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Fortification Spectra in Migraine Aura: Historical Origins of the Vauban Eponym

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ABSTRACT

Tracing the Vauban Eponym in Migraine Aura

The fortification spectra—zigzag visual patterns often preceding migraine attacks—have long intrigued both patients and physicians. Popularized by English astronomer Hubert Airy (1838-1903) in 1870, these luminous phenomena were likened to a “fortified town,” a metaphor that entered medical parlance. While British neurologist William Gowers (1845-1915) is frequently credited with associating these visual auras with the angular bastions of the fortress designs by Sébastien Le Prestre de Vauban (1633-1707), historical evidence suggests the eponym originated earlier in French medical literature. Jean-Martin Charcot (1825-1893), in a series of lectures from 1887 to 1888, vividly described his own and his patients’ experiences of scintillating scotomas as resembling Vauban-style fortifications, complete with projecting and re-entrant angles. His assistant, Charles Féré (1852-1907), further reinforced the analogy in 1892, describing migraine-induced visual phenomena as luminous discs evolving into toothed wheels or semi-crowns of fortifications. The metaphor gained broader recognition through its inclusion in the 1890 edition of Pierre Larousse’s *Grand Dictionnaire Universel*. This historical article clarifies the origins of the Vauban eponym in migraine aura, highlighting its French roots and the rich interplay between neurology, metaphor, and military architecture.

Keywords: Charcot - Jean Martin - Fortification Spectra - History of Neurology - Migraine Aura - Vauban Eponym

Introduction

Visual aura is the most common manifestation preceding migraine attacks, often characterized by zigzag patterns of luminous lines known as fortification spectra—a term widely popularized by English astronomer Hubert Airy (1838–1903), who in 1870 described his own migraine experiences as resembling a “fortified town with bastions all round it¹.” This vivid metaphor subsequently entered the medical lexicon.

In medical literature, it is widely believed that William Gowers (1845–1915), a prominent British neurologist, was the first to explicitly link the visual aura to the fortifications designed by the French military engineer Sébastien Le Prestre de Vauban (1633–1707)^{2,3,4}. In 1895, Gower wrote: “The spectra of migraine present as their most important feature the zigzag or angled character, which is well known, in its curved form, as the ‘fortification spectrum’. Its projecting and re-entrant angles bear a resemblance to the plan which the French engineer Vauban first devised as most effective for the defence of a fortress⁵.” Vauban revolutionized fortress design under Louis XIV, introducing angular bastions, ravelins, and complex geometric layouts intended to resist artillery fire. These designs became iconic and were widely emulated across Europe. In this regard, some authors have recently suggested that the architectural style attributed to Vauban may have earlier origins, as Michele Sanmicheli (1484–1559), a Venetian engineer, had already developed similar fortification principles in the 16th century, including low, thick walls and polygonal bastions.⁴ However, other bastion fortifications, such as the fortress of Sansepolcro, designed by Giuliano da Sangallo (1445–1516) in the early 16th century, predates Sanmicheli’s works (his first bastion fortifications date back to 1527, Verona) and already exhibits these features⁶. Despite Gowers’ 1895 description, the association between visual aura and Vauban’s fortifications appears to be older. This historical article clarifies the origins of the Vauban eponym in migraine aura, highlighting its French roots and the rich interplay between neurology, metaphor, and military architecture.

The Vauban eponym in Jean-Martin Charcot’s *Leçons du Mardi à la Salpêtrière*

The first known reference to the Vauban eponym in migraine aura is attributed to Jean-Martin Charcot (1825–1893) and can be found in his *Leçons du Mardi à la Salpêtrière* (“Tuesday Lessons”). These lessons originated as transcriptions of impromptu clinical presentations delivered by Charcot between 1887 and 1889 and meticulously recorded by hand by his students Edouard-Emmery Blin (1863–1930), Jean-Baptiste Charcot (1867–1936), and Henri Colin (1860–1930)^{7,8}. They capture spontaneous dialogues between Charcot and his patients, reflecting the immediacy and realism of clinical encounters.

In a lecture dated November 22, 1887, Charcot described a 37-year-old man suffering from migraine with visual aura (Fig. 1). While detailing the patient’s symptoms—spe-

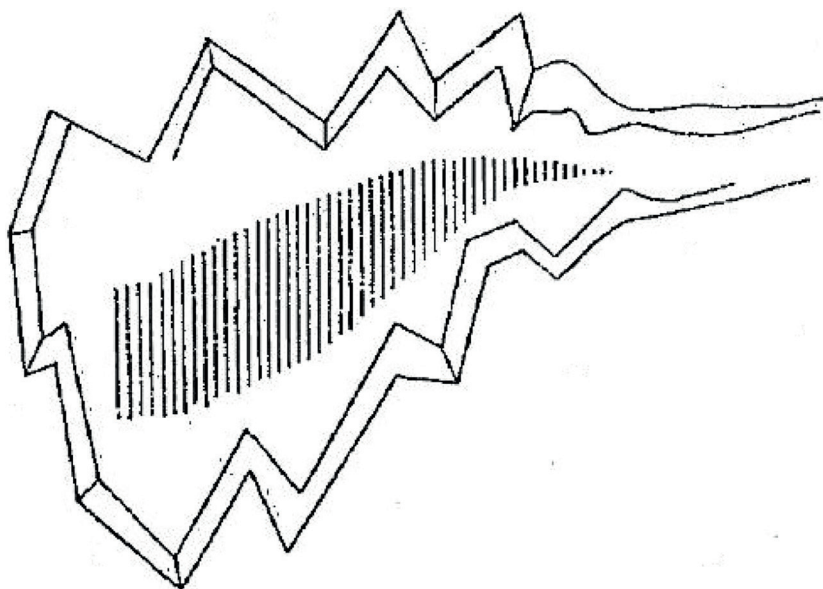


Fig. 1. Visual aura in migraine as drawn by Jean-Martin Charcot (1887). This schematic representation, based on Charcot's own experience and clinical observations, illustrates the characteristic zigzag pattern of the scintillating scotoma, resembling the angular bastions of a Vauban-style fortification. Originally published in *Leçons du mardi à la Salpêtrière* (1892, p. 21).

cifically a scintillating scotoma—Charcot illustrated the phenomenon with the following description: “On a dans l’œil une image qui est ainsi faite, cela ressemble à un plan de fortifications.”

[“One has in the eye an image shaped like this; it resembles a plan of fortifications.”] (p. 25)⁷. He immediately added, “Je connais la forme de cette image par moi-même pour l’avoir ressentie, mais la description vient d’un astronome.” [I know the shape of this image from personal experience, having felt it myself, but the description comes from an astronomer.] (p. 26)⁷.

Thus, in this initial account, Charcot does not yet associate the visual aura’s fortification-like shape with Vauban’s name, nor does he mention the astronomer Hubert Airy as a prior source for the description.

Interestingly, these details appear in the 1892 edition of the *Leçons du Mardi*:

L’image en question, décrite et figurée de visu par un astronome anglais, Airy, rappelle par sa configuration une enceinte fortifiée à la Vauban.

[The image in question, described and illustrated from life by an English astronomer, Airy, resembles in its configuration a fortified enclosure in the style of Vauban.] (p. 21)⁸.

The addition of these details in the transition from the 1887 edition to the definitive 1892 version is significant, as it reflects the ongoing refinement and enhancement of the text. Although the *Leçons du Mardi à la Salpêtrière* were originally conceived as

spontaneous clinical transcripts, they underwent substantial editing and revision prior to their publication between 1889 and 1892^{9,10}.

In a subsequent lecture on December 13, 1887, Charcot again disclosed that he himself had experienced a similar condition:

Mon Dieu! Il n'est pas étonnant qu'on ne puisse décrire du premier coup le scotome scintillant. Je l'ai eu quelquefois, j'avais la sensation d'une espèce de feu d'artifice. Ce n'est que plus tard, par une analyse un peu attentive du phénomène, que je suis parvenu à découvrir qu'il s'agissait là d'une espèce de cercle comparable à une fortification à la Vauban avec des angles saillants et rentrants.

[My God! It's not surprising that one cannot describe the scintillating scotoma at first glance. I have had it myself on occasion—I had the sensation of a kind of firework. It was only later, through a more attentive analysis of the phenomenon, that I came to realize it was a kind of circle comparable to a Vauban-style fortification, with projecting and re-entrant angles.] (p. 69)⁷.

This text appears, almost unchanged, in the 1892 printed edition of the *Leçons du Mardi* (the modifications are highlighted in bold).

Mon Dieu! Il n'est pas étonnant qu'on ne puisse décrire du premier coup le scotome scintillant. Je l'ai eu quelquefois. Les premières fois que je l'ai remarqué, j'avais ou croyais avoir devant les yeux l'image d'un bouquet de feu d'artifice, la sensation de feu d'artifice. Ce n'est que plus tard, par une analyse un peu attentive du phénomène, que je suis parvenu à découvrir qu'il s'agissait là d'une espèce de cercle comparable à une fortification à la Vauban avec des angles saillants et rentrants.

[My God! It is not surprising that one cannot describe the scintillating scotoma at first glance. I have had it myself on occasion. **The first times I noticed it, I had—or thought I had—in front of my eyes the image of a bouquet of fireworks, the sensation of fireworks.** It was only later, through a more attentive analysis of the phenomenon, that I came to realize it was a kind of circle comparable to a Vauban-style fortification, with projecting and re-entrant angles.] (p. 58)⁸.

In another lecture dated January 10, 1888, Charcot again used the eponym:

Et cette dame me fit en effet une description très exacte sur un petit morceau de papier de la meuse fortification à la Vauban.

[And this lady indeed gave me a very precise description, on a small piece of paper, of the fortification in the style of Vauban] (p. 102)⁷.

The same reference appears in the 1892 printed edition of Charcot's *Lessons* ("La description du scotome scintillant, avec le dessin de fortification à la Vauban était parfaite." *The description of the scintillating scotoma, with the drawing of a Vauban-style fortification, was perfect.* P. 89)⁸.

Notably, the attribution of the Vauban eponym by Charcot was referenced in 1986 by Macdonald Critchley (1900-1997), a prominent British neurologist known for his influential work on aphasia, migraine, and higher cerebral functions. However, Critchley

curiously provides incorrect biographical details about Vauban, stating: “Vauban was responsible for the defence of Paris in the Franco-Prussian War of 1870” [!]¹¹.

Charles Samson Féré’s Use of the Vauban Eponym

The eponym was later reinforced by Charles Samson Féré (1852-1907), who served as Charcot’s assistant from 1881 and became chief physician at the Hospice Bicêtre in 1887, a position he held until his death. Féré collaborated closely with Charcot and made notable contributions to the study of ophthalmic migraine. In his 1881 work *Contribution à l’étude de la migraine ophthalmique*, Féré did not mention Vauban in the context of migraine spectres and fortifications¹². However, this connection is explicitly made in his 1889 article *A Contribution to the Pathology of Night*, published in *Brain*:

*When this pain has persisted from about half-an-hour to an hour the patient begins to perceive scintillations which she localises on the left of both fields of vision. These soon give place to a sort of luminous disc, whose borders are indistinct and seem to vibrate rapidly. This disc, situated towards the left, slowly enlarges and at the same time becomes dark in the centre. In a few minutes the disc has assumed the appearance of a toothed saw hollowed out on the half of its internal circumference, or of a half crown of fortification à la Vauban. This toothed wheel is the same colour as electric light, but from time to time red and blue points appear*¹³.

Hence, Féré’s citation of Vauban appears shortly after Charcot’s references in his 1887-1888 Tuesday Lessons.

In 1892, Féré described a 52-year-old woman, “Madame P...”, suffering from “migraine ophthalmique avec impulsions procursives” (ophthalmic migraine with impulsive tendencies). He wrote:

*Quand cette douleur s’est installée depuis une demi-heure ou une heure, la malade commence à éprouver des scintillations qu’elle localise dans l’œil gauche, mais qui, en réalité, existent dans la moitié gauche des deux champs visuels. Ces scintillations font bientôt place à une sorte de disque lumineux, dont les bords sont indécis et paraissent animés de vibrations rapides. Ce disque, situé vers la gauche, s’élargit peu à peu, en même temps qu’il s’ouvre en dedans et que son centre s’assombrit. Au bout de quelques minutes, le disque a pris l’aspect d’une roue dentée, échancrée sur sa demi-circonférence interne, ou d’une demi-couronne de fortifications à la Vauban. [When the pain has been present for half an hour or an hour, the patient begins to experience scintillations that she localizes in the left eye, but which, in reality, occur in the left half of both visual fields. These scintillations soon give way to a kind of luminous disc, whose edges are indistinct and appear animated by rapid vibrations. This disc, located to the left, gradually expands, while opening inward and darkening at the center. After a few minutes, the disc takes on the appearance of a toothed wheel, notched along its inner semicircle, or of a semi-crown of Vauban-style fortifications]*¹⁴.

The eponym gained further popularity and dissemination when it appeared in the *Grand Dictionnaire Universel du XIXe siècle* by Pierre Larousse (1890). Under the entry for *migraine*, the following description is found:

On a dans l'œil une image lumineuse formée de radiations et de sillons lumineux autour d'un centre obscur et qui ressemble assez à un plan de fortifications à la Vauban.
 [One sees in the eye a luminous image formed of rays and luminous grooves around a dark center, which closely resembles a plan of Vauban-style fortifications]¹⁵.

Of note, this encyclopedic entry is quoted and attributed to Féré himself.

Conclusions

In conclusion, the eponym referring to Vauban clearly originated with a French author, most likely Charcot, and was only later adopted by Gowers and the broader international medical literature.

Actually, there is no evidence that Gowers—or any other contemporary—proposed the analogy prior to Charcot, even in an unpublished work. All circumstantial evidence points to a different conclusion. Although only partially published¹⁶, there is no indication that migraine-related issues were discussed in the correspondence between Charcot and Gowers.

Gowers' description of fortification spectra appears as early as Volume II of the first edition of his *Manual of Diseases of the Nervous System* (1886), where he explicitly references Airy's account (p. 776) and repeatedly uses the term “fortification spectrum” or “fortification spectra” (pp. 155, 780, 788, and 792)¹⁷. However, a specific reference to Vauban is notably absent from all subsequent editions of the manual, including the revised and expanded 1907 edition¹⁸. This reference emerges only in an 1895 article⁵, published after Charcot and his students had popularized the term—at which point Gowers had likely become aware of it, either directly through Charcot's writings or indirectly through the broader dissemination of his ideas.

Correctly attributing the Vauban eponym associated with fortification spectra in migraine to Charcot and his school, rather than to Gowers or other sources, clarifies the historical development of medical terminology and highlights the influence of French neurology in shaping clinical language in 19th--century Neurology¹⁹. Even if Charcot did not coin the term “fortification spectra,” he introduced the specific comparison to Vauban's fortifications, which became widely used in describing visual aura. This attribution reflects a different logic from that of typical medical eponyms. In medicine, eponyms often (although not necessarily always) refer to the first individual to describe a phenomenon^{20,21}. In this case, however, the reference to Vauban does not stem from his being the originator of a particular style of fortification—others had developed similar designs earlier⁶—but from his prominence and lasting influence in the field. The analogy gained traction due to Vauban's fame and recognizability, further amplified by its introduction through Charcot's teaching.

Recognizing this distinction helps reframe the genealogy of migraine terminology and illustrates how clinical language can be shaped by cultural visibility and pedagogical utility, rather than strict historical priority.

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