Aspects of John Hyacinth de Magellan's Scientific Network Between Britain, Flanders and France

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The former Augustinian monk and abbot, the Portuguese João Jacinto de Magalhães,[1] later usually known as John Hyacinth de Magellan, had during his lifetime a vast network of scientific and philosophical correspondents throughout Europe and America. The knowledge of his activities is mainly available in the period after he obtained a secularisation brief from the Pope, probably during 1758. In his early days it is known that he travelled abroad and visited several European countries, staying for some time in Paris where he joined the circle of friends of the Portuguese physician Ribeiro Sanches and was also introduced to the Parisian astronomers' circle. In late 1763, he moved to London and stayed there till the end of his days, although he travelled frequently to the Continent as is clear from his correspondence.[2] His scientific interests, namely those connected with instruments (barometers, octants and sextants) were soon evident also in England where he soon became recognised for his knowledge. By 1770 he became a member of the Royal Society of Arts, and after other academies/ societies such as the Académie Royale des Sciences in Paris, of which he became a corresponding member, and the Royal Society in London. Many important names were Magellan's proposers of Magellan's election to the Royal Society, namely Mathieu Maty, Benjamin Franklin, Joseph Priestley, William Hunter and Joseph Banks.[3]

Magellan's surviving correspondence and publications are mainly from the seventies and eighties. One can distinguish different levels of networks when considering the main affairs with which Magellan's interlocutors dealt with: manufacturers; instrumentalists; mathematicians; astronomers; physicians; chemists; politicians, high dignities; philosophers in general. His scientific communications were also be made at distinct levels, institutionally or in a semi-private way (personal laboratories of dignities or else), in coffee houses / clubs, instrumentalists workshops.

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Magellan established correspondence with a very large number of people and deals with a diverse list of topics, fundamentally concerned with science, technology and medical subjects and on the most recent developments and/or publications that appeared in England or elsewhere that could be of interest to his correspondents, friends and acquaintances or permit exchange of ideas and discussion with them.

Magellan's correspondence with regard to Priestley's discoveries

In the present paper particular attention is paid of some of his correspondence concerned with Priestley's discoveries on gases and its communication in Flanders, France and Holland at Priestley's request.

With regard to Flanders he was in contact with the Duke of Arenberg, Leuven University members (Thijsbaert), Academicians of the Brussels Imperial and Royal Academy of Sciences (Needham, Marcy, Chevalier, Mann), official and governmental bodies (Tackoen, Crumpipen), individuals / astronomers (Pigott), clergymen (Needham, Marcy, Mann, Chevalier). In Holland, he was in touch with some Professors (Gaubius, Allamand, van Swinden, Ingenhousz, van Marum), with dignities (Gallitzin, others) as well as with merchants and what were termed at the time "curious people". When considering France it is impossible not to mention Lavoisier, but also Trudaine de Montigny, Pierre Macquer, Ribeiro Sanches, among several others.

During the seventies, Priestley developed several experimental studies on gases and their nature as in that way it would be possible to examine them in a closer manner towards their primitive elements. Concerning Magellan, Priestley wrote:

"My friend M. Magellan who makes several trips to the Continent; who maintains there a very large correspondence, so that he is well acquainted with the recent physicists' works; and who committed himself with the mission of initialising several skilled foreign physicists in the practice of experiments of this type,[4] *gave me advice that many others persons, of whom the public still doesn't know their names, are at the moment very much occupied with the same subject. It is a domain so fertile that one cannot doubt that in these circumstances, many of the difficulties I have left without a solution will be soon solved …".*[5]

As Magellan wrote, Priestley asked him to communicate abroad his experiments. So in several letters Magellan gave details of Priestley's work and those of other philosophers concerning the 'airs', and established a chain of discussion that

involved personalities in France, Flanders, Holland, and so on. Carbon dioxide (fixed air) proved to be a very interesting topic not only because of its recent discovery and the analysis of its physical and chemical properties, but mainly because to some of them seemed to be peculiar in regard to organic preservation, and its use in medicine.

Turning back to the several spheres from which one can observe Magellan's activities it is possible to verify that he maintained good relations with some of leading figures of society, mainly through their common philosophical interests or tolerance on them and also after he entered the British and French learned societies.

Magellan's renowned expertise, his contacts and a natural propensity to maintain them enabled his implementation of a vast list of correspondents and the use of some privileged diplomatic mail systems to speed up his letters and parcels of books, instruments, even some small novelties useful for some of his friends, to the seeds and plants from Siberia, America or Portugal for production elsewhere, or for the improvement of botanical gardens. The mail sent through Trudaine de Montigny (1733-1777) facilitated access to Pierre Macquer,[6] Lavoisier,[7] Le Bègue du Presle, Messier, Sanches,[8] etc.

The topics on chemistry and pneumatics began to appear in Magellan's correspondence in the early seventies (according to the remaining letters). On 20th March 1771, Magellan wrote to Macquer (1718-1784), on some experiments made by Scheele on 'fluores' (silicon fluoride) that produced real quartz. At the same time, he informed that at the Royal Society they were continuing reading Priestley's excellent memoir on fixed and mephitic airs and also another one on the application of fixed air on a patient with a putrid fever and the way they did it.

Other messages were exchanged with Macquer, namely on the elastic gum that he was trying to obtain from Portuguese correspondents in Brazil. Magellan foresaw some good uses for it in the areas of mechanics as well as on arts and crafts and considers that Macquer will be able to find out what its nature is (4 May 1771). In this same long letter he told him that the English edition of Macquer's *Dictionnaire de Chimie* was being produced and that he was very curious to read the French second edition, Magellan knows is being prepared in Paris. Later, in that same year, he gives information on some new interesting experiments that may be repeated and studied by Macquer. They were concerned with recent experiments made by 'M^{r}. Mayer, apothecary in Osnabruck', 'D^{r}. Black from Edinburgh'; and 'M^{r}. Rousseau in Muncken, Baviere', all them concerned with a special 'air', Black entitled 'fixed air'. Magellan also mentioned two booklets,

recently appeared in Wien, one by Jacquin (1769) and another by Crantz (1770), he offered to send to Macquer in case they do not exist in Paris. In addition he reported on the experiments made by Cavendish and Lane, just published in the *Philosophical Transactions* (25 October 1771).

Two letters were sent in the same period, to Trudaine de Montigny, dated 5 and 7 July 1772.[9] Magellan said to Trudaine that the recent studies on fixed air had become of public interest and that he thinks one of his letters should be printed and circulated broadly in France. And proceeds, mentioning the experiments made by Sir John Pringle about fixed air properties against putrefaction, on Macbride's interpretation of its properties and the use of 'beer must' as an antiseptic to preserve against and cure scurvy as experimented upon and confirmed in the British vessels. Black's experiments with calciferous stones and substances that also possess a large amount of fixed air are also referred to as well as the discoveries of Dr. Brownrigg on the waters, such as those of Pyrmont and similar, whose special acidic taste was according to him due to that same air. Magellan further pursued his detailed descriptions, referring Priestley's researches presented at the Royal Society namely on that same air, on the mephitic air and on the inflammable air. That Priestley had discovered a way to impregnate common water with fixed air, and confirmed similar qualities previously identified in the 'beer must' and some mineral waters. He proceeded, adding that while reading Priestley's booklet carefully he thought he could make it easier to be used either on board of a vessel, or on earth. That he then tried it and made many tests before several friends who found it easier and more manageable than the previous method, although not that different in essence. Magellan next gave a detailed description of Priestley's booklet.

By the end of 1772, one of Magellan's correspondents in Brussels was the astronomer Nathaniel Pigott[10] who was undertaking a precise geographical determination of the locations of the main towns in the Low Countries. Magellan provided him with several instruments and news he should also share with other friends in common and acquaintances in Flanders. By middle January of 1774, he was giving him notice of the Gold Medal awarded to Priestley because of his discoveries on gases. And that he was sending Pigott a copy of the speech made at the occasion by Sir John Pringle (18 January 1774).

Some days later, he details Priestley's air discoveries in a letter to Thijsbaert,[11] the Professor of Philosophy in Leuven. This time the subject was concerned with the discovery of nitrous air and its properties. Magellan wishes that Thijsbaert perform those experiments on gases together with his colleagues, considering that it will be easy to use Priestley's apparatus and that it will be amazing to observe

the *"action of nitrous air on common air"* (25 January 1774). The same day, he wrote to his French correspondent at the Académie Royale des Sciences, Gabriel de Bory, about the presentation at the Royal Society of Lavoisier's memoir *Sur les emanations elastiques qui se degagent de differents Corps*. Magellan complained that he would like to see Lavoisier performing those important experiments, and referred his desire of possessing Lavoisier's book, whose title enables him to think that a systematic treatment based on experiments will be presented. Meanwhile he detailed two new experimental improvements Priestley had achieved, one on the decomposition of air from its acid using the electric fire and the other one on the nitrous air and the way he proposed to prove the quality of air with it. Magellan mentioned their publication in 1772 in the *Philosophical Transactions*, adding that the experiment was astonishing. Then he left some questions to be solved by philosophers concerned with the results observed, namely on the disappearing of volumetric quantities and the conjectures on what happened (25 January 1774).

Still on the same day, Magellan wrote to Pigott on several subjects and again on airs and the speech made at Priestley's award, and will send the letter together with a box of fresh seeds from North American trees he wishes to offer to the Duke of Arenberg for his plant nursery in Edingen.

The improvements attained by Priestley, above mentioned, are again introduced with a request that they will be presented at the Brussels Academy of Sciences, as well as to Needham, the Duke of Arenberg, the British plenipotentiary minister, Gordon, and other common friends (25 January 1774).

Magellan's correspondence direct with Lavoisier also began in 1774, as far as can be seen. In that same year Magellan told Lavoisier of his great satisfaction with Lavoisier's book (*Sur les emanations elastiques*…) and also as in the note he wrote on Venel, where he gave a clear view on the merits that should be attributed to those who contributed to the identification of fixed air in the acidic waters, much in accordance with Magellan's opinion. He added, that he almost quarrelled with Rozier as he considered Venel to be the inventor of 'fixed air' whilst Venel was just using Stephen Hales' interpretation (11 February 1774).

As already mentioned, sometimes Magellan used the mediation of other friends to circulate novelties (books or others) and this happened also with Lavoisier to whom he sent on May 1774 Priestley's last publication, the first volume on the "Different kinds of airs". There, Lavoisier could already see the citation to his own work on the subject, with the merits stated. This time the messenger was the Irish chemist, Peter Woulfe, another Magellan's close friends (16 May 1774).

The circulation and spreading of knowledge by Magellan is again evident when he mentions to his friend Sanches in Paris that he had accepted the invitation to stay some few days with Priestley and Lord Shelburne where they would speak about 'fixed air', that Priestley's second volume on airs is being printed, and that new experiments and results were coming out. At the same time told him about the last meeting at the Royal Society where some experiments on animals heat had been read introducing some corrections to Boerhaave's conclusions on the heat that can be supported by men and animals without damage (7 July 1775).

He wrote to Lavoisier, communicating that Priestley had offered him the second volume of *Experiments and Observations on Different Kinds of Air*, before its public distribution, as a gift from the author, in order that Magellan could profit from a *"Mail that was sent at M. Trudaine's address in Paris"* where Duchesne (or Messier) would deliver it to Lavoisier. Magellan also told that he could not find the two books on *"Nitre"* that Lavoisier requested from him, through his wife (1775[12]).

Magellan's connections with Flanders were also flourishing in this period as referred to above. Several instruments for experimental physics[13] (which included the study of gases) and astronomy were acquired in England through Magellan's advice. And at the new Academy of Sciences in Brussels some discussions were held, some connected with Magellan and others on the recent philosophical subjects.

Magellan's friendly relationship with the 5th and 6th Dukes of Arenberg, and staying at their palace in Brussels and other residences, opened the doors to new friends and acquaintances. In their palaces, he could perform several experimental sessions on airs and electricity, all before those interested in philosophical matters rather than in the futilities of social life. The news on the experiments on fixed air and others, and on the achievements of the second Cook's voyage to the Southern hemisphere, were also given in detailed accounts to the Duke of Arenberg.

In an early letter to Thijsbaert, Magellan informed that very soon he would send him Priestley's second volume on airs that appeared in 1775, and which contained several interesting novelties related with oxygen (dephlogisticated air)[14] and the process of respiration.

On October 1776, Magellan sent a letter to his friend Sanches, giving him notice of his trip to the Netherlands and Flanders while accompanying his friend Arbuthnot and his sons. Magellan acted as a tutor of Arbuthnot's boys, namely in the Portuguese language in order they could later be sent to the Navy and Eastern India commerce. Magellan reported that he went to Amsterdam he was

very well received by several curious individuals of experimental physics, one of them being the uncle of the Arbuthnot boys. After that he had gone to Haarlem to visit Dr. van Marum and his new electrical machine, and that two days later he was in Utrecht where he made acquaintance with *"several professors of whom I received a very honourable treatment"*. Then he left for Den Haag where he dined with the Russian ambassador, Prince Gallitzin (1738-1803), who asked him to stay a few days to meet the Leiden Professors Allamand (1713-1787) and Gaubius (1705-1780) who desired to see the recent experiments on airs. Magellan stayed in Leiden for a few days where Allamand received him at the University and the experimental meeting was then arranged with Gaubius and Allamand at Gallitzin's palace, in Den Haag, where Magellan performed several experiments on the different kinds of airs, following Priestley's method.

Magellan's Dutch trip did not end in Leiden as after he went to Rotterdam, and then to Antwerp and Mechelen in Flanders, where a friend, Mr. G. Tackoen, who was counsellor at the Great Council of Mechelen (Brabant), had invited him. From there travelled to Brussels and Leuven where Thijsbaert was also waiting for him (31 October 1776) and for whom he performed, during two days, several experiments on airs that would be used in his physics course (15 November 1776).

The same time Magellan mentioned to Sanches that at that moment (November) he was staying at Prince's d'Arenberg palace in Brussels and comments on the satisfaction and astonishment reaction of Professors Allamand and Gaubius about the experiments he performed before them and their desire of maintaining contact with him. Magellan continued, telling Sanches that in Brussels he also arranged and performed the main experiments on airs in presence of Needham, Director of the Royal Academy, its secretary as well as others. And manifests his hope that *"they will be convinced on the importance of this new branch of experimental Physics"* (15 November 1776).

This enlarged trip and his achievements concerning pneumatics and other philosophical subjects was again the object of a letter to Priestley where Magellan mentioned his visit to Allamand and the performance of Priestley's experiments before him, Gaubius and Gallitzin (30 November 1776). At the same time, Magellan told Priestley that soon he would inform him personally on some improvements he made on the glass to impregnate water with fixed air that take much less time as well as on two new eudiometers to test air salubrity.

As already mentioned, the interesting and very recent experiments that were being made and interpreted during this decade concerned with gases and others,

were well circulated in Magellan's network. For instance, to Thijsbaert on 25 February 1777, he said:

"… I have just sent you by means of our good friend M. Needham, a small parcel in a box that I have sent him to Brussels with the glasses for the experiments on different kinds of air. It contains a small phial with copper crystals and a box with two dozens of pith balls: they will enable you with two new experiments for your lectures, which are pleasant & new …"

And continued, saying that he was tempted to send him some more delicate glasses with S-shaped tubes, as may be, he had already broken them while performing the experiments on airs. In that same letter informs he will send Thijsbaert his book on the glass-apparatus for making mineral waters and the one on the new eudiometers, together with one of those instruments (25 February 1777).

Conclusion

Detailed evidence has been presented on J. H. de Magellan, as a disseminator and important vehicle in the introduction of Priestley's discoveries on gases in Flanders, France and Holland.

The protagonists in the debates on the new gases were leading figures of chemistry such as Priestley and Lavoisier, although the focus herein has not fixed on them, but rather on the communication network established through Magellan with some other secondary figures that were significantly important in the appreciation and discussion of the new evolving topics of chemistry and their acceptance, namely because of their public utility. Magellan's interest in different philosophical matters allied with his natural propensity to communicate favoured this kind of commitment and the circulation of knowledge. The circulation of which enabled others to gather and improve chemistry from the discussions that took place. It is also evident that natural philosophy was being developed through a great emphasis put on experiments as well as by Magellan's idealism. It is considered that some of the above mentioned experiences were really new, in France, Flanders and Holland and that after the initial communications with Magellan, some of his interlocutors joined the discussions and the studies of gases.

In addition to the progress facilitated in the science, the scientific connections with Flanders were improved and this allowed Magellan to repay a debt of gratitude to the land that had received him as a member not only of its Imperial

Academy but also as a member of Soignies' Chapter with the benefits that those bodies conveyed.[15]

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References and foot notes

[1] Aveiro, 4 November 1722, London/Islington, 7 February 1790.
An early study on Magellan's life and work was developed by Isabel M. C. de O. Malaquias, in, *A obra de João Jacinto de Magalhães no contexto da ciência do séc. XVIII* (Aveiro: Universidade de Aveiro, 1994).
R. W. Home's entrance on *Jean Hyacinthe de Magellan* to the *Oxford Dictionary of National Biography*, (Oxford: Oxford University Press, 2004) Vol. 37: 115-117.
[2] The publication of all the extant correspondence of João Jacinto de Magalhães is being prepared by Rod W. Home, Manuel F. Thomaz and Isabel Malaquias and we hope it will soon be available.
[3] He became member of about ten prestigious societies / academies: Royal Society of Arts in1770; Académie Royale des Sciences in 1771; Royal Society in 1774; Academiae Scientiarum Imperialis Petropolitanae in 1778; Academia Ciências de Lisboa in 1779; American Philosophical Society of Philadelphia in 1784; Hollandsche Maastschappij der Wetenschappen (Haarlem) in 1784; Koninklijke Academie voor Wetenschappen (Brussels) in 1785; Akademie der Wissenschafften (Berlin) in 1786; Real Academia de Ciencias Exactas, Fisicas Naturales de Madrid.
[4] Pneumatics was the subject.
[5] Joseph Priestley, *Expériences et observations sur différentes Espèces d'Air.* Ouvrage traduit de l'Anglois de M. J. Priestley, … (Paris, 1780), Tome IV, Préface de l'Auteur, on xj-xij.
[6] Letters to Pierre Macquer at the Archives Nationales.
[7] I.M. Malaquias "A comunicação científica entre João Jacinto de Magalhães e Antoine-Laurent Lavoisier", *Química - Boletim da Sociedade Portuguesa de Química*, nº52 (1994): 24-29.
Letters to Lavoisier at Archives de l'Académie des Sciences.
[8] Letters to Sanches at the Osterreichische National Bibliotek.
[9] Letters to Trudaine at the Archives de l'Académie des Sciences.
[10] Letters to Pigott at the Royal Astronomical Society.
[11] Letters to Thijsbaert at Liège University Library.
[12] Letter without a complete specification of date.

[13] Geert Vanpaemel, *Eccho's van een wetenschappelijke revolutie. De mechanistische natuurwetenschap aan de Leuvense Artesfaculteit (1650-1797)*, (Paleis der Academïen, Brussel, 1986) Jaargang 48, Nr. 173, on 151, 156.
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André Cresens, "Het laboratorium" in *De blinde hertog, Louis Engelbert van Arenberg & zijn tijd 1750-1820*, Derez, Dillemans, Duvosquel, Roegiers, Tytgat, Verbrugge (Gemeentekreddiet, 1996), on 183-192.
[14] "In 1775 Priestley wrote letters dated 15 March (to Sir John Pringle), 1 April (to Dr. Price), and 24 May (to Sir John Pringle, misdated 25 May in the printed paper), which were later printed in the *Philosophical Transactions* as "Account of further Discoveries in Air", dealing with dephlogisticated air, vitriolic acid air (sulphur dioxide), nitrous air, and vegetable acid air (acetic acid vapour). The 1st letter, on dephlogisticated air, was read to the Royal Society on 23 March. (…)". In J. R. Partington, *A History of Chemistry,* (Mansfield: Martino Fine Books, 1996 repr) vol. 3, on 256. "In October 1774, Priestley visited Paris with Lord Shelburne and told Lavoisier at dinner of his discovery of dephlogisticated air". In Partington, *A History* vol. 3, 402.
[15] Ame Demeuldre, *Le Chapitre de Saint-Vincent à Soignies - ses dignitaires et ses chanoines*, (Soignies: Imprimerie Felix Noefnet, 1902), on 161-162.