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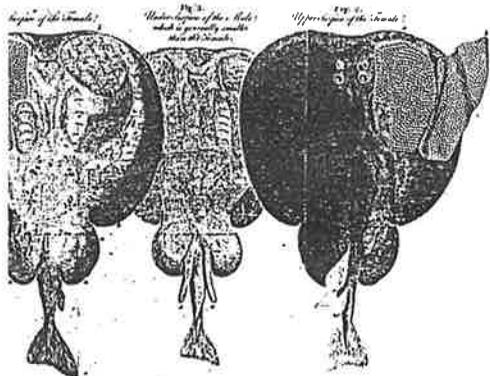
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Jean Jallabert (1712-1768): A Precursor in Electrotherapy

By Dr. Isaac Benguigui.
Translated by Elizabeth Ihrig.

(Part I of a two-part article.)

The first applications of electricity to therapy were entirely empirical, and charlatans quickly seized on the idea. Paradoxically, electrotherapy had been employed several centuries before the term "electricity" was even invented. The idea existed among the Ancients; some peoples of the Mediterranean and of the tropical seas treated certain cases of paralysis and diseases of nervous origin with discharges from the "Torpedo" (torpedo fish), which they considered a therapeutic agent. Hippocrates, Aristotle, and Pliny relate several facts referring to the history of the torpedo, and we find passages in Scribonius Largus, Galen, and Dioscorides showing that the torpedo was employed as a therapeutic agent.



Torpedo. *Philosophical Transactions*, vol. LXIII (1773).

The first instruments used in attempts to obtain therapeutic results with electricity were also those used to generate it, such as simple glass or resin tubes.¹ From that time on, as a consequence of contemporary ideas about electricity and its relation to animal life, some physicists researched the effects that could be produced in the body by an electrical discharge.

Medical Electricity

In the 18th century, the developing body of electrical studies, and in particular the "Leyden Experiment" (1745), suggested the idea of applying electricity in the treatment of certain illnesses.

There were essentially four groups of experiments:

- recent experiments with electricity produced by friction;
- observations of the affinities among light, fire, and electricity;

- proof of electricity in the air;
- the ascertainment that muscles and nerves could be easily excited by electric stimulation.

This last observation was to make Jallabert a precursor in electrotherapy and would mark an important date in the history of medical electricity.

The accepted idea was that the human body was filled with something called "electrical matter." The swiftness and subtlety attributed to this matter gave rise to the hypothesis of the identification of nervous fluid with electric fluid.

Attempts were made at the beginning of the century to explain muscular contraction by means of a strong attraction exercised on the blood that took place in the muscles. From this, some physicists had researched the effects that could be produced by the application of electricity to paralysis.

Jean Jallabert was born in Geneva on July 26, 1712. After theological studies, and under the influence of two great mathematicians, Gabriel Cramer (1704-1752) and Jean Louis Calandrini (1703-1758), he turned to science. The Consul of the Republic created a new chair in 1737 and Jallabert was named honorary professor of mathematics and experimental physics at the Academy of Calvin (The University of Geneva). In 1748 his work, *Experiments on electricity, with some conjectures on the cause of its effects*,² was published. It was well received and contained the "Journal of some experiments made on a paralytic." In the foreword is a passage which demonstrates quite well the modesty and intellectual honesty of its author:

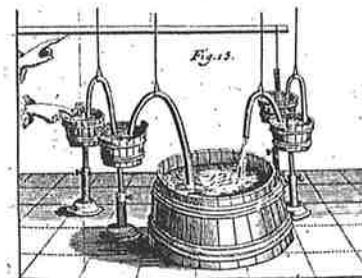
"Even if I am mistaken, my errors could still be useful. I will have noted some stumbling blocks on a road that is full of them. It was the unsuccessful attempts of those who first looked for unknown lands that, perhaps, garnered their followers the glory of having discovered them."³

Besides his research activities, Jallabert carried on an extensive correspondence with several European scholars: the Abbot Nollet, Buffon, Maupertuis, de Haller, D. Bernouilli and others.

Jallabert's Work

In his experiments with siphons, Jallabert established that electrified water formed a jet "the height and amplitude" of which were greater than those of non-electrified water; this applied for small openings (less than one mm in diameter). He then made an analogy between the effects of electricity on the blood that spurts in the vein and those of an electrified jet of water. Jallabert asked himself if the electric matter, mixing with the blood, doesn't penetrate the nerves, there to unite with the nervous fluid and increase its speed. Would it not be the action of the electric matter on the nervous fluid that

makes it flow more rapidly and abundantly through the motor nerves of the heart, an action to which must be attributed the more frequent contractions of this muscle? To explain the convulsive movements caused by the electric fluid, he specified that the expansion and contraction of muscles are produced by the flow of a "very subtle" fluid in the nerve fibrils. The electric matter leaving an electrified body carries away with it a certain amount of nervous fluid, dilates that body's vesicular membranes, and thus brings about its shrinking.



From the 1748 edition of Jallabert's book.

Starting out from these observations, Jallabert arrived at the application of electricity to paralysis, which was the goal of his research. He considered that paralysis was often produced by the interruption of the flow of the nervous fluid and that the violent jerks excited all of a sudden by [electrical] commotion could, in certain cases, dissipate the obstacles impeding the flow of the fluid and restore to the nerves their freedom of movement. Jallabert gave examples of persons whom a sudden fear or an excess of rage had cured of paralysis, and wondered if commotion "discreetly employed" would not be preferable to the strong vomitives some doctors advised giving. The effects of commotion, such as heat, shuddering, and tingling were, for him, proof of its effectiveness.

Physiological Effects Observed by Jallabert

The effects of electricity most noticed by Jallabert were:

- the acceleration of the pulse: between 90 and 96 beats per minute for an electrified person, while rarely passing 80 for non-electrified subjects.⁴
- the increasing amplitude of a jet in a blood-letting experiment (an experiment made in Strasbourg by Boecière, a professor of medicine).⁵
- another effect of electricity was the increase in body heat. A Fahrenheit thermometer on the chest or under the armpit, unable to rise beyond 92 degrees F. (34 degrees C.), climbed to 97 degrees F. (36 degrees C.) after a patient was strongly electrified.
- But the most important and substantial effect, the one that had given some therapeutic results, was that electricity excited a convulsive movement in the muscles. Jallabert put this

last observation to the test in an attempt to see what effect electricity would produce on a paralytic.

Let us first note that Jallabert conducted some experiments on patients well before the publication of his book, as shown by a letter to him from François Boissier de Sauvages, professor at Montpellier, dated August 15, 1746, which reads, "Thanks to your instructions, electricity has become fashionable in this city; everyone is getting electrified here."⁶

We should specify that some of the effects observed by Jallabert had also been mentioned by other electrical investigators of that period. Jallabert's assertion concerning the acceleration of the pulse had been strongly contested by Nollet and the surgeon Morand in their memoir presented at the Academy of Sciences in Paris in 1749: "It may be that electricity produced this effect on common folks chosen at random for this undertaking, who would have been frightened by the instruments and the phenomena of electricity; but if physicists were subjected to this experiment, we are convinced that electricity would not alter their pulse in any way . . ." while others like de Sauvages, Mauduyt, and Sigaud de La Fond all confirmed Jallabert's experiments and observed the acceleration of the pulse under the influence of electrification. This was equally the case in the use of electricity as a means of accelerating the menses; this effect was admitted into the therapy of the 18th century (Van Swieten, Mauduyt, Sigaud de la Fond).



Allegorical frontispiece from the Abbé Sans *Cure of paralysis by electricity*, Paris, 1772.

But the remarkable observation of Jallabert was of muscular contraction caused by electricity: "An effect of electricity that it is useful to notice are the various convulsive movements in those muscles from which one draws sparks. I have often observed them in the muscles of the carpus and fingers of a paralyzed arm, and after I had drawn sparks from the extensor and flexor muscles, these parts, although deprived of movement and feeling for a long time, would move at my will, in a very marked manner."⁷ This brings us to an examination of his famous paralytic patient, who marks a date in the history of electrotherapy.

continued on page 4

NOTES

1. *Intonacatures*, glass tubes lined internally with a medicated layer containing some drug appropriate to the patient's condition, which the electrified person would hold in his hand.
2. Jallabert, Jean, *Expériences sur l'électricité avec quelques conjectures sur la cause de ses effets*, Geneva, Barrillot & Son, 1748; another edition was published in Paris in 1749. Two German editions followed in 1750 and 1771 in Basel.
3. Jallabert, *loc. cit.*, 1748 ed., p. X.
4. I think Jallabert was influenced by an experiment he had made with a vase of electrified water that emptied in a time shorter by one-sixth. This report would later be taken up and confirmed by other electric researchers, such as Sigaud de La Fond, *Précis historique et expérimental des phénomènes électriques*, Paris, 1781.
5. Arduoin, Leon, *Coup d'oeil sur l'histoire de l'électrothérapie* (Doctoral thesis in medicine), Paris, 1878, p. 22. (I thank the National Library of Medicine for having sent the microfilm.)
6. Ms. Jallabert, 82, fol. 44r. Bibliothèque Publique et Universitaire, Geneva. (17 letters from François Boissier de Sauvages to Jallabert, correspondence 1743-1750.) A professor at Montpellier, de Sauvages treated rheumatism, sciatica, and even gout with electricity. For his experiments, cf. Dr. Louis Dulier, "François Boissier de Sauvages 1716-1767", in: *Revue d'histoire des sciences et de leurs applications*, Paris, 1969-1970, v. XXII, p. 303-322.
7. Morand and Nollet, "Expériences sur l'électricité appliquée à des paralytiques," in: *Mémoires de l'Académie Royale des Sciences*, Paris, 1749, p. 56. (Mémoire read by Nollet.) Nollet had already attempted some experiments on paralytics in April 1746, with the collaboration of the two surgeons, Morand and de La Sone. The experiments, conducted at the Hôtel Royal des Invalides, met with no success. Cf. Nollet, Jean Antoine (the Abbot Nollet), *Recherches sur les causes particulières des phénomènes électriques et sur les effets nuisibles ou avantageux qu'on peut attendre*, Paris, 1753, p. 404-405.
8. Jallabert, *loc. cit.*, Paris, 1749, p. 79.

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Events Calendar

Sunday, February 21 at 4 p.m.
The Bakken Chamber Players.
Works by: Beethoven, Arensky and a guitar solo work.
\$8 at the door.

Saturday, March 19 at 8 p.m.
The Tivoli Trio.
Works by: Haydn, Brahms and Rebecca Clarke.
Tickets at door \$10 and \$7 for students and seniors.

Sunday, March 20 at 3 p.m.
Saxophone quartet.
Program not available at this time. For information please call 869-6561.

Sunday, April 17 at 4 p.m.
The Bakken Chamber Players
Works by: Moszkowski, Jeffrey Van and Brahms.
Tickets at door \$8.

Sunday, May 1 at 4 p.m.
Symphony Chamber Players
Works by: Mozart and Mendelssohn.
Tickets at door \$8.

Sunday, May 15 at 4 p.m.
Duo works for piano and violin. Lucinda Marvin violin.

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The Bakken is a center of learning that collects books, instruments, and archival materials both to foster understanding of the history and applications of electromagnetism in the life sciences and to benefit contemporary society.

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