

Neurophysiology in between the interests of Dom Pedro II of Brazil, and Charles Brown-Séquard

Neurofisiologia entre os interesses de Dom Pedro II do Brasil e Charles Brown-Séquard

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ABSTRACT

This article presents our historical research regarding Charles Brown-Séquard, a famous scientist with important contributions to the medical field, in particular for neurology, and endocrinology, and his relationship with Dom Pedro II, the second and last Brazilian Emperor, and an enlightened ruler. The Emperor contacted several illustrious personages in support of State policy, such as for the development of experimental physiology at the Imperial Museum of Natural History, but also for personal purposes given his health problems and those of the Empress.

Charles Brown-Séquard and his pilgrimage between different worlds as a physician and physiologist are presented until his definitive establishment in Paris, where he replaces Claude Bernard in the chair of experimental medicine at the Collège de France. Jacques-Arsene d'Arsonval took over after this chair, and together with Brown-Séquard, he electrophysiologically examined the Emperor's diabetic peripheral neuropathy.

In this article, the Emperor's relationship with Brown-Séquard was studied mainly from the correspondence sent to Dom Pedro II and retrieved from the Imperial Museum in Petrópolis, Brazil, and from the accounts of his meetings that included scientific sessions and clinical consultations. This article can be used to understand the progress of knowledge in the field of neurology/clinical neurophysiology, the tracking of emerging ideas in the field of science in the past and the threat to the credibility of researchers.

Keywords: History of medicine, neurophysiology and electrophysiology

RESUMO

Este artigo apresenta nossa pesquisa histórica a respeito de Charles Brown-Séquard, famoso cientista com importantes contribuições para a área médica, em especial para a neurologia e endocrinologia, e sua relação com Dom Pedro II, segundo e último Imperador brasileiro, e governante esclarecido. O Imperador contactou várias personalidades ilustres no apoio à política de Estado, como para o desenvolvimento da fisiologia experimental no Museu Imperial de História Natural, mas também para fins pessoais dados os seus problemas de saúde e os da Imperatriz.

Charles Brown-Séquard e sua peregrinação entre diferentes mundos como médico e fisiologista são apresentados até seu estabelecimento definitivo em Paris, onde substitui Claude Bernard na cadeira de medicina experimental no Collège de France. Jacques-Arsene d'Arsonval assumiu após esta cadeira e, juntamente com Brown-Séquard, examinou eletrofisiologicamente a neuropatia periférica diabética do imperador.

Neste artigo, a relação do Imperador com Brown-Séquard foi estudada principalmente a partir da correspondência enviada a Dom Pedro II e recuperada no Museu Imperial de Petrópolis, Brasil, e dos relatos de seus encontros que incluíam sessões científicas e consultas clínicas. Este artigo pode ser usado para entender o progresso do conhecimento no campo da neurologia/neurofisiologia clínica, o rastreamento de ideias emergentes no campo da ciência no passado e a ameaça à credibilidade dos pesquisadores.

Palavras-chave: História da medicina, neurofisiologia e eletrofisiologia

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INTRODUCTION

Pedro de Alcântara de Bragança e Bourbon e Habsburgo was the second and last Brazilian Emperor, a highly cultured man, versed in Natural Sciences and literature, who enjoyed the company of intellectuals, some of them, such as Charles Brown-Séquard, also his family or personal physician. Still, he was also involved in important scientific policy for the Brazilian Empire. These issues are mainly raised based on Brown-Séquard's letters sent to the Emperor, besides the Emperor's diaries regarding the meetings with Brown-Séquard. In this paper, we aim to demonstrate the importance of the relationship between these two historical figures, remarking on some of the themes and interests they shared.

Dom Pedro II Personal and Family Health, and Interests in Researches

Dom Pedro II was the seventh child of Dom Pedro I (1798-1834) and Dona Leopoldina (1797-1826), and became the second Emperor of Brazil at the age of 5 after the abdication and exile of his father. He did not assume the throne until he was 14 years old¹ and the country was ruled by Regents until that.

As a child and adult, he had numerous health problems, such as seizures, diabetes, excessive daytime sleepiness and peripheral neuropathy¹⁻⁶. His poor health condition led him to search for the opinion of the most reputed doctors of the time such as Jean-Martin Charcot, with whom he consulted in Paris for his profound fatigue, asthenia and malaise, a condition that accompanied him through his life⁷.

Pedro de Alcântara, as the future emperor, received a rigid and vast education as a child being versed in literature, arts, dance and linguistics¹. This intimacy with studies in several areas led him to the growing field of the Natural Sciences and he gets in touch with several scientists of his time, such as Charles-Édouard Brown-Séquard (1817-1894), Louis Pasteur (1822-1895), Jean-Martin Charcot (1825-1893) and Edmé Felix Alfred Vulpian (1826-1887) and a correspondent and partner of several international scientific institutions⁸. Besides, he was a member of the Paris Academy of Sciences from 1875 to 1891⁹.

From the age of 29, Pedro II instituted true patronage in Brazil, in the branches of literary, artistic, and scientific activity. In this way, he promoted a culture that would hardly reach the country through competent channels⁸. In 1880, under the support of Pedro II, a laboratory of Experimental Physiology was founded in the National Museum and it was headed by Louis Couty, a student of Claude Bernard and Alfred Vulpian, and João de Lacerda¹⁰. Also, he hired artistic and scientific personalities to work in Brazil and sent Brazilians abroad for higher education, sometimes at his own expense⁹, and always kept himself informed about the discoveries of his time,

including the work of Alexander Graham Bell (1847-1922) and Charles Darwin (1809- 1882)¹¹.

In the Emperor's Diary, where there were his reports about his travels in Brazil and abroad, science is always present: visits to scientific and educational institutions, as well as contact with scientists^{5, 7, 12, 13}. In correspondence with Brazilian and foreign scientists, it is shown interest in which the scientists made the Emperor aware of the progress of their work, projects, and successes¹⁴.

Dom Pedro II was married to Dona Teresa Cristina of the house of Bourbon-Two Sicilies (Figure 1) who was the Empress consort married by proxy to Pedro II in 1843. The Empress, along with the remaining members of the Imperial Family, was sent into exile from her beloved adopted land, after a *coup d'état* in 1889. Because of her sickness, she needed several appointments with outstanding physicians including Brown-Séquard, besides her grieving, she died a little more than a month after the monarchy's collapse¹⁵.



Figures 1. Members of the Brazilian Imperial Family and their relationship with world prominent characters, many of them, their doctors. A) Brazilian Emperor, Pedro de Alcântara de Bragança, Bourbon and Habsburg (* Rio de Janeiro, December 2nd of 1825- † Paris, December 5, 1891- age 66 yrs) painting by Delfim da Câmara (1834-1916), 1875, Collection National Historical Museum, Brazil, Public domain. B) Brazilian Empress Teresa Cristina Bourbon delle Due Sicilie (*Naples, March 14, 1822 - † Oporto, December 28, 1889, age 67 yrs), c.1876, PHOTO by Joaquim José Insley Pacheco (1830-1912), from Lago, Bia Corrêa do; Correea do Lago, Pedro. Princess Isabel Collection: Photographs from the 19th century. Rio de Janeiro: Capybara, 2008, Public domain.

Charles-Édouard Brown-Séquard

Brown-Séquard had an extraordinary personal and professional life, maybe because of his birth origins and peculiar behavior supposedly consequence of a bipolar disorder^{15,20}.

Charles-Édouard Brown-Séquard is in the middle of the lineage of great physiologists of the College de France (Figure 2), and he is famous for describing the syndrome of hemisection of the spinal cord that carries his name and his prolific contribution to medicine and pioneer at neuroscience. Regardless, his life is full of adventures, from his childhood on an island in the Indian Ocean, his desire to be a poet as a teenager and his devotion to science that made him cross the Atlantic 60 times in his life and had famous patients as Dom Pedro II²⁰.



Figures 2. The lineage of physiologists from the Collège de France with great names including Charles Brown-Séquard and Jacques-Arsène d'Arsonval. François Magendie (1783-1855), a pioneer of experimental physiology, was appointed professor of medicine at the Collège de France. Claude Bernard (1813-1878), the founder of modern physiology, pharmacology and experimental medicine, was Magendie's assistant, and later hold this chair. Charles-Édouard Brown-Séquard (*April 8, 1817, Port Louis, Mauritius - † April 1, 1894, Paris, France, age 76 yrs) succeeded Claude Bernard as the Chair of Experimental Medicine at the College de France (Photo: Retrieved from Cinquantenaire de la Société de biologie. Volume jubilaire publié par la Société, Paris: Masson et CV éditeurs, libraires del'Académie de Médecine, 1889). Jacques-Arsène d'Arsonval (1851-1940) was a French physician, physicist and important inventor/researcher of electrophysiology and the effects of electricity on biological organisms. He became Bernard's assistant, later deputy to Brown-Séquard. In 1887 he was appointed substitute professor at the Collège de France and later Brown-Séquard successor²⁷ (Jacques-Arsène d'Arsonval, unknown date, by Henri Manuel). Public domain.

Charles-Édouard was born in 1817 at Port Louis, Mauritius Island, to an American father and a French mother. When she was pregnant, her husband, who was a merchant sea captain, died on a voyage to India, which forced her to work as an embroiderer to maintain the family¹⁷. After finishing school and working to save money, at the age of 20, he and his mother decided to go to Paris, searching for a better future^{18,19,20}.

In his late years in Mauritius Islands, the young Charles gets in touch with a circle of writers that influenced him to write poems and plays, and his childhood dream of becoming a doctor seems to vanish¹⁸. Once in Paris, Brown-Séquard showed his work to literary academics receiving some negative criticism that reoriented him to medicine. He devoted himself to this new craft with enormous efforts, spending 18 hours a day studying and working in the laboratories, a habit that he maintained for the rest of his life^{18,20}.

In 1846, he graduated from Paris with a degree in medicine and became a pioneering physiologist, neurologist and endocrinologist^{7,19}. He was one of the first to study spinal cord physiology, and his doctoral thesis from that year was entitled "*Researches and Experiments on the Physiology of the Spinal Cord.*"^{18,19}:

Moreover, Brown-Séquard had independently performed studies establishing the relationship between the blood vessels and the sympathetic nervous system²⁰⁻²². In August 1852, reporting his findings to the Medical Examiner of Philadelphia, he concluded that the cervical sympathetic sends motor nerve fibres to many of the cranial blood vessels, that its section causes dilatation of these blood vessels, and that stimulation of the rostral portion of the sectioned nerve causes vasoconstriction. He thus concluded that sympathetic nerves can control the calibre of the blood vessels. Described as "The Father of Experimental Endocrinology", by some authors, Brown-Séquard made many contributions to our knowledge about adrenal glands and became famous due to his experiments, one of them in which he had injected himself subcutaneously with testicular extracts derived from dogs and guinea pigs in an attempt to counter the effects of ageing¹⁸⁻²¹.

In 1852, Brown-Séquard went to the United States searching for new opportunities, where he was appointed to the faculty of Virginia Medical School. However, in 1859, he migrated to London, becoming a doctor at the National Hospital for the Paralyzed and Epileptic. Coming back to America, Brown-Séquard taught at Harvard University from 1864 to 1868. In 1869, he became a professor at the École de Médecine in Paris, but in 1873 he returned to the United States and began practicing medicine in New York¹⁸.

His academic pilgrimage and scientific pioneering attracted international fame to him, bringing patients and interest in his research from all over the world. Dom Pedro II was one of them fitting into the two categories mentioned above as we are going to see later⁷.

In 1878, at the end of his career, he returned to Paris to succeed Claude Bernard as a professor of experimental medicine at the Collège de France and remained there until his death occurred in 1894¹⁸.

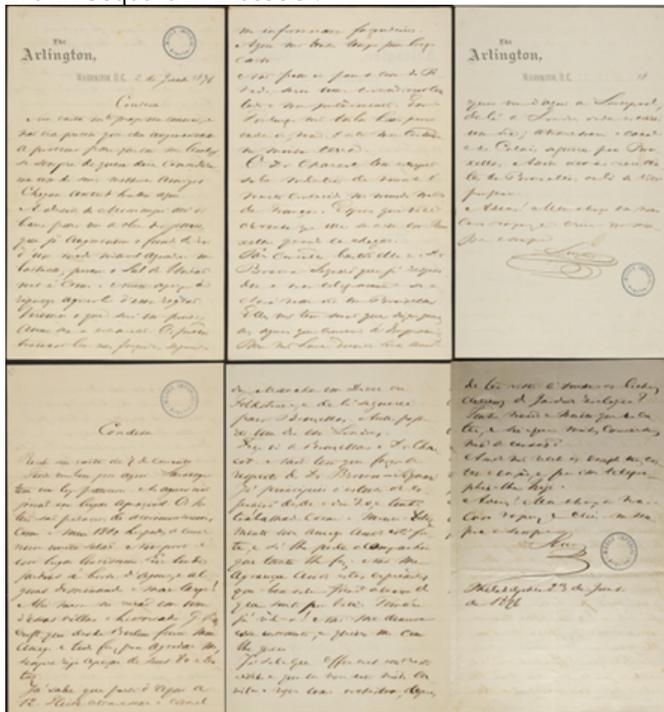
Brown-Séquard and Dom Pedro II Meetings and Correspondences

Dom Pedro II met with Brown-Séquard the three times he went to Europe as Emperor of Brazil, besides they exchanged letters in the meantime and during Pedro II's exile and, curiously, it is known that the Brown-Séquard's photograph most commonly reproduced was especially taken in 1882, to be sent as a gift to Pedro II, in exchange for his own¹⁷. However, we did not retrieve it in the Museu Imperial, despite our insistence to obtain a copy of the original photo. Regarding these meetings, they were described in Dom Pedro II diaries and transcribed by Bediaga B. et. al 1999¹².

The first occurred during Dom Pedro II's trip to Paris (1871-1872). Motivated by his interest, Dom Pedro II spent a couple of months in Paris when he visited Pasteur at his laboratory at the Ecole Normale Supérieure¹³ as well as going to see Brown-Séquard in his laboratory at the Medical

School, where the meeting took place on July 25th.

On February 23 of 1876, Dom Pedro II wrote to the Countess of Barral (Figure 3) saying that the empress Teresa Cristina had two days of painful suffering, which instantly disappeared, from neuralgia in the neck and scalp. This neuralgia could supposedly be occipital neuralgia and cervicogenic headache, a painful condition affecting the posterior head with paroxysmal, lancinating, or stabbing pain lasting from seconds to minutes^{24,25}. After this episode, in a new letter of June 02 of 1876, Dom Pedro II again wrote to the Countess of Barral, now saying about his current travel to the United States, and meeting with Dr Brown-Séquard in Brussels¹.



Figures 3. Letters are written by Dom Pedro II to the Countess of Barral, on June 2 and June 23, 1876, from Washington and Philadelphia, including notes on arrangements for consultation with the eminent physicians Jean-Martin Charcot and Charles Brown-Séquard. Source: Arquivo da Casa Imperial do Brasil, Coleção Barral Montferrat, doc 118-I-DBM-02.06.1876 PII.B.

The Empress's pre-scheduled consultation with Brown-Séquard certified by letters sent from Paris and Brighton (Figure 4), took place in Brussels.

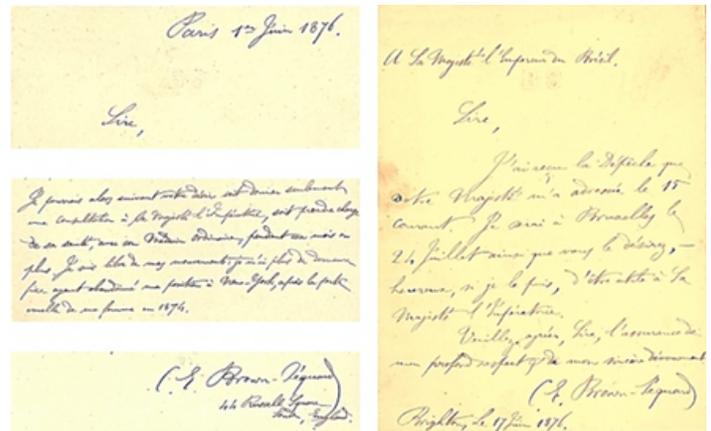
Paris, June 1st, 1876

"Sire I could then, according to your desire, give only one consultation to Her Majesty. The Empress must take charge of her health, with her ordinary physician, for a month or more. I am free of my movements: I no longer have a fixed abode having abandoned my position in New York, after the cruel loss of my wife in 1874[...]."

Charles Brown-Séquard, 44 Russell Square, London, England.

"Sire, I have received the dispatch that Your Majesty addressed to me from the 15 currents. I will be in Brussels on July 24 as you wish, happy, if I can, to be useful to Her Majesty the Empress. Please accept, Sire, the assurance of my profound respect and sincere devotion."

Charles Brown-Séquard, Brighton, June 17, 1876.



Figures 4. Letters by Charles Brown-Séquard were sent from England to Dom Pedro II in 1876 talking about his availability to examine the Empress. Source: Arquivo da Casa Imperial do Brasil, Maço 175 - Doc. 7989, and Maço 175 - Doc. 7997.

The last meetings of the still Emperor with Brown-Séquard took place during Dom Pedro's third trip to Europe, in 1887, which made their ties even stronger. Pedro II even attended a session of the Société de Biologie at the invitation of Brown-Séquard, then president of this Society. On this occasion, the Emperor was acclaimed as a member of it¹². On the morning of July 22¹² or 25¹⁹, Dom Pedro II was examined by Brown-Séquard. Also, on October 24 of this same year, he attended the session of the Société de Biologie as a guest of Brown-Séquard, and on October 25, the emperor underwent a neurophysiological study of the legs by Brown-Séquard with the help of Arsène d'Arsonval (1851-1940), who was Claude Bernard's *preparateur* and would later become famous for the biological and technological applications of electricity.

Beyond the in-person meeting, the relationship between Brown-Séquard and Dom Pedro II is highlighted by letters and comments between each other. A possible explanation was the political participation of Dom Pedro II in the development and strengthening of the experimental physiology laboratory at the Imperial Museum of Natural History, finally achieved by the work developed by Louis Couty (1854-1884), Vulpian's pupil, and João Baptista Lacerda. (1846-1915) - laboratory founded in 1880²⁶. This connection with Brazilian physiology also took place through the publication of the related products in the Archives de Physiologie Normale et Pathologique, directed by Brown-Séquard, in addition to Charcot and Vulpian.

Thus, Dom Pedro's relationship with Brown-Séquard may go beyond personal clinical neurological interests, even becoming of national political interest., as e. g., between 1887 and 1888, the emperor showed continued interest in the distinguished researcher's work, as he commented on his diary about the results of about two of his articles¹².

In 1890, during Dom Pedro II's exile, he mentioned in his diary an article written in the newspaper about Brown-Séquard, arguing in his favor, which shows

their good relationship. The article correlates with the polemic tests performed by Brown-Séquard on the effects of administering aqueous extracts of animal testicles, the so-called Brown-Séquard's elixir.¹²

Finally, Dom Pedro II's last quote about Brown-Séquard refers to sending, in October 1890, Motta Maia, his physician, to examine a friend who at the time had pneumonia¹².

DISCUSSION

Dom Pedro II was an enthusiast of the arts and sciences, which is evidenced by his relationship with prominent foreign personalities, and his encouragement for the growth of their research, which could also benefit Brazilian experimental physiology in the process of implantation and development. Besides, Dom Pedro II suffered from some neurological disorders, which increased his interest in physicians and neurology researchers of his time. Here, we better reveal Dom Pedro II's relationship with the great neurologist and physiologist Brown-Séquard and also with Jacques-Arsène d'Arsonval at the beginning of his career, with comments concerning their meetings and correspondence.

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