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Four Unpublished Letters from Nicolas Fatio de Duillier to Isaac Newton

Networks and Alchemical Knowledge

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Abstract

This article analyses four unpublished draft letters from Nicolas Fatio de Duiller to Isaac Newton, dating from June to August 1693, and held in the Special Collections in the Universiteitsbibliotheek in Leiden. Overall, these letters enrich our knowledge of Fatio-Newton's alchemical correspondence in June 1693, a phase which likely represents the peak of the two natural philosophers' alchemical collaboration. By scrutinising the content of the letters, and situating them in relation to primary and secondary sources, the article will place Newton and Fatio's epistolary exchange in relation to the social and historical background of late seventeenth-century London, bringing to light so far undisclosed aspects of the networks, alchemical practices, and expertise of the two natural philosophers.

Keywords

Fatio de Duillier – Isaac Newton – alchemy – networks – antimony – scientific translation – scientific images – Huguenot refugees – laboratory practices

1 Introduction

> Je vous suis obligé aussi des 3 lettres de Fatio à Newton que vous m'avez envoyeés. Elles servent beaucoup à faire connoitre les ideés de Newton sur la transmutation des metaux surtout quand on les compare à celles que ne a ecrítes sur le meme sujet à Boijle & qui se trouvent dans le 5me volume des ouvres de celui-ci.[1]

With these words, in a letter dating December 21, 1780, the Dutch mathematician Jean Henri Van Swinden (1746–1823) thanked the Swiss naturalist George Louis Le Sage (1724–1803) for what was an unusually generous epistolary exchange which implied intellectual admiration, trust, and the dispatch of material objects, themselves earthly and fecund carriers of models of scientific and practical knowledge. The objects in question were three – actually four, as I will show in the course of this article – draft letters from the seventeenth-century Swiss mathematician Nicolas Fatio de Duillier (1664–1753) to Sir Isaac Newton.

Renowned for being an intimate friend of Newton and for acting as a go-between for the English mathematician and the Dutch astronomer Huygens (1629–1695), Fatio was born in Switzerland and had lived both in France, where he had been disciple of the astronomer Giovanni Domenico Cassini (1625–1712), and England. It was in London, after being elected a Fellow of the Royal Society thanks to the introduction of the French savant Henri Justel in 1689, that Fatio met Newton.[2] Fatio was also an avid practitioner of alchemy, and secretly shared this interest with the English natural philosopher in the course of the 1690s. He would die in Madresfield (England) in 1753, after turbulent decades during which he had been involved with the seditious French-

1 Van Swinden to George Louis Le Sage, Franeker, December 21, 1780, Universiteitsbibliotheek Leiden (henceforth UBL), BPL 755 Swinden-Principes, A/B, fol. 1 verso. This repository (BPL 755) consists in the correspondence of Jean Henri Van Swinden. Its folders are organised alphabetically rather than chronologically. As such, this repository presents an irregular foliation, with each (sent/received) letter numbered progressively as a single item and separately from the rest of the folder. The page numbers attributed here in this article reflect this specific foliation style.

2 Richard Westfall, *Never at Rest. A Biography of Isaac Newton* (Cambridge: Cambridge University Press, 1980), p. 493. For a summary of Fatio's biography and his intense relationship with Isaac Newton, see Karin Figala, Ulrich Petzold, "Physics and Poetry: Fatio de Duillier's Ecloga," *Archives Internationales d'Histoire des Sciences*, 1987, *37*:316–349. On Fatio as an intermediary, see Robert Iliffe, "Servant of Two Masters. Fatio de Duillier, Isaac Newton and Christian Huygens," in *Newton and the Netherlands: How Isaac Newton Was Fashioned in the Dutch Republic*, edited by Erik Jorink, Ad Maas (Leiden: Leiden University Press, 2013), pp. 67–91.

Huguenot Prophets movement (part of the Camisard movement), an involvement which saw him sentenced to the pillory in 1707.[3]

The letters date between June 10 and August 1, 1693. They contain a new wealth of information on transmutational practices, in particular the quest for the Philosophers Stone, fermentation, the structure of metals and the alchemical, mostly French Huguenot and familiar network which bound together Fatio and Newton. They also offer some hints to the competition between Boyle and the English mathematician, as well as some political references to William III's army and its defeat in the battle of Landen in Flanders. But why did Le Sage send Fatio's papers to Van Swinden and how did he arrive to possess them in the first place? Both before and during the time of his exchange with the Dutch mathematician, one of Le Sage's most pressing preoccupations was to understand the structure of matter, and the nature of gravity in particular. He believed he could achieve this goal by studying Fatio's publications and his views on Newton's "methode."[4] However, Fatio's published sources were relatively scarce, and Le Sage was aware of the existence of an enormous body of unpublished material written by the Swiss naturalist. He had thus decided to buy all of Fatio's extant papers in 1766. The purchase and transfer of the papers from England to Switzerland was not an easy business, and took a few years to be completed, partly through the mediation of Lord and Lady Stanhope, English residents in Switzerland whose son had been tutored by Le Sage.[5]

3 On Fatio's career, see Scott Mandelbrote, "The Heterodox Career of Nicolas Fatio de Duillier," in *Heterodoxy in Early Modern Science and Religion*, edited by John Brooke, Ian Mclean (Oxford: Oxford University Press, 2005), pp. 263–296. On Fatio and his networks, see Noémie Recous, "S'intégrer dans la République des Lettres. Le cas de Nicolas Fatio de Duillier (1681–1688)," *Revue historique*, 2016, 677/1:83–112. On Fatio and his involvement with the French prophets, see Andrew C. Domson, *Nicolas Fatio de Duillier and the Prophets of London* (PhD Diss., Yale University, 1972), pp. vi–xxvi.

4 George Louis Le Sage to Van Swinden, n. p., October 28, 1780, in UBL, BPL 755 Lacepede// Luyken, fol. 1 recto. Le Sage continued his letter by briefly enumerating Fatio's drafts in his possession, mentioning that the majority of them were actually not scientifically interesting, and rather discussed mundane topics such as familiar relations, health problems, drugs, libraries and general interests: "Ces Lettres sont dateés; du 17me X du 22 9bre 1692, du 30 Janvier, 4 du 7 Fevrier 1692/3, intendu du 8 et 9 de Mars, enfin du 10me, 20me e 24me Juin 1693. Les six premieres lettres, ne parlent point de cette transmutation; mas seulement, de petites affaires d'interêt, de famille, de santé et de drogues, des librairies et d'instruments […]" (fol. 1 verso). He had also expressed his concern that Van Swinden might want to send the drafts back if he found them to be uninteresting and he left the decision to the receiver: "Dont j'ai peur même que vous ne soyes pas trop contente; e que vous me renvoyés, monsieur, à votre trés grande commodité, ou jamais" (fol. 1 verso).

5 On a reconstruction of Le Sage's purchase of Fatio's papers, see Mandelbrote, "The Heterodox Career of Nicolas Fatio de Duillier" (cit. note 3), pp. 263–296 (pp. 264–265 in particular).

Van Swinden never returned Fatio's drafts to Le Sage. Written on both sides of a single sheet, these drafts have been lying for centuries in Van Swinden's enormous corpus of correspondence, which nowadays is in the Special Collections in the Universiteitsbibliotheek in Leiden (henceforth UBL). They have never been catalogued or published. The drafts date June 10, June 20, June 24, and August 1, 1693; overall, they enrich our understanding of Fatio-Newton's alchemical correspondence in a phase which has not been so far examined, that is, June 1693.[6] Their unique nature does not only spring from their rather peculiar location in the UBL's Special Collections, but also from the presence of what is likely Fatio's original sketch representing the "globular" structure of metallic surfaces, which will be the subject of a separate paragraph in this article. We could speculate on whether this drawing is a later addition by Le Sage, given the presence of similar images in his *Essai de Chimique Mécanique* (1758). However, we also know that Fatio's ideas and writings on gravity were already circulating in Geneva in the first decades of the eighteenth century, and that corpuscularism and Boyle's ideas were taught in the Swiss city before Le Sage acquired Fatio's papers.[7] This is to say that le Sage and Fatio's images might

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It is in virtue of Le Sage's interest in Fatio's ideas that most of Fatio's letters and manuscript treatises are today conserved in the Bibliothèque de Genève, as part of the *Papiers de Nicolas Fatio de Duillier*'s fond. However, letters from and to Fatio can also be (obviously) found in the University Library, and King's College Library (Cambridge), while one recently discovered letter – whose draft version will be presented in this paper – is conserved at the William Andrews Clark Library (UCLA) (MS F253 L 1693). Some of Fatio's letters to the English mathematician have been already published in *The Correspondence of Isaac Newton*, 8 vols. (Cambridge: Cambridge University Press, 1959–1977), henceforth *NC*, especially in Vol. 3, which concerns the time of Fatio's most intense collaboration with Newton in the making of alchemical experiments, between 1688 and 1694.

6 The folio also includes a fifth letter from Fatio to Mr Cuningham, which also bears August 1, 1693 as a date. Mr Cuningham is probably the historian and diplomat Alexander Cunningham, an acquaintance of Newton who worked as a secret agent for the Whigs and became envoy in Venice in 1715 (*NC*, Vol. 6, p. 280). From one of his letters to Newton (February 10, 1717, *NC*, Vol. 6, pp. 278–280), we also know that he was reporting to Newton about how an Italian naturalist such as Poleni received his ideas. Cunningham appears in two other occurrences in two other letters from Fatio to Newton between 1692 and 1693 (*NC*, Vol. 3, pp. 230, 243), and in a "Miscellanea" on Newton by John Conduit (after May 13, 1730); see http://www.newtonproject.ox.ac.uk/catalogue/record/THEM00168 (accessed 15 Feb. 2019). See Jed Z. Buchwald and Mordechai Feingold, *Newton and the Origin of Civilisation* (Princeton: Princeton University Press, 2012), p. 309. Cunningham also makes an appearence in a few letters from Fatio to John Locke: Esmond S. de Beer (ed.), *The Correspondence of John Locke*. Vol. 4, *Letters 1242–1701* (Oxford: Oxford Clarendon Press, 1979), p. 378. I will include a transcription of this letter in this article, given that it is part of the physical Leiden folio, although I will not elaborate on it as it falls outside of the scope of the present paper.

7 On this, see René Sigrist, *L'essor de la science moderne à Genève* (Lausanne: Presses polytech-

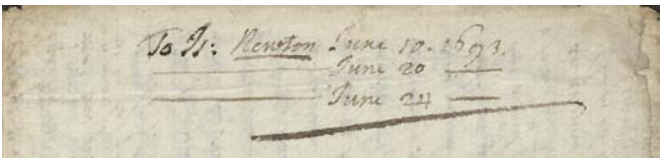

FIGURE 1 Indication of Isaac Newton as a receiver of the draft letters FROM UBL, BPL 755 LACEPEDE//LUYKEN (VERSO)

well have a separate and independent filiation. Although some scientific analysis and further research would be needed to confirm whether the drawing was indeed made by Fatio rather than by Le Sage at a later stage, a comparison between the inks used in the body of the text, and for the sketch, as well as the place of the image in the space of the sheet seems to suggest that Fatio is the sole author.[8] In terms of text authorship, even though the drafts are unsigned, the inclusion of this folio in Le Sage's papers, the themes discussed, and a comparison between these letters and other known letters by Fatio remove any doubt. Furthermore, the presence of what might be Le Sage's later handwritten indication on the verso on of the folio, "To Isaac Newton" confirms that these drafts were addressed to the English natural philosopher (Fig. 1).

As William Newman notes in his recently published book on Newtonian alchemical practices, the exchange between the two natural philosophers, which proved to be particularly intense between 1692 and 1693, can be reconstructed only partially, because of the absence of extant letters.[9] Although the final version of Fatio's draft which dates August 1 has been recently discovered and is currently being studied by Scott Mandelbrote, the other three drafts

niques et universitaires romandes, 2004), pp. 80–82. Sigrist also explains that it was Le Sage's father who introduced Boyle's theories in Geneva, after spending eleven years in England (p. 63).

8 Further research could be done to contextualise Fatio's sketch in the broader context of atomistic iconography. As noted by Christoph Lüthy, there is a longstanding history of representing atoms and corpuscles, from Giordano Bruno to Robert Hook to Christian Huygens. See Christoph Lüthy, "The Invention of Atomist Iconography," in *The Power of Images in Early Modern Science*, edited by Wolfgang Lefèvre, Jürgen Renn, Urs Shoepfilin (New York: Springer, 2003), pp. 117–140.

9 Newman implies, correctly, that Fatio and Newton had further exchanges than those we know about, a fact which seems to be confirmed by the further draft letters from Fatio to Newton discussed in the present article; see William Newman, *Newton the Alchemist: Science, Enigma and the Quest for Nature's "Secret Fire"* (Princeton: Princeton University Press, 2019), p. 373. Thanks to Newman's book (p. 375), I have been able to locate the final version of one of Fatio's original draft letters to Newton, which is held in the William Andrew Clark Memorial Library in Los Angeles (Classmark: MS F253 L 1693).

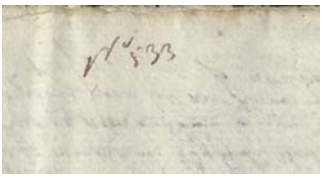

FIGURE 2
Reference to a filing system
FROM UBL, BPL 755 LACEPEDE//LUYKEN (RECTO)

are unpublished and have thus not been taken into account by the literature. The present paper intends to be a useful addition to current historiographical debates on Fatio and Newton's alchemical collaboration, and a tool for scholars and experts to conduct further research in this sense. To this end, it reproduces and briefly contextualises Fatio's lost drafts as they appear as physical objects in Le Sage's correspondence.

I will reproduce the drafts in the chronological order in which they appear in Fatio's original folio. The dimension of the paper sheet (356 × 236 mm) and the absence of watermark tell us that Fatio used common paper from the period. On the recto of the sheet we can clearly see a number "n. 533," which is likely a reference to a filing system (Fig. 2). Although it is hard to establish whether the filing system was conceived by Fatio or rather by Le Sage at a later stage to keep Fatio's papers organised, a quick examination seems to suggest that Le Sage was the author.[10]

As to Fatio's handwriting, its slightly syncopated nature allows us to establish with certainty that the documents are drafts and not final versions. Indeed, the Genevan returned on the same sentences over and over again, cancelling, rewriting, adding comments and further paragraphs to integrate missing and crucial information. This contrasts with Fatio's crystal clear style as it appears in other items of sent correspondence, in which corrections are rare.[11] In terms of chronology, if we explore Fatio's published alchemical letters to Newton (in the *Correspondence of Isaac Newton*, NC henceforth), they all bear dates between February 1692/3 and May 1693. Dating between June and August 1693, the present letters are thus extremely important to fill a gap in our knowledge and enrich our understanding not only of Newton's alchemical practices, but also of how they relied on the circulation of forms of knowledge, things and expertise between England and France, bringing together people from multiple religious faiths and confessions at a time of political turmoil and changes.

10 I owe this information to Dr. J.M. van Duijn, curator of manuscripts at the Special Collections of the Universiteitbibliotheek in Leiden, who helped me in the physical examination of the piece together with Kasper Van Ommen.

11 I have examined two of Fatio's sent letters to Jean Le Clerc in the Bijzondere Collecties of the University of Amsterdam, Oude Turfmarkt (OTM), hs. C 55: a-b (1687).

The second section of this paper addresses some general questions regarding the study of seventeenth-century alchemy, and focuses on the multiple forms of expertise needed to perform scientific observations. The third and fourth sections are about Fatio's collaborators, mostly his friend's circle and introduces another character, so far neglected by the literature, his friend's brother in law. The fifth and sixth sections focus on the letters' alchemical passages, contextualising them in relation to the alchemical procedures which Fatio and Newton were carrying out at around that time, and as they emerge from published letters as well as from a Newtonian manuscript such as *Praxis*. The conclusion will highlight possible new avenues of research which can be pursued on the basis of the new knowledge made available by these letters.

2 Multiple Actors and Expertise

That Newton did not practice alchemy alone is far from being a novelty. A bulk of literature on Newton and his alchemical practices, all emerging between the 1970s and the 1990s has provided us with sufficient evidence regarding Newton's early alchemical exchanges with Robert Boyle and John Locke in the 1670s and later collaboration with Fatio. This literature has also told us about the corpus that Newton read and appropriated – from the texts attributed to the fifteenth-century Parisian scribe and clerk Nicolas Flamel, to a later English/American such as Eirenaeus Philalethes (the pseudonym of George Starkey), the German Johann de Monte Snyders, and the Polish Michael Sendivogius, just to name a few.[12] However, it is not until very recently that scholars

12 As to Flamel, I have used the definition of Raphael Patai, *The Jewish Alchemists: A History and Source Book* (Princeton: Princeton University Press, 1994), p. 218, who identifies him as a "scribe and clerk," or, in Didier Kahn's words "écrivain public et copiste." See Kahn's postface to Nicolas Flamel, *Écrits alchimiques*. Postface de Didier Kahn (Paris: Les Belles Lettres, 1993), pp. 99–114: 99. On Newton's familiarisation with the French alchemical corpus more broadly, through Fatio, see Karin Figala, Ulrich Petzold, "Alchemy in the Newtonian Circle: Personal Acquaintances and the Problem of the Late Phase of Isaac Newton's Alchemy," in *Renaissance and Revolution*, edited by Judith V. Field, Frank L. James (Cambridge: Cambridge University Press, 1993), pp. 173–191 (especially pp. 175–177), and Betty J.T. Dobbs, *The Janus Faces of Genius: The Role of Alchemy in Newton's Thought* (Cambridge: Cambridge University Press, 1991), pp. 170–185. However, as Mandelbrote has pointed out, despite acknowledging a multiplicity of influences on Newton's alchemical practices, Dobbs' *The Janus Faces of Genius* still portrays the English natural philosopher as "a solitary adventurer in thought"; see Mandelbrote's insightful review of Dobbs' book in *The British Journal of the History of Science*, 1993, 26/4:491–493: 492. On Starkey's influence on Newton's alchemical practices, see Newman, *Gehennical Fire. The Lives of George*

have paid attention to the broader alchemical network of Newton, and to Newton's intense collaboration with Fatio, which probably began in the late 1680s, when the English natural philosopher met the young Genevan.[13]

Acknowledging that alchemy was performed as a shared endeavour, rather than as the solitary activity of a solitary genius, is central to examine how alchemical practices were the outcome of negotiations between multiple actors; if some of these actors were visible, such as Newton and his alchemical companion, Fatio, others – to use the expression of Steven Shapin – were invisible, and left little trace in the enormous Newtonian manuscript corpus. This is the case, for example, of the Jewish manual workers and servants who were hired to carry out the long digestions in the laboratory space of Fatio's alchemical partners and of who Fatio discusses in one of the extant draft letters to Newton (June 24, 1693), transcribed for the first time in this article. But we could also think of all those figures who – albeit unmentioned – were still fundamental presences in the production of alchemical knowledge, such as the suppliers of antimony, tin, lead and copper.

For example, the 24 June letter tells us that the antimony Fatio and his friend were employing in their alchemical experiments was English and definitely not of very high quality ("full of heterogeneous salts") in comparison with the "excellent" and purest French antimony which could be found in Holland.[14] This reference is important because it hints at the circulation of people and expertise in early modern Europe. As we will see in section 2 of this paper, Fatio's alchemical partner was a French-Huguenot, probably a certain Captain de Tegny, who fought in the army of William III in Flanders. He seemed to have practiced chymistry in a military context, preparing a remedy which was supposed to free the body from atrabile and which, according to yet another letter from Fatio to Newton (this time a known one dating May 18, 1693), he had successfully administered up to 10,000 people – very likely soldiers – back

Starkey, an American Alchemist in the Scientific Revolution (Chicago-London: The University of Chicago Press, 1995), pp. 228–243 (chap. 7). As to Snyders' influence on Newton, see Dobbs, *The Foundations of Newton's Alchemy or "The Hunting of the Green Lion"* (Cambridge: Cambridge University Press, 1975), pp. 168–169. Finally, on Sendivogius' influence, see Figala, "Newton's Alchemy," in *The Cambridge Companion to Newton*, edited by Bernard Cohen, George Smith (Cambridge: Cambridge University Press, 2004), pp. 370–385: 374–375.

13 Excepting for Newman, who dedicates a full chapter to the alchemical exchanges between the two in his new and monumental account *Newton the Alchemist* (cit. note 9), pp. 367–395 (chap. 17).

14 Fatio to Newton, London, June 24, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

in Holland.[15] In another letter to Newton, unfortunately undated and held in photocopy form in the British Library, Fatio mentions that Captain de Tegny owned some lands "in Poictou about Tegny, within three or four miles of a place where they dig out some excellent antimony."[16] That Tegny owned some lands in France is also confirmed in another unpublished draft letter from Fatio to Newton, dating May 29, 1693, and held at the Bibliothèque de Geneve (BGE), in which Fatio claimed that his friend "had left a good estate in France."[17] The same letter at the BGE also tells us that Fatio's friend relied on a network of retailers who would distribute his remedy to hospitals and soldiers: "He has given his remedy in some great hospitals of sick people and employed many hands at once to distribute it."[18]

The expertise of Fatio's friend in preparing medical remedies in an English-Dutch context, as well as the proximity of his lands to antimony mines in France, tells us that this person might have known how to assess the quality of the materials used to carry out alchemical experiments, and of antimony in particular. Also, it suggests that Tegny might have been able to compare the properties of materials in relation to their function in performing successful alchemical practices.[19] Finally, it tells us that he very likely knew about the

15 Fatio to Newton, London, May 18, 1693, in *NC*, Vol. 3, p. 269.

16 British Library (BL henceforth), RP 2692, fol. 1 verso. This letter – which I consulted in person – is held in photocopy form and consists of one folio. It is also quoted in Newman, *Newton the Alchemist* (cit. note 9), p. 384. My impression is that this is only the second part of a letter, given that it starts with a description of how to make a "1st lute," and almost seems to be structured as a treatise, especially given the style of Fatio's other letters to Newton, in which there are always references to previous correspondence or questions posed to him by the natural philosopher. Fatio's signature appears at the end. I believe the owner of this letter to be Gerald Alexanderson, at least he claims to have bought the original manuscript "from the venerable London bookseller Pickering and Chatto in 1984," in Alexanderson, "About the Cover: Isaac Newton, Fatio De Duiller and Alchemy," *Bulletin of the American Mathematical Society*, 2011, *48*/2:275–279, p. 278.

17 I have found out about this letter while reading Noémie Recous's article, "Scientific Passion and Religious Commitment in the Republic of Letters: Nicolas Fatio of Duillier (1664–1753)," Colloque annuel de la Commission Internationale d'Histoire et d'Etude du Christianisme, CISH, August 2015, Jinan, China; published and accessed online at https://halshs.archives-ouvertes.fr/halshs-01243058/document (accessed 20 Jun. 2019) The letter can be found at the Bibliothèque de Geneve (BGE), ms. fr. (manuscrits français) 602 f. 87 recto, and is part of the fond which collects Fatio's papers and *brouillards* (drafts): CH BGE ms. fr. 601–610.

18 Fatio to Newton, London, May 29, 1693, in BGE, ms. fr. 602 f. 87 recto (cit. note 17).

19 On materials and scientific expertise, and the production of hybrid knowledge, in between the practical and the theoretical, the artisanal and the scholarly, see Ursula Klein, Emma Spary (eds.), *Materials and Expertise in Early Modern Europe. Between Market and Laboratory* (Chicago-London: The University of Chicago Press, 2009), especially introduction,

network of French antimony "providers" in Holland, and possibly in England too and, more broadly speaking, that he valued antimony as central to both medicine and chemistry, echoing the Paracelsian tradition of chemistry providing the foundation of medicine.[20] All this does not only reveal the multiplicity of actors (as well as of materials) involved in the realisation of alchemical endeavours, but also brings to the fore a further question, of how expertise and skill could be defined in an alchemical context.[21] Alchemists embodied early modern artisanal culture, fostering, transmitting and appropriating forms of tacit knowledge which did not rely exclusively on the reading and translating of texts, manuals and procedural instructions, but also on the trained use of the human sensorium, and of sight in particular, in assessing experimental procedures.[22]

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pp. 1–23. More recently, see Simon Werrett, *Thrifty Science. Making the Most of Materials in the History of Experiments* (Chicago-London: The University of Chicago Press, 2019), pp. 1–14. See also Newman, *Newton the Alchemist* (cit. note 9), p. 384. However, while Newman points out that the reference to antimony mines "strongly suggests an alchemical context" (p. 384), a further research question to be asked here would be whether de Tegny held a military monopoly for the selling of his specific remedy in William III's Army. Research on medical monopolies in the seventeenth century, with a focus on France, is currently being done by Justin Rivest; see his *Secret Remedies and the Rise of Pharmaceutical Monopolies in France during the First Global Age* (PhD Diss., Institute for the History of Medicine, John Hopkins University, 2016).

20 On Paracelsus and how he was appropriated in England, for example, in the use of antimony in the early chemical studies of Robert Boyle, see Antonio Clericuzio, *Elements, Principles and Corpuscles. A Study of Atomism and Chemistry in the Seventeenth Century* (Dordrecht: Kluwer Academic Publishers, 2000), pp. 110–112. More broadly, on the French controversies on the use of antimony in medicine, as proposed by Paracelsus, see Didier Kahn, *Alchimie et Paracelsisme en France à la fin de la Renaissance (1567–1624)* (Geneva: Librairie Droz, 2007), pp. 20–22. However, Kahn points out that we should go beyond the *guerre de l'antimoine* to understand Paracelsus' reception in France in the fifteenth and seventeenth centuries (p. 20). See chap. 2.3 of Kahn's book for a better contextualisation, pp. 171–186.

21 This problem has been examined by Tara E. Nummedal from the point of view of the combination of "scholarly, artisanal and entrepreneurial forms of knowledge" and practices involved in carrying out alchemical experiments, of "words and works"; see Nummedal, "Words and Works in the History of Alchemy," *Isis*, 2011, *102*/2: pp. 330–337: 331. On the multiple forms of expertise and skills involved in alchemical practices see also Sven Dupré (ed.), *Laboratories of Art. Alchemy and Art Technology from Antiquity to the Eighteenth Century* (New York, Dordrecht: Springer, 2014), pp. vii–xvii. On the question of alchemical expertise and practices and of how they can help us understand chymical theories, see Lawrence Principe, William Newman, *Alchemy Tried in the Fire. Starkey, Boyle and the Fate of Helmontian Chymistry* (Chicago-London: The University of Chicago Press, 2002), pp. 14–15.

22 On the centrality of laboratory practice in seventeenth-century alchemy, see Principe, Newman, *Alchemy Tried in the Fire* (cit. note 21), p. 14; On the "material" aspects of alchem-

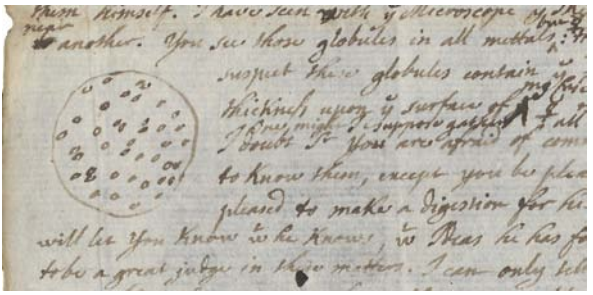

FIGURE 3 "The skin which is upon mercury," in Fatio to Newton, London, June 24, 1693
IN UBL, BPL 755 LACEPEDE//LUYKEN (RECTO)

The centrality of sight in order to perform the observation of alchemical phenomena emerges quite clearly in the 20 June letter from Fatio to Newton. In this document, Fatio sketched an image of the skin "upon mercury" and "its metallick reddish globules very closely joined one near another" as he thought to have seen them under the microscope.[23] The drawing can be found on the left margin of the recto of the folio sheet (Fig. 3). As we will see, the visual element, which here appears both as verbal description of vivid colours ("reddish globules") and as an image sketched in black ink by Fatio, functions as a way to reinforce and confirm Fatio's considerations on the process of metallic fermentation, a topic which also fascinated Newton at exactly that time and on which I will go back later in this essay: "I suspect these globules contain the metallick sulphur, the field in which they swim being as it were only a congealed metallick water. Their thickness upon the surface of my friends☿makes them perhaps to become a ferment for they are much thicker than in the mettals themselves."[24]

Even though it was common to integrate visual material in early modern alchemical writings, there are no known and published letters from Fatio to

ical knowledge as central to alchemical practices, see Pamela Smith, *The Business of Alchemy. Science and Culture in the Holy Roman Empire* (Princeton: Princeton University Press, 1994), pp. 7–9. On the role of human sensorium in the production of scientific knowledge, see Lissa Roberts, "The Death of the Sensuous Chemist: The 'New' Chemistry and the Transformation of Sensuous Technology," *Studies in History and Philosophy of Science*, 1995, *26*/4:503–529. On the cycle between "practical findings and textual accounts," see Jenny M. Rampling, "Transmuting Sericon: Alchemy as "Practical Exegesis" in Early Modern England," in *Chemical Knowledge in the Early Modern World*, special issue, *Osiris*, 2014, *29*/1:19–34.

23 Fatio to Newton, London, June 20, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

24 Ibid.

Newton in which the Genevan makes use of images. The fact that the drawing is itself part of Fatio's draft letter is per se revealing of the importance that Fatio, as a practitioner of alchemy, attributed to the ability of visualising, and thus, materialising knowledge of alchemical processes and events: in short, this image tells us about one among the many forms of expertise which were central to doing alchemy, that is, that of translating the abstract descriptions of materials and processes extrapolated from the alchemical corpus and laboratory accounts, into practical operations. Otherwise put, it highlights a tension between practices and theories, between experiments, observational practices and the identification of the laws regulating matter, as well as of the integration of text and images in the presentation of scientific knowledge, that is, the epistemic value of images.[25] More broadly, we could also interpret this image as an example of those strategies to make the invisible and corpuscular structure of matter visible to the human eye, and thus, less ephemeral, or as a way to transform the otherwise uncodifiable, almost incommensurable knowledge of the processes that Fatio saw into an object through which knowledge could be made accessible, and possibly be shared and transmitted to third parties.[26] In sum, Fatio used the medium of his sketch to transmit knowledge of the process of fermentation to a receiver, that is, Newton, in the context of their ongoing alchemical experimentations in summer 1693.[27] We will go back to Fatio's sketch in the fourth section of this essay which focuses on alchemical practices and knowledge. Meanwhile, we will shift attention to the specific individuals

25 On "visual argument" and epistemic images, see Sachiko Kusukawa, *Picturing the Book of Nature. Image, Text and Argument in Sixteenth-Century Human Anatomy and Medical Botany* (London-Chicago: The University of Chicago Press, 2012), pp. 24–25. On the use of images as a form of rhetoric, see also Alexander Wragge-Morley, "'Vividness' in English Natural History and Anatomy, 1650–1700," *Notes and Records of the Royal Society*, 2012, *66*/4:341–356. See Lüthy, "The Invention of Atomist Iconography" (cit. note 8), pp. 117–138.

26 The problem of how to train sensory experience in the making of natural knowledge was quintessential to seventeenth-century empiricism, and a preoccupation which was shared by contemporaries of Fatio and Newton, such as Robert Boyle, himself interested in alchemy. On the theme and strategies for making visible the invisible and its natural-philosophical and theological implications, see Alexander Wragge-Morley, "Robert Boyle and the Representation of Imperceptible Entities," *The British Journal for the History of Science*, 2018, *51*/1:17–40. On the role of alchemical practices in the development of mechanical philosophy, see William R. Newman, *Atoms and Alchemy. Chymistry and the Experimental Origins of the Scientific Revolution* (London-Chicago: Chicago University Press, 2006), pp. 4–5.

27 On this process of knowledge transmission, see Richard Scholar, "Introduction," in *Transmitting Knowledge: Words, Images and Instruments in Early Modern Europe*, edited by Sachiko Kusukawa, Ian Maclean (Oxford: Oxford University Press, 2006), pp. 1–10: 4.

who were collaborating on alchemical subjects with Fatio and Newton between June and August 1693, as they emerge from the Leiden folio.

3 Fatio's "Friend": Trust and Secrecy

In his recent book on Newton as an alchemist, Newman points out the role played by a "friend" of Fatio in the running of alchemical experiments. He uses this figure to shed further light on the practice of Newtonian alchemy as a shared endeavour, as well as to clarify some alchemical practices described by Fatio in his published letters to Newton in the *NC*. That Fatio was acquainted with someone who was particularly skilled at preparing a menstruum, or corrosive solvent – probably a special mercury which passed through various stages of distillation – is something that literature has known for many years. Yet, scholars have elaborated very little on the collaboration between Fatio and his friend, probably because of the absence of further extant sources documenting and contextualising it.[28]

Preliminary information regarding Fatio's friend and the alchemical practices he carried out in London can be gathered from two published letters from Fatio to Newton dating May 4 and 18, 1693.[29] In both these letters, Fatio reports on the chymical procedures to make the special mercury at the foundation of a very powerful medical remedy produced by this notorious friend of his. Fatio's friend re-emerges as an "active player," to use Newman's words, in the letter sent from Fatio to Newton on August 1, 1693, which is currently held at the Clark Library at UCLA, and which is also extant, in draft form, in the Leiden folio at the centre of this article.[30] I will not focus extensively on this letter because Newman already gives an exhaustive analysis of it. Suffice is to say that in this letter Fatio portrays his friend as an active participant in the context of his alchemical endeavours. This is confirmed by the first section of the letter, which consists

28 I have used the definition of "menstruum" as it appears in the section "alchemical glossary" on the website *The Chymistry of Isaac Newton*: http://webapp1.dlib.indiana.edu/newton/reference/glossary.do (accessed 21 Jan. 2019). See also the entry "menstruum" in Martin Ruland, *Lexicon Alchemiae* (Frankfurt: a cura ac sumtibus Zacariae Palthenii, librarii ac D., 1612), p. 331.

29 Fatio to Newton, May 18, 1693, in *NC*, Vol. 3, p. 269; also referred to in Newman, *Newton the Alchemist* (cit. note 9), p. 374. See also Fatio to Newton, May 4, 1693, in *NC*, Vol. 3, pp. 265–266.

30 I have not seen the letter at the Clark Library (MS F253 L 1693) but I have compared Newman's transcription of the alchemical section with the same section in the draft letter in the Leiden folio (verso).

of a Latin transcription of a series of alchemical operations to make a vitriol. This Latin text had been apparently sent from Newton to Fatio so that he could translate it into French to make it accessible to his friend: "[…] I had translated into French the paper that was for my friend, he saw that in one part of the operation there was a vitriol made, but it is not said afterwards to what purpose, and he desired to have it explained."[31] It is from this letter that Newman infers that Fatio's friend was a French-Huguenot, probably part of William III's Regiment in Flanders and bound to forced and long absences from his laboratory in London. It is worth reporting the passage used by Newman in his book, and which we can here extrapolate from the – slightly different – 1st August draft letter on the verso of the Leiden folio:

> My friend has been [again interrupted, &] obliged to go to a second time to his Regiment. They have now orders to be in a readiness in case they should be sent for from Flanders. So that it will be winter before I can [begin to] learn the preparation of his Remedy.[32]

As we will see, the absences of Fatio's friend represented significant hindrances to the success of his alchemical experiments and upset Fatio who hoped to learn how to make his friend's remedy as soon as possible. Taking into account the three other letters presented in this article, which date June 10, 20, and 24, 1693, we can confirm Newman's hypothesis on the social and religious identity of Fatio's friend, and shed light on further aspects which have been hitherto ignored.

Let's start from Fatio's letter to Newton dating June 10. In this document, Fatio makes quite a direct reference to his friend being known among the "French refugees." The same letter also offers us some more detailed information about the age of Fatio's friend, "between 30 and 40," his character, apparently not "airy and gay as the French have generally theirs" but "much more serious and thinking," as well as his social circle, which included French Huguenots close to William III such as "the Duke of Leinster and Mr Galloway, who are French men as you know and have some commands in the King's Army."[33] As we hinted earlier, we know from Newman's analysis of the undated British

31 Fatio to Newton, August 1, 1693, in UBL, BPL 755 Lacepede //Luyken (verso).

32 Fatio to Newton, August 1, 1693, in UBL, BPL 755 Lacepede//Luyken (verso). Quoted in Newman, *Newton the Alchemist* (cit. note 9), p. 383. However, Newman's quote is from a different physical document, that is the Clark Library letter (see above), which is the final version of the letter transcribed in the present article.

33 Fatio to Newton, London, June 10, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

Library letter from Fatio to Newton, that Fatio's friend might have been Captain de Tegny, that he was married to a sister of a certain Monsieur de Grancey and that he had been part of Colonel du Cambon's Regiment.[34]

This hypothesis seems to be more than confirmed if we look at the June 10 letter, in which Fatio uses the epithet of "Captain," at the same time giving us a further indication regarding the good reputation of this sharer of alchemical secrets among French Huguenots such as Galloway and the Duke of Leinster. Following Fatio's hint of French nationality we can also advance the hypothesis that "Galloway" was a misspelled version of the French Huguenot Henri de Massue who was made Earl of Galway by William III of England in 1693. This hypothesis is further consolidated if we consider the other figure Fatio mentions, the Duke of Leinster. The Duke of Leinster's original name was Meinhard Schomberg; he had been made Duke of Leinster in June 1690, and was one of William III of Orange's favourites. He had also collaborated with the Huguenots' engineer, Colonel du Cambon, in planning to invade Dunkirk, a design which would never be brought to completion.[35] The reference to Cambon in Fatio's letter to Newton in the British Library, and the fact that Fatio's friend was frequenting Cambon's same circles, as evidenced in the Fatio's folio, seems to suggest that Newman's hypothesis is correct. I will report an entire passage from the 10 June letter here:

> My friends age is between 30 and 40. His temper is not so airy and gay as the French have generally theirs, but he is much more serious and thinking. He has no interest at Court, but he is both esteemed and beloved by the Duke of Leinster and Mr Galloway #[36] who are French men as you know and have some commands in the King's Army. He has among the French the reputation of a very good and most upright man.[37]

34 Newman, *Newton the Alchemist* (cit. note 9), pp. 384–385.

35 The Earl of Galway has been the subject of recent scrutiny in Maria M. Léoutre, *Serving France, Ireland and England: Ruvigny. Earl of Galway 1648–1720* (London: Routledge, 2018); as to the Duke of Leister, see the essay by Matthew Glozier, "Schomberg, Miremont and Huguenot Invasions of France," in *War and Religion after Westphalia, 1648–1713*, edited by David Onnekink (London-New York: Routledge, 2016), pp. 137–170: 137–139.

36 This is an addition to the letter by Fatio himself: "Yet he despises much the Ministers and knows their craftiness. He has had some of them very often against him. And that only because he did oppose to the utmost of his power some unjust designs of theirs." It can be found straight below the letter on the recto of the folio (see the transcription at the end of this article).

37 Fatio to Newton, London, June 10, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

These references are fundamental since they tell us that both Fatio and his friend were part of a network of "highly-ranking" Huguenots, all more or less directly involved in William of Orange and Queen Mary's continuous project of reinforcing political power in England and on the European scenario through the support of Protestant – as well as Catholic – countries and in open opposition to the King of France Louis XIV.

More broadly, the significance of these passages stands in Fatio's attempt to build his friend's authority in alchemical subjects, in view of establishing a relationship of mutual trust between him and Newton. The tone of the 10 June letter seems to presuppose that Newton had previously asked some questions about this person in order to assess his aptitude to secrecy and suitability to share alchemical knowledge. This is confirmed from the very first lines of the 10 of June letter, in which Fatio assured Newton that no, his friend has never had anything to do with Boyle or other chymical practitioners:

> My friend, has, I think, never been acquainted at all with Mr Boyle, at least he has no particular acquaintance with him. He knoweth here a French minister that studys Chymistry, but they very seldom are together, neither he is very free to communicate with him. He has no other chymical acquaintance, and avoids them carefully.[38]

Fatio's reference to Boyle in the first line is important because it reminds us of the known and well-documented competition between Boyle and Newton in alchemical subjects.[39] In fact, this very sentence sounds as if it was a reply to another letter which Newton sent to Fatio, in which – we can speculate – the naturalist must have expressed his concern regarding Fatio's and his friend's chymical acquaintances.

This is not surprising, if we also take Fatio's May 4 letter, in which the Genevan tells Newton that he doesn't know Dr Le Moine but that he has however met him "at Mr Boyle's."[40] It is likely that Fatio's revelation to have been visiting Boyle prompted Newton's question regarding the social circles of Fatio's

38 Ibid.

39 For Boyle's chymical practices and his attitude of concealing information from Newton, see Lawrence Principe, *The Aspiring Adept. Robert Boyle and his Alchemical Quests* (Princeton: Princeton University Press, 1998), pp. 178–179. For a comparative study of the alchemical practices of Boyle and Newton, see Id., "The Alchemies of Robert Boyle and Isaac Newton. Alternate Approaches and Divergent Deployments," in *Rethinking the Scientific Revolution*, edited by Margaret J. Osler (Cambridge: Cambridge University Press, 2000), pp. 201–220.

40 Letter from Fatio to Newton, London, May 4, 1693, in *CN*, Vol. 3, p. 266.

friend, probably in a lost letter sent in-between Fatio's 4 May and 10 June letters. Of course, Boyle was already dead in 1693, but this did not prevent Newton from manifesting his preoccupation regarding the involvement of potential third parties who were acquainted with the then celebrated fellow of the Royal Society and perhaps took part in his alchemical quests. After all, Newton had already made clear his distrust of Boyle for "conversing wth all sort of people & being in my opinion too open & too desirous of fame" in a letter he had sent to Fatio back in 1689.[41]

In yet another passage in the 10 June letter we find Fatio reassuring Newton that his friend was quite secretive, especially in relation to the "Courtiers" whom he despised "as a crafty and wicked sort of men."[42] Fatio also highlighted his friend's discretion with regard to alchemical practices which had been developed and performed by third parties. Basically, Fatio was telling Newton that he could trust his friend and argued that "he may be something free about the things which only relate to himself, yet he is exceedingly reserved in such matters in which another is concerned."[43] Finally, the 10 June letter provides us with information on the alchemical contacts of Fatio's friend: a minister of the Church, probably another Huguenot who very likely lived in London, and an Adept who he had not seen for four years and who seemed to have advised Fatio's friend "to only study of Astrology."[44] The Adept is not a totally new figure since he already appears in the published 18 May letter from Fatio to Newton, as the chymical practitioner who gave Fatio's friend "the first inlet to the highest Chimistry and one preparation of a☿by wch the putrefaction of most mineral bodies becomes easie."[45] This figure emerges once more in one of the letters presented in this article (24 June), in which Fatio explicitly mentions the Adept, "who often smiled when he saw how my friend did perform the hard tasks he gave him now and then."[46] It also makes an appearance in another draft letter from the Genevan to Newton, dating May 29, 1693. In this letter, Fatio's friend is said to have been "acquainted [in France] with an Adept that loved him extreamely and kept for a while a correspondence with him and did do what he could to engage him to travel with him."[47]

41 Letter from Newton to Fatio, Cambridge, October 10, 1689, in *CN*, Vol. 3, p. 45. Also quoted in Principe, *The Aspiring Adept* (cit. note 39), p. 178.

42 Letter from Fatio to Newton, London, June 20, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

43 Fatio to Newton, London, June 10, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

44 Ibid.

45 Fatio to Newton, London, May 18, 1693, in *CN*, Vol. 3, p. 268.

46 Fatio to Newton, London, June 24, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

47 Fatio to Newton, London, May 29, 1693, in BGE, ms. fr. 602 f. 87 recto (cit. note 17).

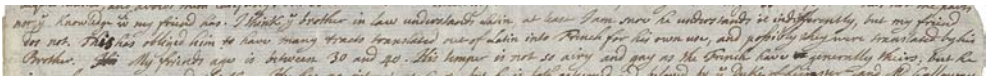

FIGURE 4 Fatio to Newton, London, June 10, 1693
IN BPL 755 LACEPEDE//LUYKEN (RECTO)

Fatio's friend was clearly not alone in his alchemical pursuits, and this obviously concerned Newton. This must have been one of the reasons why Newton cautiously kept using Fatio as a broker between himself and this alchemical friend, exchanging and communicating knowledge from the safe distance of Trinity College at Cambridge, and dismissing, albeit implicitly, all of Fatio's invitations to come visit him in London. As far as we can establish on the basis of the documentary evidence available, Newton does not seem to have ever met Fatio's alchemical partner. Before moving to examine the alchemical references in the letters presented below, we will briefly focus on yet another participant in Fatio-Newton's chymical practices, a relative of Fatio's friend, namely, his brother in law.

4 A Family Business? The Brother in Law of Fatio's Friend

The brother in law, at times referred to simply as "brother" by Fatio, is a figure which recurs throughout the three June letters in the Leiden folio (Fig. 4);[48] despite being evoked as a sort of manual helper, lacking alchemical training, the brother in law was also an active and physical presence in the laboratory of Fatio's friend, substituting him whenever he had to leave to join his Regiment: "His brother in law is exceedingly discreet, and a good and diligent artist, but he has not the parts nor the knowledge which my friend has."[49]

On the basis of the photocopy of the undated letter from Fatio to Newton held at the British Library, we could provisionally identify this figure with Monsieur de Grancey.[50] In this letter, Fatio argues that Captain De Tegny "marryed one Monsieur de Grancey's sister."[51] It might be tentative, but not impossible that Monsieur de Grancey was the fourth person involved in the making of alchemical experiments, the brother in law Fatio talks about. From a close

48 In two occurrences (June 10 and 20) Fatio uses the term "brother" – I assume it is only a short version of "brother in law," since I could not find further evidence of yet another person being involved in Fatio-Newton's alchemical endeavours.

49 Fatio to Newton, London, June 10, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

50 BL, RP 2692, fol. 1 verso; also quoted in Newman, *Newton the Alchemist* (cit. note 9), p. 384.

51 Newman, *Newton the Alchemist* (cit. note 9), p. 384.

reading of Fatio's draft letter to Newton of May 29 (held in the BGE), we can indeed claim that Tegny married into a family with alchemical "connections," as Fatio's following words seem to suggest: "Since he [De Tegny] was marryed he was acquainted in France with an Adept."[52] Also, on the basis of the letter of June 10, we can almost certainly advance the hypothesis that the brother in law was also French, and probably from a higher social background, because Fatio reveals that he might have been the person translating Latin tracts into French for his friend, Captain de Tegny:

> I think the brother in law understands Latin, at least I am sure he understands it indifferently, but my friend does not. This has obliged him to have many tracts translated out of Latin into French for his own use, and possibly they were translated by his brother.[53]

Being able to read Latin, and thus alchemical instructions written in that language, made the brother in law somehow independent in the running of alchemical experiments. At least this must be the case to some extent as in a later letter, dating June 24, 1693, Fatio also mentions that the brother in law would sometimes get stuck when left alone to attend alchemical experiments:

> His brother in Law can not do the same, for thô the Captain when he goes to his Regiment leaves him in writing as particular instructions as he can yet he soon is stopped in the execution not knowing how to overcome the difficultys which are unavoidable in the practice.[54]

These are all important points, because they question what has been thought so far, on the basis of the 1st August letter, that Fatio was the only one who translated alchemical tracts into French for his friend and because they would suggest different and so-far undisclosed further levels of participation in what was a collective endeavour. Scholarship has recently revived an interest in the practice of translating scientific texts, "as the process by which science and knowledge are transferred from one place to another, more often than not, being altered in the process" to put it in the words of Sven Dupré, and in the figure of the translator as a cultural go-between, mediating between separate models of knowledge and practices.[55] In our specific case, Fatio and the

52 Fatio to Newton, London, May 29, 1693, in BGE, ms. fr. 602 f. 87 recto (cit. note 17).
53 Fatio to Newton, London, June 10, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).
54 Fatio to Newton, London, June 24, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).
55 Sven Dupré, "Introduction: Science and Practices of Translation," in *Translating Science*

brother in law played the role of go-betweens, translating alchemical passages from Latin into French, thus allowing the Captain to access a knowledge which would otherwise remain unattainable. However, we should probably add that this was not an unequal exchange of knowledge. The Captain benefited from the pair's translation, while Fatio and the brother in law gained in terms of knowledge of those procedures regarding the transmutation of metals of which he seemed to be the most credible depositary.[56]

This trading of diverse cultures of knowledge between the three alchemical fellows – the Captain as the depositary of alchemical, practical knowledge transmitted to him by an Adept, his brother in law and Fatio as the Latin "experts" – reveals the various hitherto invisible threads which animated the space of the Captain's laboratory. Using Pamela Long's terminology, we could perhaps define the Captain's laboratory as a trading zone, "the arena in which the learned taught the skilled, and the skilled taught the learned, and in which the knowledge involved in each arena was valued by both kinds of 'traders.' "[57] However, the abovementioned figures – the Captain, Fatio and his brother in law, and the absent, although evoked through his past instructions and teaching practices, Adept – were not the only persons physically present in the Captain's laboratory. The letters in the Leiden folio also shed light on the employment of Jews to help Fatio's friend and his brother in law to carry out long digestions while they were both away: "I cannot but mention to you that he spoke to me of ~~using~~ employing some Jews as the best way to make an advantage of the science."[58] Unfortunately, we cannot say that much about this single mention of Jewish participants in the alchemical practices of Fatio-Newton and these

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over Time, special issue, *Isis*, 2018, *109*/2:302–307, p. 303, and the bibliography provided; more broadly on translation in science, see also the recent Sietske Fransen, Niall Hodson, Karl A.E. Enenkel (eds.), *Translating Early Modern Science* (Leiden: Brill, 2017), pp. 1–14. On translation as a process which springs from the situatedness of knowledge, see Sven Dupré, Harold Cook (eds.), *Translating Knowledge in the Early Modern Low Countries* (Zürich: LIT, 2012), pp. 3–17. On translation as a cultural practice see Peter Burke, Ronnie Po-chia Hsia (eds.), *Cultural Translation in Early Modern Europe* (Cambridge: Cambridge University Press, 2007).

56 On translation as a form of "exchange of knowledge," see also Sietske Fransen, *Exchange of Knowledge Through Translation: Jan Baptista Van Helmont and His Editors and Translators in the Seventeenth Century* (PhD Diss., University of London, 2014), pp. 15–25.

57 This expression was coined by Peter Galison in "Trading Zones: Coordinating Action and Belief," in *The Science Studies Reader*, edited by Mario Biagioli (London: Routledge, 1999), pp. 781–844; however, in the present context, I use it as it appears in Pamela Long, *Artisans/Practitioners and the Rise of the New Sciences 1400–1600* (Oregon: Oregon State University Press, 2011), p. 95.

58 Fatio to Newton, London, June 24, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

other parties. Nonetheless, this is a precious and probably rare reference, which could possibly open new paths of future investigation regarding the expertise of the Jewish community in London (mostly a Sephardic/Portuguese community of merchants), their interaction with Huguenots and their material and practical contribution to the production of chymical and experimental knowledge in seventeenth-century England.[59] More broadly, this textual reference recalls the function of the old but still relevant trope – identified by Steven Shapin – of "invisible technicians," of those figures which have been neglected by the historiography not in virtue of an ideological choice (or not exclusively), but mostly because of the "silence" of archives in retrieving detailed information on the "hands" who built instruments, put them in motion, provided materials and lighted fires and who – nonetheless – actively contributed to the production of scientific, in this case alchemical, knowledge.[60] The next and last section of this paper will be dedicated to explore precisely the knowledge that was generated and the practices which were at stake in the Captain's laboratory.

5 Alchemical Knowledge: Sophic Mercury, Metallick Sulphur and the Ferment of Metals

Besides helping us in the reconstruction of Newton's alchemical network, on which this article presented some preliminary findings, these documents also shed light on different aspects of alchemical knowledge, from its secretive nature, to Fatio's references to the Captain's lack of knowledge of "the ancient figures of the heathen Gods" or "the figures of Abraham the Jew," from the alchemical corpus which was at the foundation of Fatio's and Newton's experiments, to the preparatory practices which would finally lead to the making of the Philosophers Stone.[61]

The first problem which we should address is the identification of the alchemical procedures from the two succinct passages in Fatio's letter dating June 20,

59 On the migration of Sephardim from Holland to London, and the mediation of the Dutch merchant Joseph de La Penha, see Todd M. Endelman, *The Jews of Georgian England 1714–1830. Tradition and Change in a Liberal Society* (Ann Arbor: The University of Michigan Press, 1999), p. 167. For the engagement of Jewish merchants in the international trade (and the trading of wrought copper and tin), see Maurice Woolf, "Foreign Trade of London Jews in the Seventeenth Century," *Transactions & Miscellanies* (*Jewish Historical Society of England*), 1970–1973, *24*:38–58.

60 The terms "invisible technicians" comes of course from Steven Shapin's classical article "The Invisible Technician," *American Scientist*, 1989, *77*/6:554–563.

61 Fatio to Newton, London, June 20, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

1693. We should probably begin from a line in which Fatio seems to reply to Newton's queries regarding his and his collaborators' alchemical endeavours:

> To the questions in your first letter I have had only this answer that if by ♃ was meant ♁ or a Regulus of ♁ the terms in which the questions were expressed did pretty well agree with the preparations they have been busy about.[62]

Although it is hard to retrieve the exact procedure Fatio refers to in this passage, we could focus on two central points to advance some hypotheses. The first one is precisely that Fatio is replying to one of Newton's questions, likely posed by him in one of his previous – now lost – letters. From the way Fatio's reply is phrased, we can infer that Newton was asking the meaning of the alchemical symbol of tin ("♃") in the context of probably yet another letter or description of chemical procedures written by one of Fatio's collaborators. This tells us about the frequency of the Fatio-Newton epistolary exchange, which we can also derive from the fact that Fatio himself mentions – at the beginning of his letter – two more letters he received from Newton, on June 15 and 17. Fatio's passage also presents the subject "they" which very likely refers to Fatio's alchemical companions reporting an answer to Newton, and which further underlines Newman's hypothesis that Newton's alchemical practices were a shared endeavour.

The second one is the reference to the Regulus of antimony in relation to tin. A Regulus of antimony was reduced metallic antimony, that is, antimony refined from a sulphide ore, otherwise known as Star Regulus, or Regulus Stellate. The making of it involved a procedure which was central to Starkey's *Clavis* – a text part of which originally appeared in the form of a letter from Starkey to Boyle (1651) and which Newton had transcribed in Latin and used – and that for this reason had been attributed to him by the literature until the late 1980s.[63] In the context of Starkey's alchemical corpus, antimony had the very specific function of purifying quicksilver, a process which was key to the decomposition of gold into sulphur, salt and mercury, and which would even-

62 Ibid.

63 For an explanation of why *Clavis* was eventually attributed to Starkey, see William Newman, "Newton's Clavis as Starkey's Key," *Isis*, 1987, *78*/4:564–574. For a further contextualisation, see William Newman, Lawrence Principe (eds.), *George Starkey, Alchemical Laboratory Notebooks and Correspondence* (Chicago: The University of Chicago Press, 2004), pp. 12–13. In Newton's manuscript corpus, this letter appears in his handwriting in Keynes 18 in King's College Library, Cambridge University.

tually lead to the production of the Philosophers Stone.[64] It is again in relation to Starkey that we can understand what Fatio referred to when bringing tin into the picture. Although such a scarce reference makes it far from evident, it is possible that the procedure which the alchemical group was trying to carry out was the one described in Starkey's *The Marrow of Alchemy* (1654–1655), and which was centred – as Newman points out – on the distillation of the sophic (or philosophical) mercury "from alloys of metallic antimony, silver, copper, lead or tin."[65] If this was the procedure at stake, it overall referred to reducing stibnite into a Regulus of antimony through the use of iron, a problem which Newton had already encountered in the 1670s, when he was reading Starkey's *Marrow*. This would also explain Fatio's previous mention of a "metallick sulphur," which appears a few lines earlier than the reference we have just tried to analyse, in a sort of short alchemical laboratory report to be found in the same letter:

> I have seen with the microscope the skin which is upon their ☿. It is pretty thick and containes a great many metallick reddish globules very closely joined one ~~to~~ upon another. You see those globules in all mettals but ☿ but much upon ⟪illeg⟫ They seem in mettals to be inserted in an even and homogeneous field which composes by far the chiefest substance of the metal at least for quantity. I suspect these globules contain the metallick sulphur, the field in which they swim being as it were only a congealed metallick water. Their thickness upon the surface of my friends ☿ makes them perhaps to become a ferment for they are much thicker than in the mettals themselves.[66]

In terms of alchemical tradition, sulphur was one of the two principles which constituted – albeit in different proportions – all metals, the other one being mercury.[67] In Starkey's conception, it was also one of the key components in the making of sophic mercury, together with antimony. Fatio's observations concern crucial phases of the making of sophic mercury, in particular the moment in which metallic sulphur is added to mercury through iron. If this was the

64 On Starkey and his interest in antimony, see Newman, *Newton the Alchemist* (cit. note 9), p. 25. See also Principe, *The Aspiring Adept* (cit. note 39), pp. 154–160. See also Newman, Principe, "Alchemy and the Changing Significance of Analysis," in *Wrong for the Right Reason*, edited by Jed Z. Buchwald, Allan Franklin (Dordrecht: Springer, 2005), pp. 73–89: 83–84.

65 Newman, *Newton the Alchemist* (cit. note 9), p. 199.

66 Fatio to Newton, London, June 20, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

67 On the sulphur-mercury theory, see chap. 2 in Lawrence Principe, *The Secrets of Alchemy* (Chicago: Chicago University Press, 2013), especially pp. 35–37.

procedure involved, it would also explain Fatio's emphasis on the process of fermentation and, more specifically, on the transformation of metallick globules into "a ferment," that is, into active agents, in the last line of his report.[68] According to Fatio, these globules might contain the sulphur of the iron used to congeal and thick mercury. Metallic sulphur would in fact animate mercury, thicken its surface which would then begin to show – under the lens of a microscope – the "metallick and reddish globules."[69] If this is the correct experimental context for Fatio's report, then "water" might be a *Deckname* for sophic mercury, which was called "water" by Starkey in his *Secrets Revealed* (1669), another text Newton and, judging from the references, possibly Fatio too were familiar with.[70]

What is central in Fatio's report is however not only the key procedures he describes, at the centre of chrysopoeia, but also the intellectual tools and scientific categories he uses in his description as well as the hypothetical nature of his observations. When reporting on the structure of metals through the aid of a microscope, Fatio uses the term "metallick reddish globules" and advances the hypothesis ("I suspect") that they contain the metallic sulphur. The reference to the red colour evokes the broader epistemic function of colours in chrysopoeian processes, and in the works of Starkey in particular, as signs marking the stages of procedures, as well as their success or lack thereof.[71] The term "globules" is particularly central, probably referring to Starkey's corpuscular theory in the context of chrysopoeia, and thus allowing us to further frame Fatio's and Newton's alchemical practices.[72]

68 On ferments and fermentation in the seventeenth century, see Antonio Clericuzio, "Mechanism and Chemical Medicine in 17th-Century England: Boyle's Investigation of Ferments and Fermentation," in *Early Modern Medicine and Natural Philosophy*, edited by Peter Distelzweig, Benjamin Goldberg, Evan Ragland (Dordrecht: Springer, 2016), pp. 271–294.

69 Fatio to Newton, London, June 20, 1693, in UBL, BPL 755 Lacepede//Luyken (recto). For a description of the role of iron in the making of the Regulus of antimony according to Starkey, see Newman, *Gehennical Fire* (cit. note 12) p. 129.

70 For the analogy between sophic mercury and water as vivifying principle, see Principe, *The Secrets of Alchemy* (cit. note 67), p. 163. Fatio's passage also echoes the language used by Philalethes in a section on how to make sophick mercury Starkey, *Secrets Reveal'd or; an Open Entrance to the Shut Palace of the King* (London: William Cooper, 1669), pp. 4–5 (for the reference to water) and 21–23 (*On the sulphur which is sophical mercury*).

71 Starkey, *Secrets Reveal'd* (London, 1669), pp. 80–117 (cit. note 70). For colours as marking various stages of the production of the Philosophers Stone and for a focus on the alchemical meaning of the red colour, see Principe, *The Secrets of Alchemy* (cit. note 67), pp. 123–125. For a broader view on colours in early modern English chymistry and natural history, see Anna Marie Roos, "The Saline Chymistry of Colour in Seventeenth-Century English Natural History," *Early Science and Medicine*, 2015, 20/4–6:562–588.

72 Literature on corpuscular theories in seventeenth-century England is enormous. As to cor-

As explained by Newman, Starkey had developed a corpuscular theory of metals, and had claimed – in line with the sulphur-mercury theory – that all metals are constituted not only by mercury, but also by three different forms of sulphur, the external and impure sulphur, "which only causes corruption and corrosion in the base metals," the metalline sulphur which solidifies metals and, finally, the central and incoagulable sulphur "which can never be separated from his mercury."[73] Since Starkey also characterised this last type of sulphur as red in colour, were Fatio's "reddish globules" which contain "the metallick sulphur" examples of the metalline or perhaps preliminary phases of the incoagulable sulphur? The answer probably lies in Starkey's description of the preparation of sophic mercury in his *Clavis*.

The peculiarity of this process stands in the use of iron (and of the sulphur it contains), as well as silver. According to Starkey, iron would be employed to purify antimony thus producing the Regulus of antimony, or Regulus Stellate, which would then be amalgamated with mercury. Since the Regulus of antimony contained impure sulphur, the all preparation needed to go through a further step, that is, the addition of silver, whose function was to liberate the sulphur contained in the Regulus from its external and impure parts, thus revealing its incoagulable nucleus, or "fiery suphur." This combination of antimony, mercury and silver would be called "animated mercury."[74] However, to realise sophic mercury, another passage would be needed, that is, the addition of the ferment of gold, the purest red sulphur of gold, or *semina*, which would

puscularism in chymistry, see Clericuzio, *Elements* (cit. note 20), especially chaps. 3–4; for a criticism of Clericuzio's approach to Boyle, and especially his view on a corpuscular, rather than mechanical chemistry, see Newman, *Atoms and Alchemy* (cit. note 26), pp. 178–182. On Newton's chemistry and its connection with Starkey, see Newman, "The Background to Newton's Chymistry," in *The Cambridge Companion to Newton*, edited by Bernard Cohen, George Smith (Cambridge: Cambridge University Press, 2004), pp. 358–369: 363–367 in particular. More specifically, on atomist or "globular" iconography, which could be interesting to conduct further research on Fatio, see Lüthy, "The Invention of Atomist Iconography" (cit. note 8).

73 Newman, *Gehennical Fire* (cit. note 12), p. 162. On sulphur/sophical mercury, see Starkey, *Secrets Reveal'd* (cit. note 70), pp. 21–23. Newman especially elaborates on Starkey's corpuscular theory (and his explanation of the three types of sulphur) in his *Epistle to King Edward Unfolded* (1655), in Newman, "The Corpuscular Transmutational Theory of Eirenaeus Philaletes," in *Alchemy and Chemistry in the 16th and 17th Centuries*, edited by Piyo Rattansi, Antonio Clericuzio (Dordrecht: Springer, 1994), pp. 167–168. On semina and fermentation, see also Id., "The Corpuscular Theory of J.B. Van Helmont and its Medieval Sources," *Vivarium*, 1993, *30*/1:161–191.

74 This procedure is described very clearly in Newman, "The Corpuscular Transmutational Theory" (cit. note 73), p. 177. On animated mercury in Boyle's chemistry, see also Principe, *The Aspiring Adept* (cit. note 39), pp. 174–179.

then be penetrated by animated mercury, representing the first stage of the making of the Philosophers Stone. In addition to his verbal description, Fatio attempted to depict the globules on the surface of mercury, thus making visible a crucial experimental phase, likely the very process of transformation of mercury into sophic mercury, the phase in which the "metallick reddish globules" would get thicker and "become a ferment", ready to penetrate gold and possibly conclude the chrysopoeian process.[75]

We know that both Fatio and Newton were interested in fermentation in the 1690s, and that Newton interpreted fermentation as the hidden and fundamental force of nature, comparable to gravity, as it is attested by the *Query 31* of *Opticks*.[76] As Dobbs pointed out, although it is hard to understand the filiation of Newton's thoughts on this subject, it is possible that he was influenced by Van Helmont, and possibly also by Thomas Willis, who conceived fermentation in a corpuscular fashion, as "an intestine motion of particles" as well as Leibniz, for whom it was the active action of aether on matter.[77]

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75 For the sake of precision, it must be added that even though Starkey seems to be the main reference in the passage under consideration, there is no reference to the function of silver in Fatio's report.

76 Procedures similar to those carried out by Fatio can be found in Newtonian manuscripts such as King's College Library, Cambridge, Keynes MS. 58, fol. 2 recto. See transcription in *The Chymistry of Isaac Newton*, edited by William R. Newman, 2011, available at http://purl.dlib.indiana.edu/iudl/newton/ALCH00047 (accessed 14 Feb. 2019); this manuscript, Dobbs claims, is indebted to Snyders' *Tractatus De pharmaco catholico*, a work which appeared anonymously as part of *Reconditorium ac Reclusorium Opulentiae sapientiaeque Numinis Mundi Magni* (Amsterdam, 1666) otherwise known as *Chimica Vannus*; see Dobbs, *Foundations of Newton's Alchemy* (cit. note 12), p. 168; more important is perhaps Cambridge University Library, Cambridge University, Portsmouth Add. MS. 3973, fol. 12 verso. See transcription in *The Chymistry of Isaac Newton*, edited by William R. Newman, 2006, available at http://purl.dlib.indiana.edu/iudl/newton/ALCH00109 (accessed 14 Feb. 2019), in which there is evidence of Newton's fermentation experiments, especially with the Regulus of Antimony and mercury.

77 See Dobbs, *The Janus Faces of Genius* (cit. note 12), p. 50, quoting from Willis' *Diatribae Duae Medico-Philosophicae* (London, 1659). Dobbs also transcribed Newton's Ms Add. 3973.8 ("Experiments and Observations Dec. 1692 Jan. 1692/3"), a text which details a series of experiments on mineral fermentation, and which is reproduced as Appendix D (pp. 288–292). Newman also uses Willis as a reference to situate Newton's conception of fermentation; see Newman, *Newton the Alchemist* (cit. note 9), p. 471. However, it is disputed whether Newton embraced Willis' ideas on fermentation or was influenced by other authors, such as Michael Sendivogius, George Starkey and John Mayow, as Newton's *Index Chemicus* (Cambridge University, King's College Library, Keynes MS. 30/5) seems to suggest. See a transcription of the *Index* in *The Chymistry of Isaac Newton*, edited by William R. Newman, 2011, available at: http://purl.dlib.indiana.edu/iudl/newton/ALCH00202 (accessed on July 23, 2019). On Newton's *Index Chemicus*, see Anna Marie Roos, *The Salt*

Although the references to Starkey are clear, Fatio's report also seems to semantically echo Van Helmont's theory of fermentation and *semina* in relation to chrysopoeia – a theory which deeply influenced Starkey. More specifically, Fatio seems to embrace Van Helmont's conceptions of ferments as "the medial tools by which the *semina* dispose materials," where *semina* were the activating particles of matter, and the process of fermentation was a condition for any process of chrysopoeia.[78] If Van Helmont's reference is correct, we could better explain Fatio's expression "becoming a ferment" as the process through which the metallick globules on the surface of sophic mercury would acquire the property of transforming matter, constituted, if we follow the Helmontian references, of an elemental water transmuted by *semina*. The focus of Fatio on fermentation and the making of the sophic mercury, through Van Helmont and Starkey, should remind us that it was the transmutation of metals and the production of the Philosophers Stone, the highest goals of alchemy, to be at stake in his report. That the alchemical fellowship was on to something important can be also inferred from two further occurrences in the same letter.

The first one is a reference to the multiple attempts of the brother in law to prepare his matter (very likely sophic mercury) and shut it up in five philosophical eggs, that is vessels used for alchemical preparations and digestions. According to Fatio, all these attempts resulted in failure, with four eggs cracking and the fifth one "being ill governed" because of "too weak a fire." Fatio seemed to believe that the problem was the presence of air inside the egg, and reported that he had tried to find ways to take it out, although he neglects to mention how.[79] This was a common problem in the practice of alchemy, as Principe argues: when heated in a furnace, eggs sealed with lute (a special clay), used to break very frequently, because of the increasing internal pressure and the absence of mechanisms to release it.[80] Fatio furthermore reported that his friend's brother in law had complained about the Captain's attitude of secrecy in not revealing to Fatio "what these preparations were."[81] From these words, we can understand that Fatio's Captain was not eager to share technical infor-

of the Earth: Natural Philosophy, Medicine and Chymistry in England, 1650–1750 (Leiden, Brill: 2007), p. 125. See also Meagen S. Allen, "Revisiting Isaac Newton's Index Chemicus: A Response to Richard Westfall," *Ambix*, 2019, *66*/1:72–81. For Van Helmont's view of fermentation, and Helmontian echoes in Willis' ideas on fermentation, see Walter Pagel, *Van Helmont. Reformer of Science and Medicine* (Cambridge: Cambridge University Press, 1982), pp. 83–86.

78 See Newman, *Gehennical Fire* (cit. note 12), pp. 143–144, 160.

79 Fatio to Newton, London, June 20, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

80 Principe, *The Secrets of Alchemy* (cit. note 67), p. 123.

81 Fatio to Newton, London, June 20, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

mation about the matter shut up in the five eggs, neither with his brother in law, nor with Fatio. Was the matter in question the sophic mercury which, amalgamated with gold, would lead to the production of the Philosophers Stone? Was the Captain the self-elected depositary of alchemy's Arcanum? This is far from clear if we consider the second occurrence in Fatio's letter, a sentence in which Fatio seems to doubt the abilities of the Captain, rather shedding light on the alchemical skills of his friend's brother in law.

6 "The Figures of Abraham the Jew"

> I do not perceive that my friend understands or has much minded the ancient figures of the heathen Gods, nor or the figures of Abraham the Jew. Whether he can understand no great matter without perceiving the meaning of these things You may best judge. The Brother in law speaks to me only of two Gods of the Philosophers the one white and the other red While we were a going to speak more of them we were interrupted. I could not speak to him of the preparation of the ☉ and ☽ which come to bath themselves in the third fire of Artephius.[82]

The first element we should highlight in this passage from Fatio's letter (June 20) is that the Captain was not there while his brother in law was carrying out his alchemical experiments and that he was not as knowledgeable in matters of alchemy as Fatio – and possibly Newton too – might have originally thought. In fact, Fatio mentions that his friend had no knowledge of ancient alchemy ("the heathen Gods") or of "Abraham the Jew," the supposed figure at the basis of the alchemical corpus attributed to Nicolas Flamel.[83] By the latter, Fatio meant of course that his friend did not know about *Nicholas Flammel, his exposition of the hieroglyphicall figures*, which was, together with Starkey's texts, one of Newton's main alchemical references.[84]

82 Ibid.

83 See Newman, *Newton the Alchemist* (cit. note 9), p. 85. On the old creation of the myth of Flamel as an alchemist, see Didier Kahn, "Un témoin précoce de la naissance du mythe de Flamel alchimiste: Le Livre Flamel (fin du XV^e^ siècle)," *Chrysopoeia*, 1996, *5*:387–429. On when Newton began to have access to Flamel's corpus, see Allen, "Revisiting Isaac Newton's Index Chemicus" (cit. note 76), pp. 72–81.

84 This was a 1624 translated version of an earlier French text which had been itself translated by a certain Pierre Arnaud from Poitou, in 1612. On the creation of the figure of Flamel, see Nicolas Flamel, *His Exposition of the Hieroglyphicall Figures* (*1624*), edited by Laurinda Dixon (New York and London: Garland, 1994).

The presence of the comment regarding Abraham the Jew is crucial to understand the passage, since it is also found in chapter IV of Newton's famous alchemical manuscript *Praxis*. Newman has recently pointed out that *Praxis* was not composed in 1693 exclusively, as believed by Dobbs, but possibly later, and established a connection between this Newtonian manuscript and the procedures discussed by Fatio in his 1st of August letter. However, a comparison between Fatio's comment in his 20 June letter and chapter IV of *Praxis* can help further clarify the specific exchanges of alchemical knowledge between the two natural philosophers.[85]

Divided into five chapters, *Praxis* begins (Chapter I) with Newton's attempt to make sense of the alchemical meaning of the images in the plate of the *Livre de Nicolas Flamel* which he apparently consulted in the two volumes of the *Bibliothèque de Philosophes chymiques* (Paris, 1672–1678), which he had bought from Fatio in those very months;[86] it continues (Chapter II) with an exploration of *prime matter*, which turns out to be stibnite, and with an analysis of the sulphur of philosophers (Chapter III), the sulphur to be found in iron and at the basis of the production of the Regulus of Antimony which we have described in our previous section. These points, and the reference to metallick sulphur in particular, would perhaps be already sufficient to establish a continuity between Fatio's alchemical report in his 20 June letter and Newton's experimental procedures in Chapter III of *Praxis*. However, Chapter IV, titled *The first agent*, which stands for sophic mercury, also known as the rod of Mercury in Newtonian alchemical language, goes a long way in this sense.

This chapter is about the interpretation of the fourth image in Nicolas Flamel's plate (Fig. 5), in which King Herod is represented with a sword while killing innocents with the aid of soldiers. In short, Newton interprets this image almost as a prescription revealing some important passages to make a salt or sugar of lead extracted from its ore through sal ammoniac or liquor of antimony. Focusing on the first part of a cancelled passage in Newton's *Praxis*, Newman argues that King Herod represents lead and his sword a salt of iron, both extracted through the use of antimony.[87]

85 Newman, *Newton the Alchemist* (cit. note 9), p. 397. I have not seen the original manuscript (Huntington Library, Babson 420), but consulted it as transcribed in Dobbs, *The Janus Faces of Genius* (cit. note 12), pp. 296–305. Newman's comments about the dating of the manuscript refer to Dobbs' old claim that *Praxis* could be situated in 1693. The paragraphs that follow rely substantially on Newman's account of *Praxis* in *Newton the Alchemist* (cit. note 9), especially on pp. 404–409, but they take a different direction in that they focus on an unexamined passage of the deleted sentences in Newton's *Praxis*.

86 See Newton to Fatio, Cambridge, February 14, 1692/3, in *NC*, Vol. 3, pp. 245–246; See Figala, Petzold, "Alchemy in the Newtonian Circles" (cit. note 12), p. 177.

87 Newman, *Newton the Alchemist* (cit. note 9), pp. 406–407.

FIGURE 5
King Herod image from the plate of Nicolas Flamel's *Figures hieroglyphiques* in the *Bibliothèque des philosophes chymiques* (Paris, 1672) SOURCED FROM HTTP://WWW.BABORDNUM.FR/ITEMS/SHOW/632 (ACCESSED 14 FEB. 2019), COURTESY OF THE UNIVERSITY OF BORDEAUX

Added to iron (Herod's sword) and melted together with stibnite and then sublimed, the sweet and volatile salt of lead would be the basis for the production of sophic mercury. Newton's reading of this image helps us clarify both Fatio's comment on "the figures of Abraham the Jew" and his reference to the interrupted conversation about "the preparation of the ☉ and ☽ which come to bash themselves in the fire of Artephius" he was having with his friend's brother in law.

With regard to Fatio's comment on Abraham the Jew, the term "figures" simply stands for the French "les figures du juif Abraham," that is, the alchemical images from Flamel's plate in the *Bibliothèque de Philosophes chymiques* which had attracted Newton's attention and which featured in his manuscript *Praxis*.[88] As to Fatio's suspended conversation, the preparation he talked about might be precisely the one described by Newton in the last lines of his cancelled paragraph in Chapter IV of *Praxis*:

> The blood of w^{ch} infants [i.e. ^{a} sulphur of metalls] was afterwards [in y^{e} work of y^{e} 3d & 2d $^{\&\ 1st}$ ffigures] gathered up [sublimed] by other soldiers & put into a great vessel [y^{e} r ⟨illeg.⟩ Caduceus $^{\&\ cold\ saturnal\ fire}$] wherein y^{e} Sun and Moon [y^{e} two serpents $^{or\ Dragons}$] came to bath themselves.[89]

88 William Salmon, Nicolas Flamel, *Bibliothèque des philosophes* [*chymiques*], Vol. 1 (Paris: Charles Angot, 1672). The copy I consulted online is from the Université de Bordeaux, Bibliothèque universitaire des sciences et techniques, FR 35573. Available at http://www.babordnum.fr/items/show/632 (accessed 19 Jul. 2019). The *Bibliothèque* was a seventeenth-century collection of chymical treatises, put together by Nicolas Salomon, under Royal privilege. Among these treatises, there was also *Le livre de Nicolas Flamel contenant L'explication des Figures Hierogliphyques qu'il a fait metre au cimetiere des ss. Innocents à Paris* (pp. 49–98).

89 Huntington Library, Babson 420; quoted in Newman, *Newton the Alchemist* (cit. note 9), p. 406. Newman reports the entire passage, but mostly focuses on the first section of it,

FIGURE 6
Particular from the image of King Herod in Flamel's *Figures hieroglyphiques* in the *Bibliothèque des philosophes chymiques* (Paris, 1672)
SOURCED FROM HTTP://WWW.BABORDNUM.FR/ITEMS/SHOW/632 (ACCESSED 14 FEB. 2019), COURTESY OF THE UNIVERSITY OF BORDEAUX

These lines are a practical description of the one of the images in Flamel's plate, and focus on the allegory of the blood of infants and the way soldiers gather it in a great vessel together with the Sun and the Moon (Fig. 6). In the passage in question Newton equates the Sun and the Moon to the two serpents, that is, a double vitriol of copper and iron and the blood of infants to the sulphur of metals. More importantly, he equates the "great vessel" to the cold and saturnal fire, probably Snyders' third fire which also appears in Newton's manuscript *Key to Snyders*, and which is derived from lead ore.[90] Fatio's "preparation of the ☉ and ☽" seems to be precisely the practical translation of Newton's interpretation of Flamel's image, with Sun and Moon (the double vitriol of copper and iron) at the centre of the procedure. Even though Fatio does not use the term of "saturnal fire," but rather "the third fire of Artephius," the two expressions signify the same material, that is, a menstruum capable of purifying metals from sulphur.[91] This is – again – in line with *Praxis*' comparison between the blood of infants as the sulphur of metals which is gathered in the vessel, and suggests further connections between Fatio's and Newton's alchemical practices. We cannot establish with certainty who influenced whom in the making of these specific alchemical experiments; however, what is here rele-

which is useful to highlight connections between Fatio letter of August 1, and Newton's alchemical practices.

90 I have not seen this document myself, but used the transcription Newman gives of it in his last book *Newton the Alchemist* (cit. note 9), pp. 504–508; since the manuscript is in private possession, Newman could only see a photocopy of it; he dates it after 1674, basing on the symbol of the barred lead. The passage which concerns us is the following at p. 1 recto of the photocopy, transcribed by Newman at pp. 504–505 of his *Netwon the Alchemist* (cit. note 9): "Mineralis metallicus ignis materia prima est, quae repe ritur in minera Saturni tanquam in domo sua universalis. […] Si possi reci piente capere hunc spiritum, habes universale menstruum, astralem ignem […] Est verus separator impuritatum metallicorum sulphurum" (p. 504).

91 "The third fire of Artephius" was likely a *Deckname* for iron, whose role was central to the making of sophic mercury; see Newman, *Gehennical Fire* (cit. note 12), p. 164. This is not surprising, if we look at Fatio's letter of June 20 which has a focus on sulphur and fermentation.

vant is a contextualisation of Fatio's unpublished letters and alchemical passages on the basis of available sources (both primary and secondary), in order to further enhance our knowledge of his chymical collaboration with Newton.

7 Conclusion

The draft letters introduced in this article are far from giving us a complete and coherent portrayal of the intense Newton-Fatio collaboration between June and August 1693. However, they integrate our current understanding regarding the exchanges between the two natural philosophers, revealing the importance of networks of people and expertise, as well as of practices of translation and alchemical knowledge. A close examination of these letters also opens up two possible new avenues of research.

First, these letters shed light on the linguistic abilities of the members of the Fatio-Newton alchemical fellowship, information which could help us reconsider the authorship of the Newtonian manuscript *Three mysterious fires*, currently held in the Smith Historical Manuscripts Collection of the Rare Book and Manuscript Department of Columbia University Library. The manuscript – roughly dating from 1693 – consists of both a commentary on Snyders' *Tractatus de medicina universali* (1678) – although the three fires refer to Snyders' *Commentatio de pharmaco catholico* (1666) – and of a series of operations to prepare a menstruum to melt gold.[92] Newman has already argued that – despite being in the handwriting of Newton – *Three mysterious fires* was "a collaborative effort where drafts were passed back and forth between the different contributors."[93] He comes to the conclusion that – despite echoing some of the procedures carried out by Fatio's alchemical partners in August 1693 – the Latin sections of the manuscript were definitely the product of neither Fatio nor Newton.[94]

Newman's argument is based on the fact that Newton shows some uncertainties in the transcription; these uncertainties resulted in *lacunae* in the text, while Fatio's handwriting was crystal clear and thus – had he been the author of the draft Newton was copying – the text would have been easy to transcribe. A question which could be asked here is whether the Latin section of *Three Mys-*

92 See Dobbs, *Foundations of Newton's Alchemy* (cit. note 12), p. 168.

93 Newman, *Newton the Alchemist* (cit. note 9), p. 393.

94 This manuscript is transcribed by Newman in his *Newton the Alchemist* (cit. note 9), pp. 510–516; see also pp. 386–395 and 509–510 for a detailed explanation of the text. The English part of text was also transcribed back in 1971 by Samuel Devons, "Newton, the Alchemist?," *Columbia Library Column*, 1971, *20*:16–26.

terious Fires, consisting of a series of alchemical operations, might have been written by the brother in law of Fatio's friend. Monsieur de Grancey, if this was his real identity, was skilled in Latin, as we learn from the letters transcribed in this article, although it is possible that Newton was not familiar with his handwriting hence the difficulty in copying his alchemical instructions. However, since de Grancey was not the best alchemical performer around, as we have pointed out, it is also possible that he was translating in Latin the French instructions given by his brother in law, namely, Fatio's friend or even the – still unnamed – Adept. In sum, is it possible that the Latin section of *Three Mysterious Fires* was the Latin translation of a text which might have been originally written by a French speaker? This might not be completely absurd, since it is well known that Newton was not a skilled French reader, and that Fatio acted as a go-between for him and French alchemical authors.[95] Also, it might explain the reason behind the *lacunae* and Newton's uncertainties.

We could also ask a further question that has to do with the presence of Snyders in the English section of *Three Mysterious Fires*. Since Snyders was an important reference for Newton, Newman argues that it was probably the natural philosopher who brought "the elusive German into the discussion," because the German alchemist never appears in Fatio's known letters.[96] However, in the 24 June letter transcribed in this article, Snyders makes an appearance, albeit briefly. While reporting that the anonymous Adept who had trained his friend in chymical subjects had also advised him to use Snyders as an alchemical reference, Fatio evoked precisely Snyders' *Commentatio* (1666), "at the end of the Chimica Vannus."[97] This detail can take us in two directions: first, it could suggest that part of the commentary might actually have been copied or translated by Fatio from a draft written by the anonymous Adept, possibly also from French; second, it could also lead us to rethink Fatio's contribution to the English section of the text, as possible author of the entire passage, or

95 See the recent Niccolò Guicciardini, *Isaac Newton and Natural Philosophy* (London: Reaktion Books, 2018), p. 11. The role of Fatio as a mediator between French alchemy and Newton emerges also in Figala, Petzold, "Alchemy in the Newtonian Circle" (cit. note 12), p. 177. Also, even though we could perhaps conclude with Newman that Fatio did not write the Latin section of *Three Mysterious Fires*, there are still a few unexamined cross-references between Fatio's letters from 20 June 1693, and the Latin section of Newton's manuscript which would suggest the direct involvement of the Genevan. Particularly striking is the section regarding the production of a Regulus of Antimony, and a "thick" water which turns into "deep red," as well as the reference to the sulphur of metals, all elements which echo to some extent the procedure described by Fatio in his letter of June 20.

96 Newman, *Newton the Alchemist* (cit. note 9), p. 393.

97 Fatio to Newton, London, June 24, 1693, in UBL, BPL 755 Lacepede//Luyken (recto).

of part of it. We do not know that much about the linguistic abilities of the Adept, who might have been either a French (most likely Huguenot) or an English speaker. However, what can provide a hint in this sense, is Fatio's comment, in his 24 June letter, on the fact that the Adept was acquainted with French alchemy, and encouraged Fatio's notorious alchemical friend to read an unnamed chymical French author, "whose book goes under the name of Sultin."[98] In the draft letter of 29 May held in the BGE, Fatio gives us another, even clearer hint, saying that his friend had read to him a paper "of the Adept's own writing." Since Captain de Tegny "spoke only French," we can assume the Adept's paper was also written in that language.[99]

Second, these letters suggest that new research needs to be done in terms of a social history of science and more specifically in relation to the contribution of Huguenot networks to the making of alchemical knowledge in William III's England. As it has become clear by examining Fatio's four letters, the Huguenots who were involved in the making of alchemical experiments were all well integrated in the social texture of contemporary England, at the same time keeping connections with Flanders and France. This should not surprise us, given that before the Edict of Fontainebleau (1685), which revoked the Edict of Nantes (1598), a significant number of alchemical practitioners in Paris were of Calvinist faith and practiced under Royal protection, separately from the medical faculty and guilds.[100] Furthermore, this also tells us about the centrality of familiar networks, as well as of the professional profiles of French Huguenots in late seventeenth-century England.[101] In the fourth section of this

98 Newman hints to the possibility of the presence of "an English-speaking commentator to Snyders," although, given the suggestions the Adept reportedly gave to Fatio's friend, he might also have been a French Huguenot; see Newman, *Newton the Alchemist* (cit. note 9), p. 393. With regard to "Sultin," I have struggled to find any alchemical book under this name. On the basis of a reference to the fact that this book was not easy to find because it had been destroyed ("My friend could not yet find Sultin, the book having been, as it seems, designedly bought up and suppressed", Fatio to Newton, June 24, 1693), I have made the hypothesis that this was a censored book. However, what is most interesting is that Fatio does not name the author, but rather their book, thus reflecting an attitude which was common in early modern alchemy, of attributing a greater authority to works than to their authors; see Didier Kahn, *Le Fixe et le Volatil. Chimie et alchimie, de Paracelse à Lavoisier* (Paris: CNRS Éditions, 2016), pp. 14–20.

99 Fatio to Newton, London, May 29, 1693, in BGE, ms. fr. 602 f. 87 recto (cit. note 17).

100 As Clericuzio points out, some of these chymical practitioners of Huguenot faith moved to England even before the revocation of the Edict of Nantes; see his "Teaching Chemistry and Chemical Textbooks in France. From Beguin to Lemery," *Science and Education*, 2006, *15*:335–355.

101 See Robin Gwynn, *Huguenot Heritage* (Brighton: Sussex Academic Press, 2001), pp. 74–

paper, I have used the term "family business" to highlight the involvement of the brother in law of Fatio's friend in the making of alchemical experiments. It is not a coincidence that Captain de Tegny, provided this was Fatio's friend true identity, married the sister of another practitioner of alchemy, who would thus become his brother in law, Monsieur de Grancey. This is also not surprising, rather echoing a broader question, that is, the centrality of family ties – as well as of intermarriage – in the creation, transmission and appropriation of chymical as well as pharmaceutical skills and expertise in early modern Europe.[102]

Finally, Fatio's reference in the British Library letter (RP 2692) to the lands of Captain de Tegny being in Poitou (or Poictou), close to antimony mines, suggests that Poitou was an important area for the production of alchemical raw materials, and not only. The antimony produced in Poitou (in the proximity of a town called Bressuire), seems to have been known by the Montpellier doctor Jean Rey (1583–c. 1645) and by the famous Parisian *droguiste* Pierre Pomet (1658–1699).[103] But it was not only antimony to hail from Poitou: the French translator of Artephius, Pierre Arnaud, who also published Flamel's *Figure Hieroglyphiques*, and a chymical practitioner such as Nicolas Salomon, the physician who had compiled the *Bibliothèque des Philosophes chymiques* were both said to be *poitevin* that is, "from Poitou." Both texts, as we know, were known to Fatio and Newton. This of course takes us away from the specific focus of this paper, the alchemical practices of Newton and Fatio. At the

101. The role of Huguenot networks in developing alchemical practices and craftsmanship (even though in the context of the New World) emerges in Neil Kamil, *Fortress of the Soul: Violence, Metaphysics, and Material Life in the Huguenots' New World, 1517–1751* (Baltimore-London: John Hopkins University Press, 2005).

102 On this aspect, see David Gentilcore, *Medical Charlatanism in Early Modern Italy* (Oxford: Oxford University Press, 2006), pp. 154, 186. In summer 2017, I have conducted some research on the networks (and family ties and intermarriages in particular) of early modern medical operateurs between France and Italy as a postdoctoral research assistant on Dr Emma Spary's Leverhulme funded project "Selling Exotic Plant Products in Paris, 1670–1730" (University of Cambridge, Faculty of History).

103 Jean Rey, *Essays de Iean Rey* (Paris, 1775), p. 172; Pierre Pomet, *Histoire generale de drogues* (Paris: J.-B. Loyson et A. Pillon, 1694), p. 53. Rey had a long chemical correspondence with Marin Mersenne, discussing matters of metallic calcination, and tin especially. As Clericuzio argues, Rey and Mersenne, as well as Jean Brun, the apothecary considered at the basis of Rey's work, shared the same corpuscular view of matter, as it is possible to understand from a letter that Brun sent to Mersenne on April 22, 1640. See Cornélis de Waard (ed.), *La Correspondance du P. Marine Mersenne, Religieux Minime*, 10 vols., Vol. 9 (Paris: G. Beauchesne et ses fils, 1933), pp. 275–282. Quoted in Clericuzio, *Elements* (cit. note 20), p. 53, and Bernard Joly, *Descartes et la Chimie* (Paris: Libraire Philosophique Jean Vrin, 2011), p. 80.

same time, it tells us that there might be further sources – printed and not – to begin to construct a broader social history of the networks and circulation of chymical materials, people and expertise between France and England in the seventeenth century.

To conclude, going back to the original place where these letters were found, a late eighteenth-century correspondence between two naturalists, geographically separated, one in the Dutch Provinces, the other one in Switzerland, but both sharing the legacy of Newton's thought in the Enlightened Republic of Letters, we should really consider these physical objects as go-betweens, time machines bridging the seventeenth and the eighteenth centuries, the early and the late Enlightenments.

Acknowledgments

I have discovered these letters while working on an entirely different project as postdoctoral Brill Fellow at the Scaliger Institute in Leiden between October and December 2018. I owe a debt of gratitude to librarian Ernst-Jan Munnik, curator of manuscripts Dr. Mart van Duijn, as well as to the coordinator of the Scaliger Institute Kasper Van Ommen. They have been among the first persons with whom I shared and discussed my findings. I also wish to thank Paule Hochuli Dubuis from the Bibliothèque de Genève for helping me check the references to the published and unpublished Fatio papers held there, Romain Wenz from the University of Bordeaux, and Felix Waldmann for his invaluable assistance in revising the transcription and for proofreading the article.

Editorial Note

The order of the five draft letters herein presented is the same in which they appear on the Leiden folio. I have not altered the original pagination recto/verso of the folio. As to transcription, I have substituted the early modern English "ye" with "the," "yt" with "that," "wth" with "with," "w^{ch}" with "which" and "y" with "the." The crossed words or sentences reflect Fatio's own corrections in the texts, and the same goes for his further additions, which often appear on the top of his sentences and which I have therefore put in superscript, or as footnotes, coherently and depending on the way Fatio inserted them in his manuscripts. Even though Fatio's handwriting is quite intelligible, I have at times added an ⟪illeg.⟫ when I could not make sense of the specific word he

was using, coherently with the transcription standards used in *The Chymistry of Isaac Newton* website. Also, Fatio's abbreviations have been normalised so as to make the text more accessible: "Regimt" becomes "Regiment," "Phrs. St." becomes "Philosophers Stone," "operons" "operations" and "Servts." "Servants." Finally, I have decided to include a fifth draft of a letter from Fatio to Mr. Cunningham (also unpublished), because it is present in the physical folio, even though it is not relevant to the themes discussed in the other letters in and this article.

n. 533
p. 1 recto

For I. Newton Esqr at Cambridge

Hon^{ed} S^{ir}

My friend has, I think, never been acquainted $^{at\ all}$ with Mr Boyle, at least he has had no particular acquaintance with him. He knoweth here a French Minister that studys Chymistry, but they very seldom are together, neither is he very free to ^{communicate} with him. He has no other chymical acquaintance, and avoids them carefully. His Brother in law is exceeding discreet and reserved, and a good and diligent artist, but he has not the parts nor the knowledge which my friend has. I think the brother in law understands Latin, at least I am sure he understands it indifferently, but my friend does not. This has obliged him to have many tracts translated out of Latin into French for his own use, and possibly they were translated by his Brother. ~~His~~ My friends age is between 30 and 40. His temper is not so airy and gay as the French have ⟪~~illeg.~~⟫ generally theirs, but he is much more serious and thinking. He has no interest at Court, but he is both esteemed and beloved by the Duke of Leinster and M^{d} Galloway who are French men as you know and have some commands in the $^{King's}$ Army. $^{He\ hath\ among\ the\ French\ the\ reputation\ of\ a\ very\ good\ and\ most\ upright\ man}$. I believe S^{ir} he will ~~be willing to~~ come to a mutual communication of knowledge and future successes, as you say, without obliging you to try any process, but as far as you think fit, so that you may both work as you please, and only communicate the event. Only I suppose since he had his matter very near ready to begin a long digestion he will desire you to ^{make} ⟪~~illeg.~~⟫ it for him, which can in no ways seem hard to you. For you know S^{ir} that in a few days the signs that ^{you} shall have will make you sensible whether the work ought to be continued $^{or\ no}$, and if they prove to be such as you like the going on will rather be a pleasure than a trouble to you. My friend being known among the French Refugiez particularly among the officers to prepare some excellent remedys, said to me he thought it was best to let them ~~know~~ $^{see\ freely}$ what he did and not to be reserved with them $^{as\ if\ he\ was\ a\ Master\ of\ some\ strange\ secrets}$. Upon that bottom he did suffer some $^{to\ come\ into\ his\ Laboratory\ and}$ to see his

vegetation, and when I asked him why he did so, he gave me that answer for it. I know thô he may be something free about the things which relate only to himself yet he is exceeding reserved in such matters in which another is concerned And that I suppose he has from his education there being hardly any thing in France by which a man loses more his reputation than by exposing his friends with the betraying of them ~~secrets his friends.~~ I have taken his remedy six times. By the little effect of the two last I found that four times had been enough. My health is good now I thank God; my cough is quite gone; I am hearty and ~~cap~~able ~~of~~ to go about, and I grow fuller and fatter every day. Yet I have still a cold in my head, nor are my forces come again so as to make me capable of a great or long application. My friend is with his Regiment, and I do not yet hear when he is to come It is now about four years since he saw the Adept last who often did advise him to the study of Astrology Thô I gave him a character of you S^ir^ I do not remember that I named you to him. I am with all my heart
Hon^ed^ S^ir^ Yours & c.

London June the 10th 1693.

Yet he despises much the Ministers, and knows their craftiness. He has had some of them very often against him, and that only because he did oppose to the utmost of his power some unjust designs of theirs.

≠ His being out of town has obliged me to give you in this letter ⟪illeg.⟫ for an answer to yours such things as I could best cause to be done after I had conferred with his Brother.

Hon.^ed^ S^ir^
I have received your letters of June the 15^th^ and 17^th^. ~~The Gentleman~~ My friends Brother in Law is extreamly reserved with me and with all the world and I can hardly have ~~any~~ an answer to any question I propose to him. It is he that has had the thought of beginning the digestion I have seen. He said that while he was working with his Brother for the preparations of their matters he ~~thought~~ fancied he had allready enough to go on to the main work after one certain way, of which he thinks the Authors have three severall ones. So he shut up his matters in five eggs: four have broke and the other has been ill governed and has had too weak a fire. Yet it continues to work and to alter to this very day. I doubt the air contained in the egg makes them to break. That has put me upon enquiring an easie way how to take all the air out of an egg or as much of it as one pleases before it is sealed and I have found it. The Brother in Law told me he thought the matter shut up in his egg ~~as he thought~~ had not been sufficiently prepared, and did speak all along as if he intended I should believe that the Captain had not sufficiently told

me what these preparations were, neither would he tell them himself. I have seen with the microscope the skin which is upon their ☿. It is pretty thick and containes a great many metallick reddish globules very closely joined one ~~to~~ upon another. You see those globules in all mettals but ☿ but much upon ⟪illeg.⟫: They seem in mettals to be inserted in an even and homogeneous field which composes by far the chiefest substance of the mettal at least for quantity. I suspect these globules contain the metallick sulphur, the field in which they swim being as it were only a congealed metallick water. Their thickness upon the surface of my friends ☿ makes them perhaps to become a ferment, for they are there much thicker than in the mettals themselves. One might I suppose gather all the skin and by new operations have a new one formed and so gather it to what quantity one pleases. I doubt S^ir^ you are afraid of communicating to my friend the things you know. You need not fear it for he will neither expect nor desire to know them, except you be pleased to communicate them freely to him. All I have spoken of to him and he will expect is ~~this~~ that you be pleased to make a digestion for him; for when he is come he ~~will~~ intends himself to make an end of preparing his matters. In the mean while he will let you know what he knows, what ideas he has followed and which bottom he goes upon, which perhaps may be of some use to you, perhaps not; for I can not pretend to be a great judge in these matters. I can only tell that my friend has had some good instructions given him and that he knows severall things very extraordinary thô perhaps not much significant as to the main point. To the questions in your first letter I have had only this answer that if by ♃ was meant ♁ or a Regulus of ♁ the terms in which the questions were exprest did pretty well agree with the preparations they have been busy about. I do not perceive that my friend understands or has much minded the ancient figures of the heathen Gods, ~~nor~~ or the figures of Abraham the Jew. Whether he can understand no great matter without perceiving the meaning of these things You may best judge. The Brother in law speaks to me only of two Gods of the Philosophers the one white and the other red While we were a going to speak more of them we were interrupted. I could not speak to him of the preparation of the ☉ and ☽ which come to bath themselves in the third fire of Artephius. I am sure my friend has not more correspondence with the Courtiers than I mentioned to you and that he despises them as a crafty and wicked sort of men. I suppose he will be here about the beginning of the next week. I have a whole floor for me and in 3 hours time a bed may be set up in my dining room. These ~~will~~ rooms will be at your choice S^ir^ in case you should come and I should have provided none for you. If you do come you can not oblige me more than with bringing your papers that relate to divinity which I am never weary to read. I do not know whether my health would not suffer me to read your papers about the squaring of curves & c. which you had once brought hither but I ~~could~~ did not read. I should be glad S^ir^ to know whether I

must let my friend to hope that you will come to town he will be here as I guess about the beginning of the next week. When he comes you shall hear from me.

I am with all manner of respect.
London June the 20th 1693

Honed Sir,
My friend came ~~yesterday~~ last night to Town, but I have not yet seen him. The nature of your studys makes me sensible Sir that it is scarce to be hoped ~~that~~ you should have exactly the same ideas; and if you were busy about some experiments of consequence as I seem to gather from your letter. I do not know whether you will get or loose by your ~~journey~~ coming hither. I have perceived that my friend makes no great mystery of his occupation, and that it is ~~known~~ thought by severall he endeavours to find the Philosophers Stone. He beleaves it is time enough to be thorowly reserved when he has found the secret. He is extreamly inventive and stiks allmost at no difficulty in working but overcomes them easily. His brother in Law can not do the same, for thô the Captain when he goes to his Regiment leaves him in writing as particular instructions as he can yet he soon is stopped in the execution not knowing how to overcome the difficultys which are unavoidable in the practice. It was that inventive genius of my friend with which the Adept was so much taken, who often smiled when he saw how my friend did perform the hard tasks he gave him now and then. I suppose he relies upon his parts and his being tyed to no country against such a time as it might prove dangerous for him that his skill should be known. I cannot but mention ~~to you~~ that he spoke to me of ~~using~~ employing some Jews as the best way to make an advantage of the science. His Brother in Law having some occupations which he must mind and which often call him out of town and his health being but weak so that he can study and work but very little ~~that~~ has made the Captain very desirous of finding some body that could work with him or that could at present go thrô a long digestion. The Servants upon whom they have relyed to keep their fire have often left their matters to grow cold. They have in Holland ~~a matter of~~ about 100tt weight of most excellent french ♁, which they miss exceedingly, finding that the English ♁ is full of heterogeneous salts ~~that spoyl much their~~ which make a great difficulty in some operations. There is a Chymical Author extreamly scarce, who did write in French, as I suppose, and whose book goes under the name of Sultin, of which the Adept whom my friend knew spoke very much as being a most excellent treatise. He gave allmost the same Commendation to Sneider which you have seen at the end of Chimica Vannus. My friend could not yet find Sultin, the book having been, as it seems, designedly bought up and suppressed. I believe of all the Captains in the King's service my friend alone has a full Company, and even some men above the just number, thô he receives nothing near what is due to him.

By that S^ir^ you may guess he is a man that loves to do exactly what he thinks to be his duty. I come just now for the 2^d^ time from my friends without finding him at home I was ^loath^ to let this letter go before I had from himself an answer to every one of your questions. If you do not come S^ir^ before Wednesday pray let me know it ^in time^ and I ~~shall~~ ^will^ write to you by the tuesday's post.
I am with all manner of respect London June the 24^th^ 1693 Honoured S^ir^
Yours & c.

p. 1 verso

Hon^ed^ S^ir^
When I had translated into French the paper that was for my friend he saw that in one part of the operations there was a vitriol made, but it is not said afterwards to what purpose, and he desired to have it explained; the paper did proceed thus; Post hanc, primam operationem. Terra Nostra pulvirisata ponatur in aqua Regia. Ubi paululum ebullierit et Terra coeperit dissolvi, et menstruum agendo nonnihil incaluerit effundatur menstruum clarum in aliud vas ubi est viride aeris pulverisatum. Potest menstruum prius ad medietatem evaporari sed non opus est et ob noxiis ejus fumos praestat hanc operationem omittere. Digeratur menstruum cum viridi aeris et extrahetur ⊕ Sublimetur Reg. ♁ ^ii^ cum ✳ (una pars Regulus pulv. cum duabus ✳) & hujus sublimati partes tres abstrahantur a duabus ~~plumbi albi~~ ^cerussae^. Deinde a plumbo [I suppose by this is meant the white lead or C.] cum aqua pluviali (addito si opus est aceto destillato q.s. sed praestat aceto non uti) extrahatur Saccharum. Hoc saccharum ubi aridum fuerit liquescat ad ignem ut acetum quo usus fuerit evanescat; et cum ejus parte una vel 2 vel 3 misceantur partes 2 vel 3 terrae nostrae et pars 1 ferri et ad ignem satis validum in loco clauso fiat ebullitio lenta. Deinde accipe & c.
I ⟪~~illeg.~~⟫ suppose S^ir^ that it would be easie to make ☿ to mix with this composition provided one did use ☿coagulated with the vapours or steams coming from lead just congealed after fusion; For that ☿might be powdered and so mixed pretty well by bare trituration with the other materials, and the lead that doth congeal it might be a medium to make it to unite with the Sacccharum ⟪illeg.⟫ and by consequence with the rest of the mixture. That malleable Reg. which you saw here, in which there was some ☿was made by that method, but ^yet^ there must be some dexterity used ^in the making of it^. A experimentation of B.V. dos say that this malleable Regulus mixed with ☿and is better ^by far^ than the unguents used by Chirurgeons; and indeed if some leafs or plates of it be put upon ulcers, it cures them and destroys the ~~and~~ venom that makes them ~~hard to be cured~~ of an ill nature; but perhaps the Commentator had a higher meaning.

You have seen S^ir^ in the Gazettes the ill news we have had from Flanders: and I ~~doubt~~ fear we ~~shall~~ may hear shortly of a further loss at Sea, if the French have but prosecuted the Merchant fleet, which it was time enough for them to begin to do 3 or 4 days after the fight, because of the sluggishness of Merchant men. All the loss in Flanders is owing as it seems to a fault of conduct in the King's Army; for whereas he had made himself, by sending away a strong detachment, weaker than the French, and he had begun with the army to withdraw from them towards Louvain, where the river and city would have covered him, he lost some days in his exceeding slow march, not suspecting perhaps that the French would be so quick, and so was overtaken by them and forced to a very unequal fight. The rout has been ~~extreme~~ very great, and the Queen cryes here continually in her closet, but is easie and merry in publick where she excuses the redness of her eyes by saying she has an humour falling upon them. Yet it is likely that the French have lost many men before they got into the Kings camps, which they say was sooner by 3 hours than the gazette dos own, at least if we must believe some private letters. There is no manner of certainty in the particulars that are said now of there having been a second fight.
My Friend has been again interrupted & obliged to go a second time to his Regiment, They have now orders to be in a readiness in case they should be sent for from Flanders. So that it will be winter before I can begin to learn the preparation of his Remedy.
Mr Craig has published a new book of Quadratures much better than his first.
I am with all manner of respect. Hon^ed^ S^ir^ London August the 1. 1693

To Mr Cunningham
My dear S^ir^
Mr Begrie and I have often asked one another whether he or I had heard from you, or whether ~~we know~~ it was known when you want to come to Town. I thank God I am pretty well recovered tho I have been all the while at London, where I hope to see you ~~in town~~ in a few weeks. You have seen & c … a second fight. [as in the former letter]
I am with all my heart S^ir^ Yours London August the 1. 1693.