

## IN MEMORIAM

### BABINSKI, histologist and anatomy-pathologist

J. POIRIER

*Faculty of Medicine Pitié-Salpêtrière,  
University Pierre and Marie Curie – Paris VI, Paris, France*

#### Abstract

Joseph Babinski (1857–1932), a French neurologist of Polish origin, *médecin des hôpitaux de Paris*, is well known for the discovery of the Sign (the toes phenomenon) which bears his name. Beyond the Sign, his semiological work in the field of neurology is also important (particularly cutaneous and osteo-tendinous reflexes, cerebellar and vestibular semiology, hysteria and pithiatism) as well as his role in the birth of the French neurosurgery. On the contrary, the implication of Babinski in pathological anatomy and histology is usually unrecognized. However, in the beginning of his career, Babinski worked as an *Interne* in the clinical departments of Victor Cornil (1837–1908), professor of pathological anatomy and president of the *Société d'Anatomie de Paris*, Alfred Vulpian (1826–1887), past professor of pathological anatomy and then professor of experimental physiology, and in the laboratory of Louis Ranvier (1835–1922), professor of general anatomy at the *Collège de France*. Babinski became *préparateur* at the chair of pathological anatomy, member then treasurer of the *Société Anatomique*, member of the *Société de Biologie*. He reported on several clinico-pathological observations of general pathology (liver cirrhosis, cancer of the kidney, cancer of a buttock, squamous epithelioma, tuberculosis, multiple cysts of the liver and the kidneys, bowel occlusion), of neuropathology (embolic brain softenings, hydatidic cysts of the brain, multiple sclerosis, spinal cord combined sclerosis, tabetic arthropathies, adiposo-genital syndrome due to a pituitary tumor) and of human neuro-muscular histology (neuro-muscular spindles, muscular histology after nerve sectioning, diphtheria paralysis, peripheral neuritis).

**Keywords:** History of Medicine, Histology, Pathological Anatomy, Babinski.

The celebrity of Joseph Babinski (1857–1932) [1] is principally due to his discovery in 1896 of the toe phenomenon, later known as the *Babinski reflex* or *Babinski sign*.

French neurologist from Polish origin, he was, during two years (1885–1887), *chef de clinique* at the *Clinique des maladies du système nerveux*, headed by Jean-Martin Charcot (1825–1893) at the Salpêtrière Hospital. Babinski was promoted *médecin des hôpitaux de Paris* in 1890, and was head of a Medical Department at La Pitié Hospital from 1895 to his retirement in 1922.

In addition to the *Sign*, Babinski produced many important contributions to neurological symptomatology, essentially with regard to cutaneous and osteo-tendinous reflexes, precise localization of spinal cord compression, cerebellar (asynergy, adiadochokinesia, hypermetria, cerebellar catalepsia) and vestibular signs. He also proposed a new concept of *hysteria* under the term of *pithiatism*.

Several syndromes were termed according to his name such as the Babinski–Frölich, Anton–Babinski, Babinski–Nageotte, Babinski–Vaquez syndromes.

He also was the main initiator of French neurosurgery, by stimulating and supporting the two pioneers of this new discipline: his closest disciple Clovis Vincent (1879–1947) and his friend Thierry de Martel (1875–1940).

On the other hand, his contribution to anatomy-pathology and histology is often ignored, although it deserves attention and is far from to be neglected.

At the beginning of his career, during the fourth years of his *internat* (1880–1885), Babinski appeared as a future anatomy-pathologist and histologist. However, after his meeting with Charcot, during his *clinicat*, due to an unforeseeable concurrence of circumstances, Babinski gave up histology and pathologic anatomy, and preferred the study of the living to that of the dead [2]. Then he became a pure clinician and he no more put his eyes on the ocular of a microscope [3]. He left the histopathological work to two disciples, Jumentié and mainly Nageotte. Henceforth, his *credo* and only goal was to make clinical distinction between organic and hysteric disorders, which resulted in a real switch in his career.

#### ☞ The three masters of Babinski in pathological anatomy and in histology

Three highly charismatic personalities surrounded the histological and anatomy-pathological period of the Babinski's career (i.e. during his *internat*): Victor Cornil, Alfred Vulpian and, more indirectly, Louis Ranvier. Four institutions were daily attended by Babinski: hospital, the chair of Pathological Anatomy of the Faculty of Medicine (head Professor Cornil), the *Société Anatomique de Paris* (President Cornil) and the *Collège de France* (where Ranvier was head of the chair of General Anatomy). On the other hand, he did not attend the chair of Histology of the Faculty of Medicine, founded in 1862 for Charles Robin (1821–1885), and headed by Mathias Duval (1844–1907) since 1886.

### Victor Cornil (1837–1908)

Victor Cornil [4] had a double brilliant career as a famous physician and as a Republican politician close to the Left wing. The oldest *interne* of Charcot, Victor Cornil was *médecin des hôpitaux* (1869), head of department at La Pitié Hospital (1881) and professor of Pathological Anatomy. He succeeded to Charcot when Charcot occupied the *chaire de Clinique des maladies du système nerveux* created for him in 1882.

The *Progrès Médical*, a weekly paper directed by Désiré Bourneville (1840–1909), close disciple of Charcot, supporter of scientific medicine and defender of pathological anatomy, advocated Cornil's work. The great clarity of his lessons was emphasized, as well as their modernity. By example, when Paris was affected by cholera in 1884, he introduced in his lessons the state of the art concerning the *Vibrio cholerae* from the works of Robert Koch. In his teaching, Victor Cornil used to start the lectures by the description of normal anatomy then normal histology of the organs before showing the lesions, macroscopically and microscopically, to the students. Therefore, during his lessons, he used drawings, schemas and projections of slides (by oxyhydric light lanterns). In addition, each morning, in his department at the Pitié Hospital, he performed one autopsy and commented the lesions for the students. Students could also undertake *post-mortem* examination, under the direction of the professor. Moreover, once a week, in his laboratory, the students were allowed to microscopically examine the lesions, which have been presented during the theoretical lessons. Cornil was fond of autopsies and histopathology.

Work-addict, he published many papers and, in collaboration with Ranvier, a *Manuel d'histologie pathologique* [5], “a marvelous and clear condensation of his observations” [6]. At the chair of Pathological Anatomy, under the authority of the professor Victor Cornil, there were the *chef des travaux* (Albert Gombault, during many years), some *préparateurs* and sometimes some *moniteurs*.

During his two last years of his *internat* (1883–1884 and 1884–1885), Babinski was *préparateur*, position that he left when he became the *chef de clinique* of Charcot.

The Romanian physician Victor Babès (1854–1926), former professor of Pathological Histology at the University of Budapest, then professor of Pathological Anatomy and Bacteriology at Bucharest, after having worked with Rudolf Virchow (1821–1902) and Robert Koch (1843–1910), became close to Victor Cornil. His name was given to the *babesiosis*, an uncommon malaria-like disease caused by the intracellular protozoan parasite that he had discovered, and which bears his name, *Babesia*. In 1885, with Victor Cornil, he published a book of bacteriology [7] and devised a box for culture of bacteria, similar to the well-known *PETRI box*, devised in 1877 by the German bacteriologist Julius Richard Petri (1852–1921), assistant of Koch. During the solemn meeting of the *Société Anatomique* held in honor of the ten years of his

presidency, Charcot spoke highly of Cornil: “Aren't you, in this pathological-anatomical beautiful science that you love with a true passion and that you have enriched with so many first-rate papers, aren't you one of our initiators, one of our great masters in pathological histology, one of those finally that we can rightly become proud of in front of foreigners” [8].

On the other hand, Cornil occupied many political functions as Deputy, Senator, Mayor, Prefect and General-Councilor. He was a Republican, at the Left wing, and became President of the *Ligue républicaine du VI<sup>e</sup> arrondissement* during the *Commune de Paris* (May 1871). He also was a member of the *French Public Health Committee*, and was *Chevalier*, then *Officier*, of the *Légion d'honneur*.

In addition to be a teacher and a politic man, Victor Cornil had a remarkable personality, which certainly made a profound impression on his *interne* Babinski.

### Alfred Vulpian (1826–1887)

During the third year of his *internat*, Babinski worked in the department of Vulpian. Alfred Vulpian [9] began his medical studies under the influence of Pierre Flourens (1794–1867), professor at the *Muséum*. He was promoted *médecin des hôpitaux* (1857) and head of the chair of Pathological Anatomy (1866) where he succeeded to Jean Cruveilhier (1791–1874) and will be later succeeded by Charcot.

In 1862, at the same time than Charcot, he was promoted Head of department at the *Salpêtrière*. Vulpian, like Cornil and many other famous physicians at that time, was work-addict, and his life has been entirely devoted to science and query of scientific truth. Though slightly occulted by the glory of his friend Charcot and of his pupil Dejerine, his works are worthy in the field of clinical-anatomy, physiology and physiopathology of the nervous system. He was appointed Dean of the Faculty of Medicine of Paris (1875–1881).

### Louis Ranvier (1835–1922)

Though not directly affiliated with the *Collège de France*, Babinski frequently met Louis Ranvier and mainly Nageotte. His friend Suchard was *préparateur de cours* and his intimate friend Jean Darier *répétiteur* for Ranvier.

Born in Lyon, where he started his medical studies, Louis Ranvier [10] became *interne des hôpitaux de Paris*, *préparateur* at the *Collège de France*, then director of the histological laboratory associated with the chair of Claude Bernard (1813–1818), and lastly, in 1875, Ranvier was nominated professor at the *Collège de France* in a chair of *General Anatomy*.

The teaching of Ranvier was remarkable. The *Progrès Médical* emphasized the fact that Ranvier followed the experimental method of his master and friend Claude Bernard and that he always asked physiology to confirm his morphological observations [11]. His numerous researches were devoted to bone and connective tissues, muscles and degeneration and regeneration of nerve fibers [12], and nervous endings.

In 1871, he described the periodical annular constrictions of myelinated fibers (later called *Ranvier's nodes*) [13], and the T structure of axons in the neurons of the spinal ganglia. Ranvier succeeded Robin at the *Académie des Sciences*.

With Balbiani, he founded the *Archives d'Anatomie*

*Microscopique* (1897), the first French review of microscopical studies. His main coworkers and disciples were Charles Malassez (1842–1909), Félix Hennequy (1850–1928), Edouard-Gérard Balbiani (1823–1899), Justin Jolly (1870–1953) and also many French or foreign biologists and physicians, particularly Babinski.



JOSEPH BABINSKI (1857–1932) VICTOR CORNIL (1837–1908) ALFRED VULPIEN (1826–1887) LOUIS RANVIER (1835–1922)

### ☞ The two disciples, histologists of Babinski

After the first period of Babinski's career, when he did no more put his eyes on a microscope, two of his pupils, both high-qualified neurologists, performed pathological anatomy and histology: Jean Nageotte and Joseph Jumentié.

#### Jean Nageotte (1866–1948)

Jean Nageotte [14] wrote his medical thesis [15] in the laboratory of Fulgence Raymond at the Lariboisière Hospital. In his thesis, he thanked his masters during his *internat* and, among those, Babinski. Nageotte was *chef des travaux anatomiques de la Clinique des maladies du système nerveux*, then *médecin-aliéniste des hôpitaux* at the Bicêtre Hospital, then at the Salpêtrière.

He performed the autopsies and histological examinations in the Babinski's department at the *Pitié* Hospital. For the Babinski's laboratory he directed the construction of a new microtome for brain cutting [16], called at the *Musée de l'Assistance publique* in Paris "the Babinski's microtome", although it has never been utilized by Babinski himself!

After having been *répétiteur* in the histological laboratory of the *École des Hautes-Etudes*, at the *Collège de France*, he succeeded Louis Ranvier in 1913 at the *Collège de France* in the *Chair of Comparative Histology* which has been created for him and from which he retired in 1937.

Nageotte published many papers and books on microscopic anatomy of connective tissue and, over all, on the nervous system [17].

In 1902, Babinski and Nageotte reported at the *Société de Neurologie de Paris*, three observations of a new syndrome due to unilateral lesions of the medulla oblongata, syndrome that will be later known as *Babinski-Nageotte syndrome* [18]. The clinical features were vertigo, right hemiplegia with anaesthesia, hemiasynergy with lateropulsion and myosis on the left

pupil. The *post-mortem* anatomical study of the brain, obviously due to Nageotte, was based on 1200 serial sections of the block made of the medulla oblongata, cerebellum, pons and basal ganglia, after fixation by bichromate, impregnation in osmium tetroxyde according to the Marchi's method and embedding in celloidin. In the left half of the medulla oblongata, four distinct foci considered as small softenings due to syphilis were found [19]. Few cases of this syndrome have been published afterwards [20].

With Babinski, Nageotte also worked on cerebro-spinal fluid cytology [21]. They showed that a permanent lymphocytosis of the cerebro-spinal fluid, if it was not due to a tuberculous meningitis, was usually the sign of a diffuse syphilis (tabes or paralysis of the insane) [22]. With Gendron, Babinski showed that hyperleucocytosis, made of an hyperpolynucleosis sometimes followed by an hyperlymphocytosis, may occur in the cerebro-spinal fluid during cerebral softenings [23].

#### Joseph Jumentié (1881–1928)

During all his life, Joseph Jumentié [24] remained close to his two beloved masters of *internat*, Dejerine and Babinski.

His thesis, prepared in the Dejerine's laboratory at the Salpêtrière, was devoted to ponto-cerebellar angle tumors [25].

During World War I, he was the assistant of Professor Joseph Grasset (1849–1918) at the Neurological Center of Montpellier. Later, he became director of the *Dejerine Foundation*, physician of the *Galignani Foundation* and assistant of André-Thomas (1867–1963) at the Saint-Joseph hospital in Paris.

The *post-mortem* examination of the brain of Henri Mouninou, the famous cerebellar patient of Babinski, was done by Jumentié who was able to confirm the clinical diagnosis by showing several vascular necrotic lesions in the cerebellum [26]. Curiously, the paper reporting these data was signed by Babinski alone!

## ☞ The institutional implication of Babinski in anatomical pathology

During this first part of his career, Babinski was closely implicated in the anatomo-pathological institutions. In 1884–1885, yet *interne*, he was *préparateur* at the chair of Pathological Anatomy held by Victor Cornil, and among others, he published a few Cornil's lessons [27], on erysipelas, phlegmon and smallpox.

He was a member of the *Société Anatomique de Paris*. Founded in Paris at the beginning of the XIXe century, the *Société Anatomique* was the site where clinico-pathological observations collected in the Paris hospitals were presented, most often by the *Internes*. It was a tribune where each communication had to be accompanied by the corresponding anatomo-pathological pieces, in order to avoid idle, purely clinical, discussions. In May 1884, M. Letulle, in his report [28] on the candidacy of Babinski to the position of *membre adjoint* of the *Société*, emphasized the main interest of the anatomo-pathological data of two observations of epithelioma that Babinski had reported at the *Société*. Later, Babinski presented the report on the candidacy of Charrin [29], Hallé [30] and Guillet [31]. He was treasurer of the *Société* in 1885–1886, and became an honorary member in 1894. He also was a member of the *Société de Biologie*.

## ☞ General pathological anatomy

From 1882 to 1886, Babinski presented nine communications at the *Société Anatomique*, strictly in the field of general pathological anatomy and histology. The cases came from the clinical departments of Victor Cornil or Vulpian. At this time, all his communications were signed by Babinski alone, and never co-signed by Victor Cornil, Vulpian or Ranvier. Later, when a paper of Babinski contained some pathological or histological data, Nageotte or Jumentié have been most often associated, but always in second position behind Babinski.

In January 1882, Babinski presented [32] the *post-mortem* anatomical data confirming the clinical diagnosis of the liver cirrhosis in a patient. In February, he showed [33] a cancer of the kidney, which appeared in a woman who had been previously operated from a squirrhe of the breast. In May, he reported [34] the histological data concerning a cancer of buttock, which had been operated on by M. Polailon. Babinski described, with many details, a squamous epithelioma belonging to the group of the Verneuil's sweat glands adenomas, with the singularity that the origin of the tumor was not the sudoral glands but was situated within the stratum spinosum of epiderm.

The same year, he reported [35] the *post-mortem* data of a patient who had lung tuberculosis, with laryngitis and ulceration of the lip. The histopathological description of the tuberculous lesions was very detailed. In the following communication [36], he reported two cases of squamous epithelioma whose probable origin was an ovarian dermoid cyst. In June, he presented the case [37] of a 56-year-old woman with

multiple cysts, lined by an epithelium, within the liver and the kidneys. The next year, he reported a case of bowel occlusion [38] and, in 1885, the histological examination of a mucous epithelioma [39]. In a tumor case [40], which has been previously presented by M. Mérigot, he described a cancer containing epithelial cells with a brush border, but there was not enough material to determine the precise origin of this tumor.

## ☞ Neuropathology

### The embolic brain softenings

In 1883, at the *Société Anatomique*, Babinski reported [41] the case of a man of 61-year-old who has had two ictus, the first one with a left regressive hemiplegia, the second with a non-regressive right hemiplegia, rapidly complicated by broncho-pulmonary infection, which led to death ten days after the initial symptoms. *Post-mortem* brain examination showed multiple foci of softening in both hemispheres. No atheroma was found, neither in aorta, nor in cervical arteries and arteries of the base of the brain. Examination of the heart showed verrucosities on the aortic sigmoids, which were probably the origin of cerebral embolisms leading to the ictus.

### Hydatic cysts of the brain

The same year, Babinski reported [42] the clinical observation of a man of 36-year-old, who had received a horse kick to the head five years before. In November 1882, seizures appear then severe headaches, right hemiparesia and lastly a more and deeper prostration leading to death in February 1883. *Post-mortem* examination of the brain showed a spheric cavity in the left cerebral hemisphere, surrounded by a semi-translucid membrane and which contained a water-looking liquid. A cerebral hydatic cyst. Was diagnosed or, more precisely, an acephalocyst, because no hooks were detected by examination of several preparations. The possible responsibility of the previous head traumatism was discussed.

### Multiple sclerosis

The work of Babinski on multiple sclerosis has been summarized in his medical thesis [43]. The originality of his work was based upon the use of longitudinal histological sections of the spinal cord in complement of transversal ones. Therefore, he could confirm the opinion of Charcot and Vulpian that, in the plaques of multiple sclerosis, myelin is destroyed but most often the axons are preserved. This latter fact explained the usual absence of wallerian degeneration in multiple sclerosis. He showed also that the destruction of the myelin was not due to a mechanical phenomenon of compression but to the action of neuroglial and migratory cells.

### The spinal cord combined sclerosis

During the meeting of January 1886 at the *Société Anatomique*, Babinski showed some slices of the spinal cord of a patient, in his own name and in name of

Charrin [44]. The patient presented the classical symptoms of ataxia, but, in addition, at the level of the lower limbs, contracture and brisk jerk reflexes. *Post-mortem* examination of the spinal cord confirmed the clinical diagnosis of spinal cord combined sclerosis, showing, particularly at the level of the cervical enlargement, a sclerosis of the dorsal funiculi, crossed pyramidal tracts, of fascicles of Türck and of the direct cerebellar tracts. These lesions were those of the *idiopathic anaemia* described in 1849 then in 1855 by Thomas Addison (1793–1860), the famous English physician of the Guy's Hospital in London. This disease was called *pernicious anemia* by Anton Biermer in 1872 and is presently known as *Addisonian anemia* or *Addison–Biermer disease* due to vitamin B12 deficiency. Babinski did not refer to these previous works.

### Tabetic arthropathies

Two communications [45] in 1887 at the *Société Anatomique* were devoted to tabetic arthropathies. Babinski presented the bones, especially the femurs of a tabetic patient who died with severe osteo-articular lesions. He discussed the true nature of tabetic arthropathies and substantiated the ideas of Charcot in showing that these arthropathies were different from those of chronic rheumatism (*arthritic deformans*). He said that the rarefaction of bone tissue was characteristic of tabetic arthropathies while, on the contrary, there was neof ormation of bone tissue (*productive osteitis*) in rheumatismal chronic arthritis. He showed that the femurs of his patient presented tabetic arthropathy at their superior extremity whereas they showed rheumatismal arthritis at their lower extremity. During the following discussion, Victor Cornil objected that there were no two different processes, but simply tabetic lesions in two different phases of development. Babinski was not convinced and maintained his view [46].

### The Babinski–Fröhlich syndrome

In 1900, Babinski presented, at a meeting of the *Société de Neurologie de Paris* [47], the clinico-pathological observation of a 17-year-old female who complained from headache, loss of vision, amenorrhea and presented seizures. The clinical examination showed obesity, infantile aspect of the external genitalia and a bilateral papilloedema, but no acromegaly. The patient died rapidly after the first clinical examination. Autopsy showed a voluminous tumor occupying the pituitary sella, and very small ovaries and uterus (the size of organs from a young girl 8–10-year-old). Histological examination of the tumor was performed by Jacques Onanoff and presented in his thesis [48]. It showed a squamous epithelioma arising from the pituitary gland epithelium. Babinski concluded that a hypophyseal lesion was able, when starting during childhood, to lead to an *infantilism*, i.e. a stop in the development of genitalia. In the following discussion, Brissaud contested the use of the term *infantilism* for this case, but Babinski stuck to it.

The Austrian physician Alfred Fröhlich published a similar case [49] one year later, in 1901. Therefore, this

adiposo-genital syndrome is often called *Babinski–Fröhlich syndrome*.

## ☞ Muscle and peripheral nerve histology

### The neuro-muscular spindles

In a communication at the *Société de Biologie* [50] in 1886, and again at the *Société Anatomique* [51], Babinski gave an excellent histological description of some particular structures of normal human skeletal striated muscle, which he called *neuro-muscular fascicles (faisceaux neuro-musculaires)* and which are presently known as *neuro-muscular spindles*. He thought to be the first to describe these neuromuscular fascicles, but three years later [52] he recognized that new bibliographical researches showed that they already have been observed by other authors, particularly by Golgi. However, he claimed that his work has been useful for anatomo-pathologists who did not know very well that these structures were normal.

### ☞ Muscle histology after nerve section

Six weeks after sectioning the sciatic nerve of rabbits, samples of the innervated muscles were taken off and examined after fixation in ammonium bichromate or chromic acid, hardening by gum and alcohol, transversal sectioning, staining by picro-carmin or Hematoxylin. Babinski found atrophy of the contractile substance, and concluded that following suppression of function, morphological differentiation disappears, and that the element seemed to return to the embryonic state [53].

In another study, he showed that histological examination of the nerves corresponding to paralyzed muscles in experimental diphtheria paralysis did not show any lesion [54].

### Various muscle diseases

Babinski published a few papers on muscular atrophy [55], progressive primary myopathy [56] and electrical contractility of the striated muscles after death [57].

### Peripheral neuritis

Clinico-pathological study of peripheral neuritis was the subject of a lesson [58], of a communication at a Congress [59] and mainly of a voluminous chapter (about 200 pages) in two editions (1894 [60] and 1905 [61]) of the famous *Traité de Médecine* by Charcot JM, Bouchard ChJ, Brissaud E.

### ☞ Experimental pathology

Even if he began his career as a histopathologist, Babinski was fundamentally a clinician, not prone to experimental medicine. However he undertook some experimental works, mainly on pyocyanic disease [62] in rabbits which develop paralysis [63] and arthropathies [64], in collaboration with Albert Charrin (1856–1907), future professor at the *Collège de France* at the Chair of General and Comparative Pathology.

### Acknowledgements

- Christian Derouesné, Honorary Professor at Paris VI University.
- Florence Greffe, curator of the Archives of the Académie des Sciences, Paris.
- Stephane Kraxner, curator of the Archives of the Pasteur Institute, Paris.
- Véronique Leroux-Hugon, librarian in chief, Charcot Library, Salpêtrière Hospital, Paris.
- Evelyne Maury, curator of the Archives of the Collège de France, Paris.
- Jean-François Minot, curator at the Musée de l'Assistance Publique, Paris.

### References

- [1] PHILIPPON J., POIRIER J., *Joseph Babinski, a biography*, Oxford University Press, New York, 2008, in press.
- [2] FULTON J. F., *Science in the clinic as exemplified by the life and work of Joseph Babinski*, J Nerv Ment Dis, 1933, 77(2):121–133.
- [3] TOURNAY A., *Joseph Babinski (1857–1932)*, Médecine de France, 1953, 43:3–10.
- [4] MILIAN G., *Le Professeur V. Cornil (1837–1908)*, Le Progrès Médical, 1908, XXIII(17):199–200.
- [5] CORNIL V., RANVIER L., *Manuel d'histologie pathologique*, F. Alcan, Paris, 1869.
- [6] MILIAN G., *Le Professeur V. Cornil (1837–1908)*, Le Progrès Médical, 1908, XXIII(17):99–200.
- [7] CORNIL V., BABES V., *Les bactéries et leur rôle dans l'anatomie et l'histologie pathologiques des maladies infectieuses*, F. Alcan, Paris, 1885.
- [8] "N'êtes-vous pas dans cette belle science anatomo-pathologique que vous aimez avec une véritable passion et que vous avez enrichie de tant de travaux de premier ordre, n'êtes-vous pas, dis-je, un de nos initiateurs, un de nos grands maîtres en histologie pathologique, un de ceux enfin dont nous pouvons, à juste titre, nous enorgueillir devant l'étranger?", Le Progrès Médical, 1883, XI(52):1052–1054.
- [9] \*\*\*, *Record of Alfred Vulpian*, Archives of the Académie des Sciences, Paris.
- [10] \*\*\*, *Record of Louis Ranvier*, Archives of the Académie des Sciences, Paris.
- [11] BARBARA J. G., *Louis Ranvier (1835–1922): the contribution of microscopy to physiology, and the renewal of French general anatomy*, J Hist Neurosci, 2007, 16(4):413–431.
- [12] RANVIER L., *Leçons sur l'histologie du système nerveux*, recueillies par M. Ed. Weber, Paris, 1878.
- [13] BARBARA J. G., *Les étranglements annulaires de Louis Ranvier (1871)*, Société des Neurosciences, La Lettre N°28, Histoire des Neurosciences, 2005, 3.
- [14] \*\*\*, *Record of Jean Nageotte*, Archives of the Académie des Sciences, Paris; *Record of Jean Nageotte*, Archives of the Collège de France; CROSBY E. C., Jean Nageotte (1866–1948). In: HAYMAKER W., SCHILLER F. (eds), *The founders of neurology*, Charles C. Thomas, Springfield, 2<sup>nd</sup> edition, 1970, 133–136; NAGEOTTE J., *Notice sur les travaux de M. J. Nageotte*, Imprimerie de la Cour d'Appel, Paris, 1911.
- [15] NAGEOTTE J., *Tabès et paralysie générale*, G. Steinheil, Paris, 1893.
- [16] NAGEOTTE J., *Note sur un nouveau microtome à cerveau*, Comptes-rendus hebdomadaires des Séances et Mémoires de la Société de Biologie, 1899, 51(1):202–203.
- [17] NAGEOTTE J., *La structure fine du système nerveux*, Maloine, Paris, 1905.
- [18] BABINSKI J., NAGEOTTE J., *Hémiasynergie, latéropulsion et myosis bulbaires avec hémianesthésie et hémiparésie croisées*, Rev Neurol (Paris), 1902, 30 avril, X(8):358–365.
- [19] BABINSKI J., NAGEOTTE J., *Lésions syphilitiques des centres nerveux. Foyers de ramollissement dans le bulbe. Hémiasynergie, latéropulsion et myosis bulbaires avec hémianesthésie et hémiparésie croisées*, Nouvelle iconographie de la Salpêtrière, 1902, novembre–décembre, XV(6):492–512 [travail complémentaire de la communication à la Société de Neurologie de Paris du 17 avril 1902].
- [20] KRASNIANSKI M., NEUDECKER S., SCHLUTER A., ZIERZ S., *Babinski–Nageotte's syndrome and Hemimedullary (Reinhold's) syndrome are clinically and morphologically distinct conditions*, J Neurol, 2003, 250(8):938–942.
- [21] BABINSKI J., NAGEOTTE J., *Contribution à l'étude du cytodagnostic du liquide céphalo-rachidien dans les affections nerveuses*, Bulletins et Mémoires de la Société Médicale des Hôpitaux de Paris, 1901, 24 mai, XVIII:537–548.
- [22] BABINSKI J., *Lymphocytose dans le tabès et la paralysie générale*, Rev Neurol (Paris), 1903, XI(6):341.
- [23] BABINSKI J., GENDRON A., *Leucocytose du liquide céphalo-rachidien au cours du ramollissement de l'écorce cérébrale*, Bulletins et Mémoires de la Société Médicale des Hôpitaux de Paris, 1912, 3è série, XXXIII:370–374.
- [24] JUMENTIÉ J., *Nécrologie par le professeur Paul Laignel-Lavastine, Président de la Société de Neurologie de Paris*, Rev Neurol (Paris), 1928, II(1):146–147.
- [25] JUMENTIÉ J., *Les tumeurs de l'angle ponto-cérébelleux (étude anatomo-pathologique et clinique)*, Thèse de doctorat en médecine, G. Steinheil, Paris, 1911.
- [26] BABINSKI J., *Syndrome cérébelleux*, Bulletin de l'Académie de Médecine, 1925, 39(16):422.
- [27] CORNIL V., *Leçons professées pendant le premier semestre de l'année 1883-84 par M. Cornil, Professeur d'Anatomie pathologique à la Faculté de Médecine de Paris et recueillies par MM. Berlioz, Babinski, Gibier, Chantemesse, avec 25 figures intercalées dans le texte*, Ancienne Librairie Germer Baillière et C<sup>ie</sup>, Félix Alcan Éditeur, Paris, 1884.
- [28] LETULLE M., *Rapport sur la candidature de M. Babinski au titre de membre adjoint*, Bulletins de la Société Anatomique de Paris, 1883, LVIII(VIII):265–267.
- [29] BABINSKI J., *Rapport sur la candidature de M. Charrin à la place de membre-adjoint de la Société Anatomique*, Bulletins de la Société Anatomique de Paris, 1883, LVIII(VIII):482–484.
- [30] BABINSKI J., *Rapport sur la candidature de M. Hallé*, Bulletins de la Société Anatomique de Paris, 1886, LXI(XI):648–649.
- [31] BABINSKI J., *Rapport sur la candidature de M. Guillet au titre de membre adjoint de la Société Anatomique*, Bulletins de la Société Anatomique de Paris, 1887, LXII(1):496–497.
- [32] BABINSKI J., *Pièces d'un malade qui, durant la vie, avait présenté les symptômes de cirrhose du foie*, Bulletins de la Société Anatomique de Paris, 1882, LVII(VII):28.
- [33] BABINSKI J., *Cancer du rein développé chez une femme opérée d'une squirrhe du sein*, Bulletins de la Société Anatomique de Paris, 1882, LVII(VII):113.
- [34] BABINSKI J., *Epithélioma tubulé de la peau de la région fessière développé au dépens du corps muqueux de Malpighi*, Bulletins de la Société Anatomique de Paris, 1883, LVIII(VIII):232–233.
- [35] BABINSKI J., *Tuberculose pulmonaire – Angine et laryngite tuberculeuses – Ulcération tuberculeuse de la lèvre*, Bulletins de la Société Anatomique de Paris, 1882, LVII(VII):236–238.
- [36] BABINSKI J., *Deux cas d'épithélioma pavimenteux ayant vraisemblablement pour point de départ un kyste dermoïde de l'ovaire*, Bulletins de la Société Anatomique de Paris, 1883, LVIII(VIII):234–236.
- [37] BABINSKI J., *Kystes multiples du foie et des reins – Urémie*, Bulletins de la Société Anatomique de Paris, 1882, LVII(VII):341–344.
- [38] BABINSKI J., *Occlusion intestinale due à un calcul biliaire enclavé dans le rectum*, Société Anatomique de Paris, séance du 16 février 1883, Bulletins de la Société Anatomique de Paris, 1883, LVIII(VIII):117–118.

- [39] BABINSKI J., *À propos d'une tumeur présentée par M. Ballue comme un épithéliome corné du maxillaire inférieur, M. Babinski dit "qu'il s'agit plutôt d'un épithéliome lobulé, muqueux: il existe fort peu d'éléidine"*, Société Anatomique de Paris, séance du 23 janvier 1885, *Bulletins de la Société Anatomique de Paris*, 1885, LX(X):52.
- [40] BABINSKI J., *Examen histologique de la tumeur présentée dans la dernière séance par M. Mérigot*, *Bulletins de la Société Anatomique de Paris*, 1885, LX(X):464.
- [41] BABINSKI J., *Ramollissement cérébral*, *Bulletins de la Société Anatomique de Paris*, 1883, LVIII(VIII):140–143.
- [42] BABINSKI J., *Kyste hydatique du cerveau*, *Bulletins de la Société Anatomique de Paris*, 1883, LVIII(VIII):143–145.
- [43] BABINSKI J., *Étude anatomique et clinique sur la sclérose en plaques*, Thèse, G. Masson, Paris, 1885.
- [44] BABINSKI J., *Coupes de moelle offrant un type de sclérose combinée*, *Bulletins de la Société Anatomique de Paris*, 1886, LXI(XI):17–18.
- [45] BABINSKI J., *Arthropathies des ataxiques*, *Bulletins de la Société Anatomique de Paris*, 1887, LXII(II):624–626.
- [46] BABINSKI J., *Ataxie locomotrice – Arthropathie tabétique – Rhumatisme chronique*, *Bulletins de la Société Anatomique de Paris*, 1887, LXII(II):669–672.
- [47] BABINSKI J., *Tumeur du corps pituitaire sans acromégalie et avec arrêt de développement des organes génitaux*, Société de Neurologie de Paris, séance du 7 juin 1900, *Rev Neurol (Paris)*, 1900, VIII(11):531–533.
- [48] ONANOFF J., *Sur un cas d'épithélioma (étude histologique). Thèse pour le doctorat en médecine*, Ollier–Henry, Paris, 1892.
- [49] FRÖHLICH A., *Ein fall von Tumor der Hypophysis cerebri ohne Akromegalie*, *Wiener Klinische Rundschau*, 1901, 15:833–836, 906–908.
- [50] BABINSKI J., *Sur la présence dans les muscles striés de l'homme d'un système spécial constitué par des groupes de petites fibres musculaires entourées d'une gaine lamelleuse*, *Comptes-rendus hebdomadaires des Séances et Mémoires de la Société de Biologie*, 1886, 38(3):629–631.
- [51] BABINSKI J., *M. Babinski montre des préparations de figures nouvelles trouvées par lui dans les muscles striés de l'homme à l'état normal. Ces pièces ont déjà fait l'objet d'une communication à la Société de Biologie*, *Bulletins de la Société Anatomique de Paris*, 1886, LXI(XI):753.
- [52] BABINSKI J., *Exposé des travaux scientifiques*, Masson, Paris, 1913.
- [53] BABINSKI J., *Des modifications que présentent les muscles à la suite de la section des nerfs qui s'y rendent*, *Comptes Rendus de l'Académie des Sciences*, 1884, 7 janvier, 98:51–52.
- [54] BABINSKI J., *Notice sur les travaux scientifiques*, Masson, Paris, 1892.
- [55] BABINSKI J., *Atrophie musculaire d'origine cérébrale, avec intégrité des cornes antérieures de la moelle et des nerfs moteurs*, *Comptes-rendus hebdomadaires des Séances et Mémoires de la Société de Biologie*, 1886, 8<sup>e</sup> série, III:76–78.
- [56] BABINSKI J., ONANOFF M., *Myopathie progressive primitive. Sur la corrélation qui existe entre la prédisposition de certains muscles à la myopathie et la rapidité de leur développement (Travail du laboratoire de M. le Prof. Charcot à la Salpêtrière)*, *Comptes-rendus hebdomadaires des Séances et Mémoires de la Société de Biologie*, 1888, 8<sup>e</sup> série, V:145–151.
- [57] BABINSKI J., *De la contractilité électrique des muscles striés après la mort*, *Comptes-rendus hebdomadaires des Séances et Mémoires de la Société de Biologie*, 1899, 51(1):343–346.
- [58] BABINSKI J., *Anatomie pathologique des névrites périphériques (quelques remarques critiques sur les travaux récents concernant ces névrites). Leçon faite à la Salpêtrière le 30 mai 1890*, *Gazette hebdomadaire de Médecine et de Chirurgie*, 1890, 27(32):374–379; 1890, 27(32):383–388.
- [59] BABINSKI J., *Des névrites périphériques. Congrès des aliénistes et neurologistes de France et des pays de langue française. Session de Clermont-Ferrand (du 6 au 11 août 1894), séance du 7 août*, *Rev Neurol (Paris)*, 1894, II(16):483–485.
- [60] BABINSKI J., *Des névrites*. In: CHARCOT J M, BOUCHARD CH J, BRISSAUD E. (eds), *Traité de Médecine*, tome VI, Masson, Paris, 1894, 649–834.
- [61] BABINSKI J., *Des névrites*. In: BOUCHARD CH. J., BRISSAUD E., *Traité de Médecine*, tome VI, 2<sup>e</sup> édition, Masson, Paris, 1905, 1–202.
- [62] BABINSKI J., *Maladie pyocyannique – Arthropathies expérimentales*, *Bulletins de la Société Anatomique de Paris*, 1889, LXIV(III):468.
- [63] BABINSKI J., CHARRIN A., *De la paralysie pyocyannique. Étude clinique et anatomique*, *Comptes-rendus hebdomadaires des Séances et Mémoires de la Société de Biologie*, 1888, 8<sup>e</sup> série, V:257–259.
- [64] BABINSKI J., CHARRIN A., *Arthropathies expérimentales. Paralysie pyocyannique*, *Comptes-rendus hebdomadaires des Séances et Mémoires de la Société de Biologie*, 1889, 9<sup>e</sup> série, I:545–547.

### Corresponding author

Jacques Poirier, Honorary Professor of Histology and Embryology, Faculty of Medicine Pitié-Salpêtrière, University Pierre and Marie Curie – Paris VI; Past Head of Department, Pitié-Salpêtrière Hospital, Assistance publique – Hôpitaux de Paris; 7 rue Bague, 75015 Paris, France; Phone 0033603662177, E-mail: poirierpaulin@aol.com

Received: March 5<sup>th</sup>, 2008

Accepted: April 25<sup>th</sup>, 2008