LETTERS AS AN INSTRUMENT OF SHAPING SCIENTIFIC KNOWLEDGE IN THE ANCIENT REGIME:

LEARNED AND AMATEUR CORRESPONDENCES IN THE 18TH CENTURY IN FRANCE

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Resumo: *Este artigo propõe-se apresentar dois tipos de correspondência científica que contribuiram, de maneiras diferentes, para o processo de formação do conhecimento no Illuminismo francês. Por um lado, temos as cartas entre pares sobre novas descobertas e tentativas de explicação de fenómenos naturais. Por outro lado, temos a carta ficticia dirigida por um cientista para uma leitora feminina. Este tipo de carta apresenta uma teoria científica complicada de uma maneira mais simples e atraente. Os dois tipos de correspondência cientifica revelam as incertezas e as muitas questões não resolvidas sobre fenómenos naturais no século XVIII, em França.*
Palavras-chave: *Illuminismo; França; correspondência; ciência.*

Abstract: *This article wishes to present two types of scientific correspondence that contributed, in different ways, to the process of the shaping of knowledge in the French Enlightenment. On the one hand, we have the letters between peers, which exchanged on the subject of new discoveries and potential explanations of the natural phenomena. On the other hand, we find the fictional letter which is written by a man of science and addressed to a female reader; this kind of letter presents a complicated scientific issue in a simpler and an appealing way. The two types of scientific correspondence reveal the uncertainties and the many unsolved questions concerning the natural phenomena in the 18th century in France.*
Keywords: *Enlightenment; France; correspondence; science.*

The purpose of this article is to present the great contribution of scientific letters and of scientific correspondence to the shaping of knowledge during the French Enlightenment. Throughout the 18th century the scientific activity is deeply embedded in the phenomenon of sociability. During this period, men of science deploy their activities in professional circles such as the laboratory or the Academy of Science, but, at the same time, they participate in informal encounters in salons and in cafes; these are privileged places to expose to the peers and to the cultivated and the curious some of the latest scientific theories and discoveries. The salons are also places of scientific inspiration for the men of science. The French philosopher and naturalist Pierre Louis de Maupertuis (1698-1759) was first exposed to the albino child that was born from very black parents in an aristocratic salon, where this boy was exhibited: «I was yesterday in a house to which they brought the black-white (le Negre-blanc) who is at the moment in Paris; they assured us that the child was born from very dark parents and we all endlessly meditated on this prodigy»[1]. Similar to

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1 MAUPERTUIS, 1744: 1.

the polite conversation in salons, the letter is a very efficient way of communicating, sharing and disseminating scientific ideas. The exchange of letters is a means to unfold a scientific discussion outside the academic establishment or outside a specific geographical territory.

In this article we shall focus on two types of scientific correspondences during the Enlightenment; on the one hand the exchange of letters between two colleagues or two men of science. During the 18th century in particular, the scientific ideas and theories were in permanent movement, undergoing many modifications and redefinitions. The men of science could rarely relay upon the instruments that were at their disposal (such as the microscope) in order to achieve certainty about nature and on natural phenomena. As a result, many crucial questions regarding the reproduction and the origin of life were a subject of scientific debates and controversies. In this perspective, men of science wrote to each other not only to defend their point of view but mostly because they awaited the observations, the opinions and the amendments of their colleagues.

On the other hand, I would like to present a fictional kind of correspondence between a man of science and an amateur reader (either real of invented), in many cases a woman. In this case, the frame of the letter is only used to imitate an epistolary exchange between a scientific authority and a less instructed reader, who is in the position of learning. I refer to this type of correspondence as fictional because even if the recipient of the letter might have existed, we have no evidence that an exchange of letters really took place. The man of science uses the form of a letter (less committing than a scientific essay or treatise) in order to present a complicated scientific idea in a simpler way; the social codes and the etiquettes of the time expect indeed that men of science would address a female reader in a non scholarly and in a more appealing way.

I would like to show in this article that both kind of correspondences, the letter to a peer and the letter to an amateur reader, reflect the uncertainties that hover over the scientific field in the 18th century; in both cases the writer describes an unusual natural phenomenon and he invites his reader to think about that peculiarity without imposing on him any categorical explanation.

Let us show now the characteristics of each type of scientific correspondence, the exchange between peers and the correspondence between a man of science and an amateur receiver, as well as their contribution to the processes of shaping scientific knowledge during the Enlightenment.

THE CORRESPONDENCE BETWEEN PEERS

I wish to analyze first the exchange of letters between two Swiss naturalists that were also cousins and friends: Charles Bonnet (1720-1793) and Abraham Trembley (1710-1784). Not only the two scholars wrote in French but they also played a key role in the scientific field in France during the Enlightenment. Their work in different domains, Bonnet enquiring on the reproduction of insects and Trembley on the reproduction of water polyps, «communicated [within a year] two striking biological discoveries to the Paris

Academy of Sciences»[2] and their work has been described in the same volume of the *Histoire de l'Académie Royale des Sciences*, for the year of 1741[3].

As expected, their pioneer research on marvelous forms of life that remained until then mostly hidden from the sight of the average man earned them a membership by correspondence of the Royal Academy of Sciences. The external correspondents were, as mentioned by Licinia Ferreira, a very important component of the scientific activity of the academy, they extended the scientific potential of a given institute by the experience they brought with them from the outside[4].

On 1740 Charles Bonnet was appointed as a member by correspondence of his French tutor, the naturalist René-Antoine de Réaumur, after successfully completing an inquiry that was begun by this specialist in the domain of insects. As it is mentioned by the perpetual secretary of the Paris Academy of Science, Réaumur suspected for a long time that the aphids were able to engender without coupling and without having any kind of contact with other insects. He tried to carry some experiences but failed to achieve any convincing results; as a result, Réaumur wrote to his Natural History correspondents, asking them to conclude his experiment. As the report of the Academy mentions, «Bonnet from Genève» was the first to accomplish this mission, strenuously repeating his experiments on nine successive generations of aphids before asserting that these insects reproduced themselves without any need of coupling up[5]. On 1757 Bonnet became the correspondent of yet another French academician, the botanist Duhamel du Monceau and on 1783 he was appointed as a foreign associate. As for Abraham Trembley, this assiduous observer was appointed as a member by correspondence of the Academy of sciences on 1749, exchanging first with Réaumur, then, on 1757 undertaking a correspondence with the French botanist Antoine de Juisseau.

The correspondence between Tremblay and Bonnet continues the interest of the later in the thematic of tiny creatures and their reproduction without coupling. Bonnet, who had once striven to observe the multiplication of aphids, becomes naturally intrigued by the research of Tremblay that investigates the «sweat water polyp with arms in the shape of horns» and her outstanding ability to regenerate without any external intervention.

It was precisely on November 25th 1740 that Abraham Trembley first began to conduct his famous experiments on the polyps; convinced that the polyp is going to die after being cut transversally, in length, into two parts, Trembley puts the two pieces in a flat glass that contains some water in order to better observe them through a magnifying glass. He will soon discover that every separated piece becomes «a perfect animal» within

2 DAWSON, 1987: 5.

3 «Insectes qui se multiplient sans accouplement & par la seule fécondité de chaque individu» (Insects that multiply without coupling and solely by means of fecondity of each individual) ; «Animaux coupés & partagés en plusieurs parties, & qui se reproduisent tout entiers dans chacune» (animals that are cut and segmented in many pieces, which can entierly regenerate in each part) in, *Histoire de l'Académie Royale des Sciences*, Paris, de l'Imprimerie Royale, 1741, p. 32-35.

4 FERREIRA, (s.d.): 3, available at: https://estudogeral.sib.uc.pt/bitstream/10316/17982/1/O%20papel%20das%20academias_Instituto%20de%20Coimbra.pdf (accessed on 30/04/2017).

5 *Histoire de l'Académie Royale des Sciences*, Paris, de l'Imprimerie Royale, p. 33.

maximum three weeks. As he mentions in the academic disquisition[6] he writes on the subject, one of his first concerns after making this discovery was to share the information, by means of a letter, with Réaumur. Not only he described to him the astonishing phenomenon and the experiments he has repeatedly made, but he had also sent to the French naturalist some samples of polyps[7]. It was thus by means of letters that the news on the regeneration of the polyps had arrived in France, as it is mentioned by the secretary of the Paris Academy of Sciences, Bernard de Fontenelle, who says in 1741: «This discovery belongs to M. Trembley that lives currently in La Haye in Holland. M. Tremblay has written about the polyp to M. Réaumur who communicated the news to the Academy of Sciences in Paris»[8]. In his report Fontenelle highlights the fabulous virtues of the aquatic creature, which, in his own terms, is not less marvelous than the legend of the phoenix that is said to reborn from her ashes:

> *The nature exceeds here our wildest imagination. From each piece of the same animal that has been cut in 2, 3, 4, 20, 30, 40 parts and so to speak, even chopped, will reborn the same number of complete animals that will look like the original. […] We don't yet know what the limits of this astonishing multiplication are*[9].

As it is mentioned by Virginia Dawson, the exchange of letters between Bonnet, Trembley and Réaumur had an official character. The three correspondents paid particular attention to the linguistic style and to the order of presentation because they knew that these letters would be read before the assembly of the Paris Academy of Sciences; she points out that Bonnet compared his letters to Réaumur to small treatises. On the contrary, Dawson notices that the scientific correspondence between Bonnet and Trembley enjoys a more informal and intimate character[10].

On the early 1740s Bonnet and Trembley begin to exchange letters on the subject of the aquatic polyp. In his letter to Abraham Trembley, Charles Bonnet places the aquatic creature in the same marvelous register as Fontenelle did:

> *Your aquatic creature is something so strange and surprising and I think we should regard it as one of the greatest marvels that the study of natural history may offer. We may say that you have found the missing chain between the vegetal and the animal*[11].

As we argued before, the letter is an open space for discussion and it reflects the doubts and the process of thinking on new phenomena or on scientific issues that don't have yet a certain solution. Because the information that is being provided in the letters

6 TREMBLEY, 1744.
7 *Ibid.*, p.3.
8 «Animaux coupés & partagés en plusieurs parties, & qui se reproduisent tout entiers dans chacune» in, *Histoire de l'Académie Royale des Sciences*, Paris, de l'Imprimerie Royale, 1741, p. 34.
9 *Ibid.*, p. 33.
10 DAWSON, 1987: 19-20.
11 Letter of Bonnet to Trembley, 24 march 1741 in DAWSON, 1987: 138.

is never definitive, the response of the other side reveals the process of knowledge shaping, and the gradual clarification of the issues that are being discussed. In his letter Bonnet asks Trembley to give him more details, or at least to better describe the polyp: «I wish you could tell me a little about the figure of the animal, if it is an animal, about his dimension, his color, the places where we can find it and other things that may help us recognize it[12]». As the correspondence goes on, new hypothesis and interpretations are submitted for the judgment of the other side. In his response to Charles Bonnet Abraham Trembley confirms that the strange creature can be considered from now on as an animal: «I call it an animal because it is now decided that it is one»[13]. Trembley forwards this new idea after the hypothesis has been confirmed in a letter from his skillful teacher: «This is the opinion of Sir Réaumur to whom I sent a big creature of this kind. He called it a polyp»[14], Trembley writes to Bonnet. Trembley later describes the polyp, and draws a sketch of it. He adds to the element of surprise another enigmatic factor:

> *Another singularity that these animals present is their way of multiplying. The young get out of the body of the old like the branches get out of the tree trunk. You would observe at the beginning a little excrescent that grows bigger every day, after a while you can see the legs, and after some time, after the animal is complete, he detaches himself from the mother*[15].

In his next letter, Charles Bonnet expresses his doubts regarding the nature of this strange creature. He mentions that this discovery will cause an immense controversy amongst the scholars because it will contradict the metaphysical beliefs of the time:

> *The things you observed on your polyps won't be a cause of delight for the metaphysicians; if on the one hand the reproduction of the polyp seems to prove that this creature has a soul, from the other hand his extraordinary way of reproduction may engender horrible difficulties. Can we say that this insect has as many souls as his parts, which can also become perfect insects*[16]*?*

If the mysterious creature can acquire as many souls as his infinite reproducible parts then it may imply that the universe is not an absolute and divine Creation but that it is instead open to unpredictable changes. The polyp has the ability to change her nature and to adapt to hazard and to the given circumstances.

In the 18th century the letter to a peer is the most convenient intellectual instrument for the exchange of new scientific ideas. In the letters they address to their colleagues, the scholars share their recent discoveries and they describe new phenomena that have not yet been defined. The novelty of the phenomena which are described and discussed in these letters reflects for instance in the lexicon of the writers, who talk about a «universe

12 *Idem.*
13 Letter of Trembley to Bonnet, 5 May 1741, in DAWSON, 1987: 139.
14 *Idem.*
15 *Idem.*
16 Letter of Bonnet to Trembley, 1 September 1741, in DAWSON, 1987: 206.

of marvels»[17], «singularity of facts»[18] etc. In the 18th century the letter is an intermediary space of work, the scholars observe and conduct experiments in the privacy of their laboratory, then they share the results of their work in the letter that will bring back to them the comments and the helpful remarks of their colleagues, before finally rendering their work official and publishing it or submitting it to the Academy of Sciences. The letter is also a precious space for giving advices on how to manage the discovery and how to present it to the peers. In his letter to Trembley, Charles Bonnet mentions that the discovery of the polyp and her unique system of reproduction may grant him the honor to become a member by correspondence of the Paris Academy of Science: «I am sure that M. Réaumur will tell the Academy of Sciences about your discovery and that it will not be long until you will be nominated a member by correspondence of the Academy»[19], he writes to Trembley.

I propose to examine now the characteristics of the fictional letter – that is a discourse that adopts the form of a letter in which a man of science pretends to write to a less experienced reader.

THE FICTIONAL LETTER

Contrary to the real correspondence between peers which is based on a concrete exchange of letters and in which the men of science respond to each other, the fictional letter has a one-dimensional aspect. It is designated as a letter, because it contains the discourse of one side but we can never get to know the point of view of the correspondent. In this perspective, the fictional letter which is written by a man of science who pretends to instruct his correspondent is more close to the scientific manifest or to the short scientific essay because it is used for the exposition of scientific ideas.

In our particular example, which is the *Letter on the Comet* (*Lettre sur la Comète*), written in 1742, Maupertuis mentions a mysterious lady that he does not name: «You had wished, Madam, that I tell you about the Comet that is nowadays in the center of all conversations in Paris»[20]. The letter is therefore presented by the writer as an instructive text and as a lesson or initiation to the most acute scientific issues of the time. The discourse of the man of science is in fact the sole authoritative voice and he does not expect to learn from the observations or the comments of his correspondent. Indeed, the subject is not a very simple one; Maupertuis undertakes the task of explaining the phenomenon of heavenly bodies, he describes the sun and the other six planets: Mercury, Venus, the Earth, Mars, Jupiter and Saturn and reserves a special place to the subject of the comets. But Maupertuis also wishes to explain the historical context of the phenomenon, and he reviews for his reader the different theories and opinions of the most notorious men of science:

17 *Idem.*
18 *Idem.*
19 Letter of Bonnet to Trembley, 24 march 1741 in DAWSON, 1897: 199.
20 MAUPERTUIS, 1742:1. *Lettre sur la Comète*. http://gallica.bnf.fr/ark:/12148/bpt6k58218899/f2.image.

> *Aristotle was certain the comets were in fact meteors that were produced by the emanations of the earth and the seas: and as we can imagine, all the philosophers that followed him did not change a thing from this belief*[21].

This shallow way of presenting the opinions and the theories of the most influent philosophers and men of science is very obvious when Maupertuis presents the ideas of the famous mathematician and astronomer Johannes Kepler (1571-1630):

> *Kepler to whom the astronomy is heavily indebted, found it legitimate to think that as the seas have their whales and their monsters, so do the skies: the comets were these monsters*[22].

The historical perspective is of course unnecessary and redundant in the professional correspondence between two or more peers, who share the same knowledge base on the subject they discuss. But Maupertuis is writing here not only for the non scholar reader; he also aims to entertain his reader and to cultivate his interest in a serious subject by introducing funny and anecdotal remarks.

Despite what may seem from this presentation, Maupertuis is a rigorous man of science. Member of the Academy of Sciences since 1723, he is very familiar with the codes of the scientific writing. His dissertations and the results of his experiments have been published by the Academy of Sciences and gained him much respect in the scientific community of the time. In the Letter on the Comet Maupertuis chooses though to present the history of the falling stars in an anecdotic and a simplified way, he gives special emphasis to the most provocative and ridiculous elements that can be found in the ideas of some of the most famous men of science because he knows that the naïve reader will be tempted to remember the elements that amused him and retained his attention. After reading Maupertuis's letter on the comet the reader may not be able to participate in professional astronomical debates but he will certainly remember the main ideas of the most prominent thinkers in the field.

As I tried to show in this presentation, in the 18th century the letter is a means of learning about new discoveries or getting familiar with the work of a colleague. The letter allows shaping the scientific knowledge because one man of science refers to the ideas of his fellow, criticizes them or contributes to their evolvement with further proofs. The letter is also an efficient way to learn about the scientific issues of the time in a less official way.

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21 *Ibid*., p.13.
22 *Ibid*., p.12.

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