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Book review

Benjamin Franklin and his Natural Philosophy

Moura, Breno Arsioli. *A Filosofia Natural de Benjamin Franklin: Traduções de Cartas e Ensaios sobre a Eletricidade e a Luz*. [The Natural Philosophy of Benjamin Franklin: Translations of Letters and Essays on Electricity and Light] São Paulo: Editora Universidade Federal do ABC, 2019. 160 p. ISBN: 978-85-68576-90-8. R$ 36,00

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As Moura argues in his book, Benjamin Franklin scholarship until the mid-1940s had not been dedicated to studying his scientific achievements beyond the myth of his famous kite experiment. I. Bernard Cohen (1914-2003), the first scholar to receive a Ph.D. in history of science in the United States, changed the state of Franklin scholarship when he made his debut as an author with *Benjamin Franklin's Experiments* (1941), the first scholarly annotated edition of Franklin's writings on electricity. Cohen would later publish other important works on Franklin's research in natural philosophy, such as *Franklin and Newton: An Inquiry into Speculative Newtonian Science and Franklin's Work in Electricity as an Example Thereof* (1956) and *Benjamin Franklin's Science* (1990). The establishment of "The Papers of Benjamin

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[2] https://sites.google.com/site/pehfcm/home.

Franklin" by The American Philosophical Society and Yale University beginning in 1954 and the organization of the "Benjamin Franklin Papers" at the Library of Congress in the early-1970s were also of instrumental importance.[3] Moreover, what might be of interest to those unfamiliar with Brazilian work in the history of science is Moura's review of the works done in Brazil on Benjamin Franklin's science, such as SILVA, C. C.; PIMENTEL, A. C. (2008), SILVA, C. C.; HEERING, P. (2008), PYENSON, L. (1998), MOURA, B. A. (2016), and MOURA, B. A.; BONFIM, T. (2017).

The product of four years of investigative and translation work in both Brazil and the USA, Moura's book consists of two introductory chapters on Franklin's scientific research on light and electricity followed by the annotated translation of six letters and one essay by Franklin outlined in the table below.

Primary Source	Year	Publication	Number
Franklin's letter to Peter Collinson	1747	*Experiments and Observations*, 4th edition, 1769	LETTER 1
Franklin's letter to Peter Collinson	1747	*Experiments and Observations*, 4th edition, 1769	LETTER 2
Franklin's letter to John Mitchel	1749	*Experiments and Observations*, 4th edition, 1769	LETTER 3
Franklin's letter to Peter Collinson	1750	*Experiments and Observations*, 4th edition, 1769	LETTER 4
Franklin's letter to Cadwallader Colden	1752	*Experiments and Observations*, 4th edition, 1769	LETTER 5
Franklin's letter to Peter Collinson	1752	*Experiments and Observations*, 4th edition, 1769, also published in *Philosophical Transactions*, v.47, p.565-567, 1751-1752	LETTER 6
Franklin's essay "A new and curious theory of light and heat"	1788	*Transactions of the American Philosophical Society*, 1793	ESSAY

"A New and Curious Theory of Light and Heat" is an essay which was read by Franklin at a meeting of the American Philosophical Society in 1788 and published posthumously in 1793 in the *Transactions of the American Philosophical Society*. As for the letters, they were written between the 1740s-50s and first published in 1751 in a book titled *Experiments and Observations on Electricity, Made at Philadelphia in America*. For his work, Moura used the 1769 fourth edition.[4]

Chapters 1 and 2 are dedicated to detailing the historical situation of the science of electricity and optics, respectively, as found by Franklin when he first became interested in and involved with natural philosophy in the early-1740s. In these introductory chapters, Moura outlines some of the key figures and developments leading up to Franklin's work. Francis Hauksbee (1660-1713), developer of the first machines to generate electrical phenomena, and Stephen Gray (1666-1736), known as the discoverer of "electrical induction," were some of the most well-known scientists working on electricity in the UK at the time and were both members of the Royal Society. Meanwhile, Charles Du Fay (1698-

[3]https://franklinpapers.org
https://www.loc.gov/collections/benjamin-franklin-papers/about-this-collection/.

[4] Both primary sources used by Moura, namely, the *Transactions of the American Philosophical Society* (1793) and the 1764 fourth edition of *Experiments and Observations* can be found in the Internet Archive, https://archive.org.

1739), discoverer of the existence of two types of electricity, which he named "vitreous" and "resinous", and his disciple, Jean-Antoine Nollet (1700-1770), who supposedly invented the "electroscope", were some of the most known scientists working on electricity in France with Nollet becoming the fiercest European opponent of Franklin's electrical research. Willem Jacob's Gravesande (1688-1742), a Dutch mathematician, and Ewald Georg von Kleist (1700-1748), a German jurist and Lutheran cleric, independently invented the so-called "Leyden jar". As Franklin became interested in electrical research, he became familiar with these earliest works by all these authors.

Franklin fomented in 1727 the formation of a club called the "Junto", a group of scholars pondering matters literacy, civic, and scientific, whose members organized the "Library Company of Philadelphia" in 1731. Although Franklin's interest in science preceded his involvement in establishing these organizations, it was largely through them that Franklin began his scientific research and network with scientists in Europe. In 1732 Franklin's "Library Company" received a copy of *Mathematical Elements of Natural Philosophy, Confirmed by Experiments; or, an Introduction to Newtonian Philosophy* (1720) by Willem Jacob's Gravesande, which had been translated into English by John Theophilus Desaguliers (1683-1744), a British scientist, lecturer and promoter of Newtonian philosophy who replaced Francis Hauksbee as a demonstrator at the Royal Society's weekly meetings. Franklin also read John Theophilus Desaguliers' two-volume *A Course of Experimental Philosophy* (1734-1744) around 1744.

Franklin met Archibald Spencer (1698-1760) in Philadelphia as early as 1746. A scientist, lecturer, and science popularizer, Spencer exposed Franklin to some rudimentary electrical experiments. However, it was only when in the same year Peter Collinson (1694-1768), a British agent for the Library Company and member of the Royal Society, sent to the Company a glass tube together with a short description of experiments that Franklin was set on the course of his electrical research. Henry Pemberton (1694-1771) was also an important figure for Franklin's involvement with research in natural science. Having first met him in London around 1725, Pemberton sent a copy of his work, *A View of Sir I. Newton's Philosophy* (1728), to the Library Company. Collinson and William Watson (1715-1784), an English physician and scientist, promoted Franklin's works in the UK, while Georges-Louis Leclerc (1707-1788), being opposed to Jean-Antoine Nollet's science, did so in France, as Franklin's work conflicted with Nollet's interpretation of electrical phenomena.

Finally, it is interesting and important to note that although most of these earliest influences on Franklin's research in natural science were Newtonians, his understanding of the nature of light conflicted with theirs based on Newton's *Opticks* (1704), a work Franklin most probably read. Franklin was then a bit of an outlier when it came to embracing the most respected and accepted interpretation of the nature of light circa 1740, which was based on Newton's *Opticks*, deciding instead to side with other dissenting views such as those of Leonhard Euler (1707-1783) and Claude-Nicolas Le Cat (1700-1768). Franklin articulated his vibrational, as opposed to corpuscular, view of the nature of light in his 1752 letter to natural scientist Cadwallader Colden (1688-1776), arguments analyzed by Moura in his translation of this letter (LETTER 5).

Moura begins Chapter 3 by clarifying the vocabulary used by Franklin, which can be confusing if not taken into account the context of the period, namely, i) the difference between "Electrick" and "Non-Electrick", ii) words such as "electric virtue", "electric effluvium", "electrical fluid", "electrical matter", and "electrical fire", and iii) the difference between the verbs "electrise" and "electrify" in Franklin's texts. Moura's comments are very detailed and helpful in understanding the path followed by Franklin to develop his ideas about electricity and light. As Moura shows us by diving into the first three letters (LETTERS 1, 2, and 3), Franklin discovered what today would be called positive and negative charge, what Du Fray called "vitreous" and "resinous", the principle of conservation of electric charge, and the fact that items that were sharply pointed could more efficiently attract and

conduct electricity than blunter objects. Furthermore, Franklin conjectured that lightning was electrical in nature and outlined an explanation of the phenomenon.

It is in his 1750 letter to Collinson (LETTER 4) that Benjamin Franklin describes his lighting rod (conductor) and his final version of his theory of electricity. It is only in his 1752 letter to Collinson (LETTER 6) that Franklin delineates his famous kite experiment. Finally, in his 1788 essay, Franklin returns to his corpuscular theory of light, as already seen in LETTER 5, and speculates more about the nature of light and matter alike.

Moura accomplishes in his book a very short but detailed investigation and introduction to Benjamin Franklin's research on electricity and light as well as a good description of his scientific trajectory – a highly recommended book for those interested in better understanding Benjamin Franklin's scientific achievements in these fields.

References

Assis, A. K. T. 2010. *Os fundamentos experimentais e históricos da eletricidade*. Montreal: Apeiron.

Cohen, I. B. (ed.). 1941. *Benjamin Franklin's Experiments: a new edition of Franklin's Experiments and Observations on Electricity*. Cambridge MA: Harvard University Press.

Cohen, I. B. (ed.). 1990. *Benjamin Franklin's Science*. Cambridge, MA: Harvard University Press.

Cohen, I. B. (ed.). 1956. *Franklin and Newton: an inquiry into speculative Newtonian experimental science and Franklin's work in electricity*. Philadelphia: The American Philosophical Society.

Franklin, B. 1751-1752. "A letter of Benjamin Franklin, Esq; to Mr. Peter Collinson, F. R. S. concerning an electrical kite". In: *Philosophical Transactions*, v. 47, p. 565-567.

Franklin, B. 1793. "A new and curious theory of light and heat". In: *Transactions of the American Philosophical Society*, v. 3, p. 5-7.

Franklin, B. 1769. *Experiments and observations on electricity, made at Philadelphia in America*. London: David Henry.

Moura, B. A. 2016. "Teorias vibracionais da luz na Grã-Bretanha do século XVIII", In: *Scientiae Studia*, v. 14, n. 2, p. 333-356.

Moura, B. A.; BONFIM, T. 2017. "Benjamin Franklin e a formação dos temporais com raios e trovões: tradução comentada de uma carta a John Mitchel. In: *Caderno Brasileiro de Ensino de Física*, v. 34, n. 2, p. 460-478.

Moura, B. A.; Silva, C. C. 2008. "A teoria dos estados da luz: considerações sobre alguns papéis das hipóteses na óptica newtoniana". In: Martins, R. A.; Silva, C. C.; Ferreira, J. M. H.; Martins, L. A-C. P. (eds.) Filosofia e história da ciência no cone sul: seleção dos trabalhos do 5° Encontro. Campinas: Associação de Filosofia e História da Ciência do Cone Sul, p. 91-99.

Pyenson, L. 1998. "Ética e ideologia na ciência de Nollet e Franklin". In: *História, Ciências, Saúde Manguinhos*, v. 1, p. 7-33.

Silva, C. C.; Heering, P. 2018. "Re-examining the early history of the Leiden jar: stabilization and variation in transforming a phenomenon into a fact". In: *History of Science*, v. 56, n. 3, p. 314-342.

Silva, C. C.; Pimentel, A. C. 2008. "Uma análise da história da eletricidade presente em livros didáticos: o caso de Benjamin Franklin". In: *Caderno Brasileiro de Ensino de Física*, v. 25, n. 1, p. 141-159.