gilles de la Tourette to repeat the aphorism, "Once a ticcer, always a ticcer." In 1900, when he published his last paper in *La Revue Neurologique*, he revisited the nosology of chorea in pregnant women, denying the existence of an isolated pathology; at that time, abortions were performed in such cases to save the mother and avoid the birth of a disabled child. For Gilles de la Tourette, these cases of chorea were not chorea, but either hysteria or convulsive tic disorder. However, he erroneously reaffirmed once again that Sydenham's chorea did not exist after puberty and had no link with rheumatism.

26. Theory of Meige and Feindel

In 1902, Henry Meige (1866–1940) and Eugène Feindel (1862–1930) published their work on tics and their treatment (Meige & Feindel, 1902). A translation in German appeared in 1903 (Meige & Feindel, 1903) and in English in 1907 (Meige & Feindel, 1907). In the introduction, Brissaud was categorical: "The authors of this book have resolutely identified the pathogenesis of tics as a mental process. The psychology of the ticcer can be easily penetrated in certain cases where the tic is equivalent to or superposed on 'other episodic stigmata of degeneration,' but the task becomes infinitely more complex when the incorrectness of psychic acts is limited to tics alone. Even under these circumstances, in examining the mental state, one always observes the insufficiency of inhibition. This weakness allows countless unfortunate habits to form and grow entrenched over time. Such is the role of habit in the genesis of tics, revealing their similarity with all functional acts. A tic is often merely a function performed in an untimely or unsuitable manner."

Brissaud spoke of Gilles de la Tourette syndrome as "a lamentable neurosis": "Its only special feature is the somewhat systematic regularity of its progression. It is merely the superlative expression of a neuropathic and psychopathic disposition, in all ways similar to the disposition that gives rise to the most benign tics (Brissaud, 1896). The disease, in its initial manifestations, presents like a simple convulsive oddity that ap-

pears insignificant. But when one considers that this oddity can go on indefinitely in time, spreading gradually to all limbs, accompanied by serious mental disorders that often lead to dementia, one realizes that this little symptom, this little premonitory tic, always deserves to be viewed with defiance and energetically fought." This book laid the groundwork for the interference of psychoanalysis in the treatment of ticcers. The authors contested the etiopathogenic view, in all of its foresight, that René Cruchet (1875–1959) from Bordeaux proposed in 1901 (Cruchet, 1904) and 1902 (Cruchet, 1902) (Walusinski, 2021b).

Cruchet based his reasoning on the work of Constantin von Monakow (1853–1930) and Wladimir Aleksandrowicz Muratoff or Muratow (Владимир Александрович Муратов, 1865–1916) concerning athetosis and chorea. Similarly to these authors, he proposed a functional disorder "of the cortex and basal ganglia of the brain." For Meige and Feindel the tic, a coordinated movement, was evidence of a "reflex" activity of the cerebral cortex. They deduced it could be overcome by education (a movement oriented toward a goal) and therefore the will. They compared the process to a baby's sucking, an innate automatism that becomes mastication, a learned automatism. They thus conceived of tics as "the frequent repetition of a primitively voluntary movement." In their view, the premonitory sensation associated with tics was proof that they were conscious acts, justifying their position based on Brissaud: "The tic is a coordinated automatic act and thus of cortical origin." They went so far as to compare tics with micturition and defecation, noting that their execution "is preceded by a need and followed by satisfaction." They considered the tic "as a functional disturbance representing an act driven by an exaggerated, untimely need, followed by excessive, inappropriate satisfaction." Meige and Feindel used the incomplete observations reported in the seminal article of Gilles de la Tourette to posit that alongside "convulsive tic disease," there was a different clinical entity, neglected by Gilles de la Tourette but described by Brissaud: "the variable chorea of degenerates." This chorea "has no uniformity in its current manifestations, or regularity in its progression, or constancy in its duration… It is a neurosis that lacks symptomatic rigor, as it were… Do the involuntary manifestations of the syndrome warrant inclusion in the pathologies listed in the chapter on myoclonia?" It is surprising to read the following: "Gilles de la Tourette refused to consider this condition as a chorea. For him, it is simply one of the forms of the convulsive tic disease; indeed, variable chorea does sometimes entail the utterance of explosive sylla-

bles and even coprolalia." Brissaud seemed unaware of, or unconcerned by, Charcot's efforts to demonstrate the difference between chorea and tics. In any case, posterity has forgotten variable chorea and recognized Gilles de la Tourette syndrome!

Meige and Feindel listed all of the medications already tried to reduce tics and stated their inefficacy, adding: "Since ticcers have a mental state that favors all types of mania, one must always avoid using ether, morphine, or cocaine." While electrotherapy and bathing in the sea were advised against, hydrotherapy was recommended, along with rigorous rubbing with a massage glove. Only "re-education treatment" found favor with Meige and Feindel: "Immobilization of movements and movements of immobilization… The first of these procedures consists in training the ticcer to keep the limbs and face absolutely still, photographically still, over progressively increasing time periods… Parallel to imposing this discipline of immobility on patients, an effort will be made to teach them discipline in their movements. This involves making them execute slow, regular, correct movements, on command, that exercise the muscles in the region where the tic is located… The adults responsible for young ticcers often lack sufficient firmness and authority to correct them, if the need arises… After treatment of a tic, the task of the physician is not finished. Once the untimely movement is gone, there is still the mental state of the ticcer, which makes him easy prey for another offensive of the disease. If the mental state is sufficiently modified by re-education, then it is truly possible to hope for a definitive cure of the tic, through a firming of the will, where the congenital debility had previously allowed the tics to set in. But for some time, it is wise to speak only of improvement… Firmness, patience, goodness, and good sense—these are the all-powerful weapons that the physician must wield to wage war on tics. Docility, trust, and perseverance—these are the auxiliary means that the patient must provide to emerge victorious from this combat. Once this alliance is formed, the fight will begin, and will be without respite or mercy. It must be pursued unfailingly against all of the untimely habits, motor or otherwise."

After Morel, Ribot, a professor at the prestigious Collège de France and director of the influential *Revue Philosophique*, continued to develop the concept of degeneration ("degeneration, that is, instability and psychological incoordination") and the associated notion of heredity, thereby providing an acceptable conceptual basis for explaining various social and asocial behaviors, along with all sorts of problems, from alcoholism

to depression to sterility (Pinell, 2001; Walusinski, 2020). The directive and authoritarian ideology developed by Meige and Feindel for treating tics was based on Billod's article (Billod, 1847) and Ribot's, 1883 book on diseases of the will, a best-seller in the psychological literature with its 37 editions from 1883 to 1936 (Ribot, 1883). Ribot declared: "The voluntary faculty is closely tied to the involuntary faculty; the former rests on, and takes its force from the latter and is, by comparison, quite fragile. The education of the attention basically consists in nothing more than arousing and developing feigned perceptions and endeavoring to make them stable through repetition." This explains why the will should make it possible to prevent outbursts of involuntary movements through sustained attention. The repetition of the adaptive movements should prevent involuntary movements because fundamentally, "the brain is a motor organ, which is to say that many of its elements produce movement and there is not a single state of consciousness that does not contain, to some degree, motor elements." According to Ribot, Gilles de la Tourette syndrome, like aboulia, depression, or hysteria, was "a state of incoordination, lost equilibrium, anarchy, and moral ataxia that results from a constitutional impotence of the will." It is easy to see why Meige and Feindel spoke of a fight "without respite or mercy"! These clinical, pathogenic, and therapeutic considerations would become the accepted rule for more than half a century, making the book of Meige and Feindel the reference for diagnosing and treating tics. The Englishman Samuel Alexander Kinnier Wilson (1878–1937) (Broussolle, Trocello, Woimant, Lachaux, & Quinn, 2013), known for his description of the eponymous disease involving excess copper in the organism due to a metabolic defect (Wilson, 1912), adopted the theories of Meige and Feindel on tics in 1927 (Wilson, 1927). However, he noted the difficulty of giving a pathophysiological interpretation based on the psychopathology causing the abnormal movements, in particular tics, which were present in the sequelae of the encephalitis epidemic (Constantin von Economo, 1876–1931). A recent publication casts new light on these theories based on a new pathophysiological paradigm: "Aberrant reinforcement signals to the sensorimotor striatum may be fundamental for the formation of stimulus-response associations and may contribute to the habitual behavior and tics of this syndrome" (Delorme et al., 2016).

In 1909, Cruchet wrote a volume for general practitioners in the "Consultations médicales françaises" collection entitled *La tiquose* (Cruchet, 1909). "Any simple or complex movement that is sudden and

frequently repeated without any apparent reason or purpose at irregular intervals constitutes a tic." For him, any normal movement could be transformed into a tic. Cruchet held to the principle that there was no continuum between the "habitual tic" and the "convulsive tic" or dystonia. For him, the first "was an action movement" whereas the second was an attitude or a "fixed movement." And yet he used the word "tic" for both of them! Without any discussion, he cited the popular belief that a blinking ocular tic may occur following the presence of a foreign body under the eyelid or after making a game of voluntary blinking or imitating another ticcer. In a popular book published in 1911, with a second edition in 1930, Cruchet the pediatrician advised parents and teachers on "bad habits"; that is, behaviors in children that, for him, caused lasting neuropsychiatric pathologies (Cruchet, 1911). He listed the descriptions of various localizations of tics in the face and limbs, including nail-biting and trichotillomania as tics. He distinguished "visceral tics," including snoring, sniffing, yawning, sneezing, coughing, and laryngeal and phonatory sounds, with coprolalia falling in this category. It should be noted that Cruchet considered thumb-sucking, rhythmic movement disorder, stuttering, polydipsia, bed-wetting, sleep-walking, and masturbation as "bad habits" in children that needed to be vigorously corrected. His explanation went as follows: "Any bad habit, that is, one that damages either the body's outer conformity or its physical or moral heath, can only be explained in two ways. The first entails excessive emotionalism, by virtue of which an act, once it enters one's consciousness, tends to be reproduced solely because of the initial first impression it causes. The second explanation lies in an insufficient will, which, in the presence of a sensation experienced normally, is unable to drive it away, even while recognizing it as dangerous." Everything thus came down to how a child was raised, which should hold any spontaneous impulses in check: "Tics are bad habits due to a lack of authority and control." Cruchet railed against "Freudism," an approach far removed from his principles: "Tics are attributed to narcissism, that is, this form of autoerotism characterized by the fact that subject adores themselves. A tic occurs in the part of their body where there is an erogenous zone, a sensation of pleasure… One could never have imagined that the child's legendary innocence was in fact concealing native lust and perversity." The therapeutic methods he suggested ranged from a straight-jack type restraint to application of an eye ointment or wash containing cocaine or camphor to gymnastic exer-

cises that he called the Brissaud method and the Pitres method (Walusinski, 2021b).

27. In medical treatises

In 1894, in the *Traité des Maladies du Système nerveux* by Joseph Grasset (1849–1918) and Georges Rauzier (1862–1920), the tic chapter used elements developed by Letulle in the Jaccoud dictionary without presenting Gilles de la Tourette syndrome as an isolated entity (Grasset & Rauzier, 1894).

In 1902, Henri Triboulet (1864–1920) wrote the tic chapter in the *Traité de Médecine* of Brouardel and Augustin Gilbert (1858–1927) (Triboulet, 1902). He did not distinguish transient childhood tics, leaving the reader with the impression that all ticcers have Gilles de la Tourette syndrome: "The prognosis is always serious, due to the etiological principle: a transmittable hereditary flaw." The discussion of differential diagnosis was more soundly structured and highlighted how to distinguish tics from chorea, hysteria, and "paramyoclonus." He recommended treating patients—as early as possible, he emphasized—with the methods of Meige and Feindel.

In the so-called *Charcot-Bouchard Traité de Médecine*, actually the work of Brissaud and published in 1894, there was no chapter on tics (Charcot et al., 1894). By contrast, the *Pratique Médico-Chirurgicale* of Brissaud, Pinard, and Reclus ((Brissaud, Pinard, & Reclus, 1907)) contained a long chapter on the subject, written by Meige (Meige, 1907). The descriptions of tics were detailed, and their etiology was linked to "neuropathic and psychopathic" heredity. Gilles de la Tourette syndrome was reduced to banal tics associated with coprolalia, the nature of which was contested in keeping with Magnan's opinion.

28. Psychoanalytic inquiry

The era of psychoanalytic iatrogenesis began in 1921 with the publication of a tic theory by the Hungarian psychoanalyst Sandor Ferenczi (1873–1933), who prior to that point had never examined any patients, basing his ideas on the account of one ticcer, which formed the long first chapter of the Meige and Feindel book and was entitled "The Confessions of a Victim to Tic" (Ferenczi, 1921). For him, tics were a stereo-

typed equivalent of onanism; ticcers were thus frustrated masturbators! Sigmund Freud (1856–1939) wrote little on tics. He was in Paris from October 1885 to February 1886, where he met Gilles de la Tourette and Guinon, and thus must have been aware of their articles on "convulsive tics." In his study on hysteria with Josef Breuer (1842–1925), the second case was that of Frau Emmy von N., who may have been misdiagnosed by Freud and in fact suffered from Gilles de la Tourette syndrome (Freud, 1962; Pappenheim, 1980). Of course, it is not possible to establish a retrospective diagnosis with certitude. It seems probable that Freud eliminated Gilles de la Tourette syndrome as a diagnosis because his patient's tics seemed to disappear, although temporarily, under hypnosis whereas "convulsive tics" were not modified. Freud was of Guinon's opinion that links existed between the two pathologies or that they were frequently associated (Kushner, 1998). After 1893, Freud never proposed any psychoanalytic explanations of the pathophysiology of tics. As for Charles-Louis Trepsat (1879–1937) in 1922, he recounted in *Le Progrès Médical* his psychoanalytic interpretation of the confession of a ticcer, a poor victim of onanism in childhood. Trepsat supported his case by noting that the diagnosis of tics was made by Joseph Babiński (1857–1932), whereas the clinical picture resembles dystonia (Trepsat, 1922).

The Swiss psychiatrist and psychoanalyst Raymond de Saussure (1894–1971), Freud's student, stands out honorably among other psychoanalysts. He discussed the etiological role of encephalitis lethargica, described by von Economo, and presented an observation of Gilles de la Tourette syndrome in which the tics often took the form of repeated yawning (Gilles de la Tourette, Huet, & Guinon, 1890): "Despite the similarities between Gilles de la Tourette's description and Blanche's symptoms, we still hesitate to consider her yawning fits as hysterical symptoms." For Saussure, the abnormal movements of the young patient he had treated at the Clinique de Céry, where Gilles de la Tourette died, were organic in origin, like the Parkinsonian symptoms of other victims of this epidemic, and not psychological (Saussure de, 1923).

The psychoanalyst Serge Lebovici (1915–2000) was at the other end of the spectrum, and in 1951 wrote that tics were the "symptom of an obsessional psychoneurosis"; hence the need for early treatment, which entailed "prophylactic mental hygiene," to avoid the development of a neurosis in adulthood (Lebovici, 1951).

29. Early modern concepts

In 1941, André DeWulf (1903–2000) and Ludo van Bogaert (1897–1989) confirmed the validity of the conclusions of Charcot and his students Gilles de la Tourette and Guinon on the neurological organicity of the disease (DeWulf & von Bogaert, 1941). The clinical picture for their patient was atypical, with onset at age 18. When they began treating him at age 30, his general condition was very impaired by advanced osseous tuberculosis. Aside from the abnormal movements, the patient had no psychiatric comorbidity. Shortly after his death following status epilepticus, they performed an autopsy: "We undertook a detailed histological study, exploring in particular the two motor zones, the cerebellar apparatus, the red nucleus, the basal ganglia, the olivary bodies, and the anterior horns of the cervical spine. Aside from what appears to be cellular sclerosis in layers IV-V-VI in the frontal, motor, and parietal regions, we did not observe any noteworthy details…. What we find important in this negative examination is that it permits the conclusion that Gilles de la Tourette disease has no lesional substratum, which in turn permits us to include it among the systematized extra-pyramidal diseases." The fact that this 1941 paper was written in Belgium under Nazi occupation and published in Switzerland may explain its lack of dissemination after the war among psychoanalysts. Nonetheless, the work gave the authors an opportunity to produce one of the first films of motor and phonic tics, 1 month before the patient's death. The photos of the patient that illustrated the article were reprinted in 1949 in a medical treatise published in Paris (Lemierre, Lenormant, & Pagniez, 1949).

The publications in German on this subject include the 1892 paper by Friedrich Jolly (1804–1904), a professor of psychiatry and director of the neuropsychiatric clinic at the Berlin Charité Hospital (Jolly, 1892); the 1896 paper by Johannes Bresler (1866–1942), who worked in an asylum in Kreuzburg (Upper Silesia), then part of Germany, currently Kluczbork (Opole Voivodeship) in Poland (Bresler, 1896); the 1898 paper by Hermann Wille of Münsterlingen, son of and assistant to Ludwig Wille (1834–1912), a German psychiatrist who worked in Basel, Switzerland (Wille, 1898); the 1899 paper of Georg Köster (1867–1932), a professor of psychiatry and neurology in Leipzig (Köster, 1899); the 1927 paper by Erwin Straus (1891–1975), a neuropsychiatrist and philosopher, assis-

tant to Karl Bonhoeffer (1868–1948) at Berlin Charité Hospital (immigrated to Baltimore in 1938), also a critic of psychoanalysis and friend of Eugène Minkowski (1885–1972) (Straus, 1927); the 1927 work of Joseph Wilder (1895–1976), assistant to Otto Pötzl (1877–1962) at the university neuropsychiatric clinic of Vienna (fled to New York in 1937) (Wilder, 1927); and the 1932 paper of Werner Runge (1882–?), a neurologist in Chemnitz (Runge, 1932).

The full history of Gilles de la Tourette syndrome after World War II, especially the importance of psychoanalytic theory, particularly in the U.S., is well presented in Howard Kushner's book, which stands as the reference work on this subject (Kushner, 1999).

Gilles de la Tourette disease disappeared almost totally from the medical literature from the early 20th century until the late 1950s. In the 1960s, the disease became a syndrome, firmly reassociated with Gilles de la Tourette's name.

30. Arthur and Elaine Shapiro

In a 1965 review of the literature, Diane Kelman found 44 authentic descriptions of Gilles de la Tourette syndrome in all medical publications worldwide between 1906 and 1964. She found slightly higher incidence in males than in females, onset before age 10, and normal intelligence without any particular risk of “degeneration” (she used the nineteenth-century term). She confirmed the absence of any link between Jumping, Latah, Myriachit, and Gilles de la Tourette syndrome. Finally, she noted that neuroleptics seemed to reduce the symptomatology, but that proper perspective was lacking to accurately assess their impact (Kelman, 1965). Indeed, it had only been recently, in 1961, that Jean-Noël Seignot had succeeded for the first time in effectively treating one of his patients, through experimental use of haloperidol (Seignot, 1961). His publication did not generate many immediate echoes. Then in 1968, Arthur K. Shapiro (1923–1995) and his wife Elaine, both American psychiatrists, successfully replicated Seignot's observation. In their article, which American medical journals refused to publish, they demonstrated the efficacy of haloperidol in calming the symptomatology of Gilles de la Tourette syndrome (Shapiro & Shapiro, 1968). Their work did have a large impact, first in the community of American psychiatrists, and later among American neurologists. Shapiro thus became the instigator of a

radical paradigm shift. This disease was henceforth seen as organic; psychotherapy, and to an even greater degree psychoanalysis, have no role in its treatment, aside from helping patients and their families tolerate the psycho-affective repercussions of the disease. The Shapiros estimated the number of patients in the U.S. to be approximately 100,000 in their excellent 1978 book, which can be considered the first work since the early twentieth century to comprehensively address the subject (Shapiro et al., 1978). One of their colleagues, Ruth Bruun of Cornell University, described Arthur Shapiro as "a revolutionary, willing to challenge the prevailing dogma, dynamic, charming, and relentlessly stubborn when fighting for what he thought was right and more honest than psychoanalysis then fashionable, an engaging speaker and a man of diverse interests and enthusiasms. It is extremely unusual for a couple of researchers to completely change the prevailing view of a disease, but this is exactly what they did. We salute the tenacity and perseverance of the Shapiros, who brought about the 'renaissance' in work on Gilles de la Tourette syndrome and improved treatment for patients" (Brunn & Bruun, 1994). Twenty years after their landmark publication, the Shapiros were able to attend a large meeting held on May 2 and 3, 1985, at Hôpital La Salpêtrière to celebrate the 100-year anniversary of the seminal article.

Gilles de la Tourette had highlighted the descriptions of some of his predecessors, notably Itard and Trousseau. However, according to Shapiro, the first description of the disease appeared in the book *Malleus Maleficarum* (often translated as *Hammer of the Witches*), written by two monks, Jakob Sprenger (1436–1495) and Henricus Institoris (1430–1505), and published in 1487 with the approval of Pope Innocent VIII (Institoris & Sprenger, 1487). There were several successive editions (Sprenger & Institoris, 1520). These authors described a priest with motor and phonic tics which, at the time, were considered a sign of satanic possession, to be addressed by exorcism. The 1973 American horror film *The Exorcist*, directed by William Friedkin and based on William Peter Blatty's 1971 novel of the same name, was largely inspired by the accounts in *Malleus Maleficarum*. The mother of a 12-year-old girl with "spasms" and coprolalia, very probably a true case of Gilles de la Tourette syndrome, thinks her daughter is the victim of a possession and calls on two priests for an exorcism… in our day and age (Kushner, 1995).

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