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Franklinists in Naples in the 18th Century

1. Introduction

Around 1770 some works on electricity were published in Naples: two works, writings by Giuseppe Saverio Poli[1] and one of the scientist Gian Gaetano del Muscio's[2] in which he responds to doubtful successes against Franklin's theory of electricity as published by G.S. Poli.

In spite of the fact that both authors claimed to be orthodox Franklinists, they gave conflicting interpretations to a series of phenomena regarding the nature of electric conductors.

It is well known that the 1770's were a crucial period for the study of electricity, since they marked the transition from a mostly experimental activity to a greater mathematization of this discipline.[3] So, it is extremely interesting to understand, in Italy and in particular in Naples, what the debate was around the problems that mostly concerned the physicists of that time. One of these problems was the interpretation of some anomalies of electrified glass.[4]

The purpose of this paper is to highlight and discuss the state of studies on electricity in Naples in the second half of the 18th century, pausing in particular on the analysis of Poli's and del Muscio's detailed works where they examined the very general problems regarding the theories on electric conductors and where they attempt to explain everything by applying the atmospheric theories of Franklin, even the behaviour anomalies exhibited during experiments with the Leyden jar.

The topics that will be discussed are as follows.

A short commentary on the state of scientific equipment and scientific research in Naples during the period of University reforms under the Ministry of Tannucci in the years 1759 to 1776.

A discussion of the works on electricity which were published in Naples in the 18th Century.

[1] POLI (1772), (1773).
[2] DEL MUSCIO (1773).
[3] HEILBRON (1982).
[4] In the 70's most people that worked in electricity supposed that glass was completely impermeable, Franklin was the first to uphold this supposition in 1751.

A brief demonstration, through the analysis of del Muscio and Poli's works. These writings raised and confronted some of the problems concerning atmospheric electricity as well as electrostatic electricity produced in the laboratory, of the similarities but also differences between them. Even though they both considered themselves to be Franklinists, they each gave different explanations to permeability of glass and secondary discharge in the Leyden jar.

2. Scientific Equipment under Tannucci's Ministry (1759-1776)

It is important to point out that Naples was the capital of the largest Italian state, the Kingdom of the Two Sicilies and in the second half of the 18th Century was the center of an intense push to promote and adapt an appropriate techno-scientific development such as was enjoyed in other European capitals. In order to analyze and understand science, it is necessary to have proper scientific equipment. Just what was the state of scientific equipment in Naples during the time of Enlightenment? On this point there is unanimous agreement: at the University of Naples, then, there was a very scant selection of scientific equipment and no physics theatre in which to carry out experiments.[5]

The cultural policy of Bernardo Tannucci, during the years 1759 to 1776, paid little attention to the reform programs initiated by Antonio Genovesi. The Genovesi policy called for economic, agriculture and scientific reforms for the Kingdom of the Two Sicilies. Tannucci did not understand the fact that the social and civil progress of a nation is measured by its technical and scientific accomplishments.[6]

An example of scientific disinterest on the part of Tannucci's Ministry, was the lack of interest shown to a request made in 1760 by the Newtonian Felice Sabatelli. Sabatelli wanted to institute an astronomic observatory; however, his request was repeatedly ignored and the observatory became a reality only at the beginning of the Nineteenth century. And in fact, experimental physics teaching at the University of Naples, which was established in 1735 by the Newtonian Celestino Galiani, was abandoned in the second half of the 1700's due to lack of teachers and a physics theatre.[7]

3. Works on Electricity Published in Naples in the 18th Century[8]

We can find some works on electricity published in Naples starting from 1747 when the translation appeared of the work of Georg Mathias Bose[9] *Commentario epistolare sopra l'eletricità* and in the same year, by an anonymous author, the work *Dell'elettricismo* of which the first edition was published in Venice in 1746. Finally

[5] See BORRELLI (1996), pp. 131-83.
[6] *Ibid.*, p.133.
[7] See SCHETTINO (1999), pp. 367-76.
[8] For a critical analysis see NASTASI (1982), pp. 237-64.
[9] BOSE (1744).

the work of Giovanni Windler[10] *Tentamina de causa electricitatis quibus Brevis Historia de nonnullis Auctoribus qui hanc praecipue excoluerunt materiam, premissa est*.

In 1748, we find the work of Niccolò Bammacaro *Tentamen de vi electrica ejusque phaenomenis in quo aeris cum corporibus universi aequilibrium proponitur*.

In 1750, the first edition of *Scienza della natura* by Giovanni Maria della Torre was published. This work was used as a manual in the teaching of experimental physics using the Newtonian approach.[11] Although a treatise on physics, electricity was abundantly discussed.

In 1761, the work of the French scientist Jean Antoine Nollet was translated, most likely by Maria Angela Ardinghelli.[12]

After the 1760's no work on electricity was published in Naples. This scarcity of electricity study is in line with what happened in other scientific forums both in Italy and abroad. One needed to wait more than 10 years before some works appeared which closely examined the questions confronting the theories on electric conductors and the anomalies exhibited during experiments with the Leyden jar.

The authors, Gian Gaetano Del Muscio and Giuseppe Saverio Poli cannot be considered true and proper electrical scientists.

Del Muscio was a refined mathematician who first introduced algebraic calculus in his teachings in Naples.[13] He was trained in Rome at the very prestigious "Collegio Nazzareno". His teacher was Father Urbano Tosetti who was the first to introduce an actual laboratory where his teaching of experimental physics according to the new empirical orientation could be conducted. While at the Nazzareno, Del Muscio embraced the Newtonian ideas and in his doctoral thesis, *Propositiones ex Physica Selectae*.[14] he demonstrated that he was already aware of the new electrical theories of Franklin, even going as far as to analyze them in a specific chapter entitled *De Electricismo tum artificiali tum naturali*.

Del Muscio taught in Naples from 1773 to 1778 at the "Reale Collegio Ferdinandeo", a college designed for the education of nobility.

In complete contrast was the background of Giuseppe Saverio Poli.[15] He studied in Padova near Marco Antonio Caldani specializing in medicine. In Naples, however, he became fascinated by physics and because of his scholarly teachings, was called to teach at the Reale Academia della Nunziatella.

[10] WINDLER, probably a student of Bose, who was called to Naples by the Prince of Tarsia, Ferdinando Vincenzo Spinelli. Spinelli was an amatuer of, and a dabbler in the electric sciences. Spinelli called Bose to be became curator of his private physics studio.

[11] SCHETTINO (1999).

[12] "Lettere intorno all'elettricità", presso Raimondi, Napoli 1761.

[13] For a biography of del Muscio see THOMA VIÑAS, and LEODEGARIO PICANYOL (1911), pp. 211-2.

[14] DEL MUSCIO (1765).

[15] 15 For a biography of Poli see NICOLUCCI, (1881), section III, (IV), pp. 46-53.

4. Theories of Electric Conductors in del Muscio's and Poli's Works

We will begin with an analysis of Poli's book written in 1773 because in it can be found deeper examinations of other theories already raised in 1772, namely the divergent issues resulting from experiments with the Leyden jar.

This work of Poli is divided in four chapters: in the first and third he discusses atmospheric electricity, the construction of lighting rods and their public usefulness, following the theories of Franklin.[16]

The second and fourth are entirely dedicated to electrostatic electricity produced with the Leyden Jar and the Franklin square. Poli described a series of experiments that he conducted which put into question one of the main theories of Franklin, that of the adiathermanousity of glass. Poli did not know the explanation himself because the discharge of the Leyden jar was not immediate.

According to Poli, the secondary discharge that was observed instead was not justified by Franklin's dominant theory. Another issue in conflict with Franklin's theory was the possibility of charging a jar which also had a fissure in it.

His work finishes with another series of experiments examining electrical and magnetic phenomena by witnessing the inside of a glass vase, containing a needle, fill with water and electrically charge.

Again, this reaction could not be satisfactorily explained by applying Franklin's theory , leaving Poli to realize that:

1. there is no substance in nature which cannot spread electricity, that is, no isolating substances exist.
2. no matter what its composition or form, glass when electrified, distributes the electricity not only on its surface, as purported by Franklinists, but also on the inside of the surface of the glass.

He wrote as follows:

> Tali si è stato il risultato delle mie sperienze, replicate più volte, siccome ho già detto, con vetri, e cristalli non solamente di varia forma, e grandezza, ma eziandio fabbricati in vari Paesi, come sono quelli di Germania, di Boemia, d'Inghilterra, di Venezia, e di Napoli: e mi sembra di avere forte motivo di poter concludere, che il fuoco elettrico, oltre al diffondersi per la superfizie del vetro, si proccura eziandio in qualche modo di passaggio attraverso la sostanza del medesimo.[17]

Nevertheless, to explain with his model, also the insulating effect which glass at times displayed, Poli resorted to the existence of the two forms of electricity which he called "per origine e per comunicazione".

The work caused a great debate among the Neapolitan men of electricity. Between these, the mathematician and physicist, Del Muscio was one of the major

[16] Incidentally, up to this point of time, no lightening rods of any type had been installed in Naples or the outlying regions of the Reign of Two Sicilies.
[17] POLI, *loc. cit.*, p. LXXXI.

adversaries of Poli. Del Muscio was convinced that Poli explained the electrical phenomena by turning away from the new and returning to the old theory of Cartesio, even if partially modified. This prompted Del Muscio to caption it the "old semi-Cartesian theories". Obviously, Del Muscio was referring to the two forms of electricity which Poli introduced to explain the electrification of glass.

To reaffirm the theories of Franklin, Del Muscio wrote a short pamphlet in 1773.[18] This book of 66 pages is divided into 4 chapters and begins with an introduction on the significance of the experimental method.

Every single experiment conducted by Poli was re-examined in del Muscio's booklet and reinterpreted. Obviously, this was possible to do at a time when physics was not yet mathematically exact, but above all it was possible to do because of the lack of precise instruments.

Del Muscio refuted Poli's positions not with proper experiments but by utilizing points already stated by Giambattista Baccaria, re-introducing entire passages of the works of this Turin scientist.[19]

Del Muscio accused Poli of practicing bad experimentation, in which, because he did not know how to analyze the results of the experiments, but relied instead on external causes for the explanation. A case in point was glass, which when heated to a certain temperature becomes a conductor. Moreover, it was well-known to the Franklinists that the impermeability of glass depended also on its hygrometric state.

These were the considerations that pushed Del Muscio to write:

> Che ve ne pare signor Poli? sono gli esperimenti che dimostrano false le leggi del Franklin, o sono le circostanze non avvertite, e lo spirito di contraddire, che vi spingono a non riconoscerle per vere?[20]

A year later, Poli responded to del Muscio's pamphlet; a work which seemed more an official defence of his Franklinian position than anything else.[21]

He had conducted no new experiments in 1773 and this volume seems to be merely a rehashing of his earlier works.

He did however, insert a letter written to him by the then, elderly Della Torre taking Poli's position in the quarrel between himself and del Muscio.

Poli apparently felt the need to get back into the good graces of Della Torre, who was certainly a great figure among prominent Neapolitans and among the advocates of Newtonianism in scientific teaching.

The elderly father, Della Torre not only shared Poli's ideas, but he considered them his discoveries.

In fact he so wrote:

[18] DEL MUSCIO (1765), note 2.
[19] BECCARIA (1772). Beccaria came to be known as the great spreader of franklinism in Italy.
[20] DEL MUSCIO (1765), p. LIV.
[21] POLI (1774).

> Così sono principalmente le due nuove scoperte da Voi fatte, e confermate con replicate esperienze, la prima delle quali è l'adesione della materia elettrica a tutti i corpi, e più ad alcuni, che ad altri; e la seconda è (benché questa in alcun riguardo fosse stata immaginata da altri), che per alcuni vetri, e cristalli non solo superficialmente, ma ancora per la loro solidità passa il fluido elettrico.[22]

5. Conclusion

An in-depth analysis of Neapolitan scientific production in these years, leads one to state that:

In Naples, electrical experiments were repeated without originality.

The electrical scientists explained anomalies raised by experimental practice only by applying the already tested theories. We justifiable for Poli to apply two models of experimentation (Franklinist and Cartesian) to arrive at explanations regarding laboratory produced electricity. Del Muscio applied only one model - the Franklinist approach.

To reconfirm that which is evident on the outline, one can see that after the year 1774, there were no further experiments on electricity. The interest in electricity was raised again only in the 1780's and then mainly with practical applications.

As for the main actors on the electricity stage in the 1770's, they dedicated themselves to other pursuits, Del Muscio became a bishop and was transferred to Puglia and Poli dedicated himself to his teaching and to the rewriting of his physics manual which was not only widely praised but also adopted by Volta.

[22] Cfr. "Lettera di risposta al Sig. D. Giuseppe Poli del P. D. Gio. Maria della Torre", in POLI (1764), p. CXLIV.

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