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How to Send a Secret Message from Rome to Paris in the Early Modern Period: Telegraphy between Magnetism, Sympathy, and Charlatanry

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Abstract

In 1558, the famous natural magician Giambattista della Porta was the first to allude to a method of transmitting secret messages by using manipulated magnetic compasses. Soon thereafter, this idea, known in modern historiography as 'magnetic telegraphy', was spelled out and advertised by many early modern scholars as a promising technology of communication by action at a distance. In 1609, Daniel Schwenter created the most sophisticated design for the fulfillment of this potential: two compass needles were to be magnetized in a highly codified procedure to establish a sympathetic bond between them. Used in a compass circumscribed by an alphabet, one needle would turn to a certain letter whenever the other needle was moved to that same letter. Through 'sympathy', it was thought that this could made to occur even over a distance of many miles. The idea's first critic, the Jesuit, Leonardo Garzoni, was quick to dismiss it as charlatanry, and many later authors argued that the device could not work as there was no such 'sympathy' or magnetism between the two devices. Though only a fanciful pipe dream of natural magic, this pseudo-technology of a magnetic telegraph yet testifies to the imagination of early modern scholars in having prefigured the modern reality of instantaneous global communication.

Keywords

magnetism – natural magic – telegraph – instruments – Daniel Schwenter – Giambattista della Porta

1 Introduction

Nowadays, by various media – mostly digital media like e-mail, instant messaging, or video chat – the spatial distances between people who seek to send messages or talk to each other can be easily overcome. Quasi-instantaneous messaging over huge distances began with the invention and use of the first telegraphs in the nineteenth century. Nineteenth-century historians interrogating the technical and conceptual origins of nineteenth-century cutting-edge technology pointed out that sixteenth-century authors had already considered magnetic signal transmission by using a modified nautical compass.[1] With regard to these early modern ideas, they speak of the "première idée du télégraphe magnétique," a "sistema telegrafico magnetico," and a "magnetical contrivance for signaling." In 1884, John Joseph Fahie stated in his *History of Electric Telegraphy*:

> From such experiments as these the sympathetic telegraph was but a step, involving only the supposition that the same effects might be possible at a greater distance, but when, or by whom, this step was first taken it is now difficult to say.[2]

In his book *Media Technology and Society* (2000), more than 120 years later, Brian Winston yet claims that: "The idea of using magnetism and electricity for a signalling system was thus established early in the modern period."[3] Recent historical research on the very same early modern ideas has also mostly linked these ideas to the 'magnetic telegraph.'[4]

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1 See, in particular, Timoteo Bertelli, "Di un supposto sistema telegrafico magnetico: indicato da alcuni autori dei secoli XVI e XVII," *Bullettino di bibliografia e di storia delle scienze matematiche e fisiche*, 1 (1868), 186–196; George August Vorsterman van Oyen, "La première idée du télégraphe magnétique," *Bullettino di bibliografia e di storia delle scienze matematiche e fisiche*, 1 (1868), 100; J.B. Pearson, "On Sympathetic Needles," *Proceedings of the Cambridge Philosophical Society*, 4 (1880), 96–101; John Joseph Fahie, *A History of Electric Telegraphy, to the Year 1837* (London – New York, 1884), 1–25. Bertelli's basic research is translated and partially supplemented in Heinz Balmer, *Beiträge zur Geschichte der Erkenntnis des Erdmagnetismus* (Aarau, 1956), 549–562. Cf. also Pearson, "On Sympathetic Needles," 101: "Had Bembo some magnetical contrivance for signalling which cannot now be exactly known?"

2 Fahie, *History of Electric Telegraphy*, 5.

3 Brian Winston, *Media Technology and Society: A History: From the Telegraph to the Internet* (London – New York, 2000), 21.

4 Volker Aschoff, *Geschichte der Nachrichtentechnik: Beiträge zur Geschichte der Nachrichtentechnik von ihren Anfängen bis zum Ende des 18. Jahrhunderts*, 2 vols. (Berlin, 2014), 1: 93–94, speaks of "'Telegraphen'-Vorschlag," "Kompaßtelegraphen," and "Magnetnadeltelegraphen." In John Edward Fletcher, *A Study of the Life and Works of Athanasius Kircher, "Germanus*

But what were the ideas of the early modern authors, and why is the comparison with telegraphy or even the assumption of technological continuity so appealing? For understanding the early modern idea of this technology, Anselmus de Boodt (1609) provides a lucid and simultaneously critical description of a typical design:

> Some believe that the magnet or the magnetic needle may serve to communicate secret thoughts to a friend one or two hundred miles away; but they are very wrong. The reason for this error was the power of the magnet to move an iron needle through a board, and the ability of the North Pole, or the magnetic mountain assumed by the cosmographers in the Anian Sea, to act on the magnetic needle, as they believe, up to many hundreds of miles away. For in their opinion, the magnet that touched the needle and transmitted its force to it has such a similarity and kinship with it that if, for example, it is moved ten degrees east, the needle will also move so many degrees, even if it is one hundred miles away from it. But they are mistaken, as I said; for it is quite certain that the magnet which has touched an iron needle can move it only within a certain limited space of perhaps three or four feet.[5]

Incredibilis" with a Selection of His Unpublished Correspondence and an Annotated Translation of His Autobiography, ed. Elizabeth Fletcher (Leiden – Boston, MA, 2011), 150, the author speaks of "telegraphic communication." Yasmin Annabel Haskell, *Loyola's Bees: Ideology and Industry in Jesuit Latin Didactic Poetry* (Oxford – New York, 2003), 135–136, makes reference to the "technology of friendship," "magnetic telegraph," and "telecommunications between friends," while Eileen Reeves, "Of Language and the Lodestone" (2003), <https://academiccommons.columbia.edu/doi/10.7916/D85H7NKW> (accessed 13 October 2022), here 10, refers to "a primitive sort of telegraph." Elsewhere, Gerard Paul Passannante, *The Lucretian Renaissance: Philology and the Afterlife of Tradition* (Chicago, IL – London, 2011), 2, makes mention of "an early prototype of the magnetic telegraph," while Haun Saussy, "Magnetic Language: Athanasius Kircher and Communication," in *Athanasius Kircher: The Last Man Who Knew Everything*, ed. Paula Findlen (New York, 2004), 263–281, here 266, refers to a "sort of magnetic telegraph." Koen Vermeir, "Athanasius Kircher's Magical Instruments: An Essay on 'Science', 'Religion' and Applied Metaphysics," *Studies in History and Philosophy of Science Part A*, 38 (2007), 363–400, here 364, also quotes a passage from Thomas Pynchon's *Mason & Dixon* (1997) on the "Jesuit telegraph."

5 Anselmus de Boodt, *Gemmarum et lapidum historia*, ed. Adrianus Tollius (Leiden, 1636), 464–466: "Putant aliqui Magnetem, aut acum Magneticam usui esse ad animi secreta patefacienda amico a nobis centum, aut ducentis miliaribus distante, sed vehementer errant. Causam errori praebuit virtus Magnetis, quae acum ferream etiam per tabulatum movet, ac deinde facultas poli arctici, vel montis Magnetici in freto Anian a Cosmographis constituti, qui ad multa centena miliaria in acum Magneticam, ut illi arbitrantur, agere potest. Existimant enim Magnetem qui tetigit acum, ac illi virtutem suam communicavit, similem habere, et talem cum illa consensum: ut si moveatur, exempli causa decem gradibus

Some of Boodt's contemporaries were much less skeptical and devised compasses surrounded by letters. A manipulated compass needle would point to these letters instead of to the usual northward direction. All one had to do was turn a magnetic needle to the same letter on an identical sympathetically connected compass elsewhere.

The whole idea is thus based on the assumption of an action at a distance between two objects connected to each other by the power of 'sympathy' and magnetism.[6] Early-modern naturalists frequently invoked both concepts to explain causal interactions between remote objects related to each other by an intangible bond. Of course, this pre-modern telegraphy idea has, technically speaking, nothing to do with the electromagnetic telegraphy of the modern age. Although both technologies share a common goal, the way they work – or claim to work – and their scientific and philosophical underpinnings are completely different. Moreover, authors of the early modern period did not speak about 'telegraphy' to describe their devices or technology, but usually classified it as a technology of steganography (*steganographia*), i.e., cryptology and the making of secret signs.[7] In the sixteenth and seventeenth centuries, ideas of cryptology flourished. Any technology that allowed the transmission of secret messages, especially in the time of the Thirty Years' War, would have been an invaluable asset in any commander's tactical portfolio. Thus, it was often the courtly context where such ideas emerged, and they were often covered by the overarching concept of 'secrecy', which informed many particularly practical domains of knowledge at the time.[8]

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orientem versus, etiam tot gradibus acum moveri, etiamsi centum miliaribus ab illo distet. Sed ut dixi falluntur: quia certissimum est Magnetem, qui ferream acum tetigit, tantum intra certum spatium, et exiguum, forte trium, aut quatuor pedum illud movere." Cf. also Balmer, *Beiträge zur Geschichte der Erkenntnis des Erdmagnetismus*, 553–554.

6 Cf., as a starting point, esp. Silvia Parigi, *Spiriti, effluvi, attrazioni: la fisica "curiosa" dal Rinascimento al secolo dei lumi* (Naples, 2011); Christoph Sander, *Magnes: Der Magnetstein und der Magnetismus in den Wissenschaften der Frühen Neuzeit* (Leiden – Boston, MA, 2020), 623–635, 647–652.

7 The neologism "telegraphia" is not used in the early modern period, although it is probably borrowed from forms such as "telescopium" that were coined at that time. In addition to the technical challenges – common to all forms of communication – of overcoming physical distances, a clear goal in the design of the magnetic proto-telegraph, and what the early modern scholars emphasized above all, was the ability of telegraphy to transmit a message to the exclusion of third parties. It was more important to these scholars that the message was *crypto*-graphed than that it was *tele*-graphed. Cf. Gerhard Friedrich Strasser, *Lingua universalis: Kryptologie und Theorie der Universalsprachen im 16. und 17. Jahrhundert* (Wiesbaden, 1988).

8 See Pamela O. Long, *Openness, Secrecy, Authorship: Technical Arts and the Culture of Knowledge from Antiquity to the Renaissance* (Baltimore, MD, 2001); Koen Vermeir, "Openness

But it was not only about sending secret messages. Early modern authors were clearly fascinated by the idea of being able to communicate across hundreds of miles. A quasi-magnetic long-distance communication device promised what natural magicians were aiming at: a way to use or manipulate natural, but lesser known effects in the service of humankind; in other words, what they were looking for was a new technology.[9] The effects of magnetism were often used in natural magic, and the powers of attraction and the ability to point north seemed to overcome the axiom of *actio in distans non datur*. The metaphysical concept of action at a distance was thus a prominent, if not the major issue for the magnetic telegraph. Could a gadget prove metaphysics wrong? Could human ingenuity overcome the perceived limits of nature? Or was Boodt right; was all of this charlatanry and deception the pursuit of a vain agenda so as to receive credit for a fake invention?

This paper has a structure that is both antithetical and chronological: First, it sketches how and when the idea of the magnetic telegraph came about and how it was further developed. Secondly, it outlines how and why it was doubted, criticized, or rejected. Connecting all the records in this article is the guiding imperative to try to uncover the arguments involving the notion of action at a distance. The sources do not engage in sophisticated natural-philosophical discussions of this issue, but tend to rely on implicit assumptions about the natural-philosophical underpinning of the telegraph, both in their promotion and in their refusal. The most important of these underpinnings shall be uncovered in the course of this article.

As will become clear in the context of discussions about the magnetic telegraph, the general and more abstract issue of action at a distance was approached by way of its application and usage. This adds a practical aspect to the otherwise theoretical discussions about the (im)possibility of action at a distance in early modern natural philosophy. Moreover, our analysis will address the epistemic function of instruments – imaginary or real – a function which Koen Vermeir has labelled "applied metaphysics."[10] After all, the design of any imaginary magnetic telegraph will testify to its designer's implicit

versus Secrecy? Historical and Historiographical Remarks," *The British Journal for the History of Science*, 45 (2012), 165–188; and Koen Vermeir and Dániel Margócsy, "States of Secrecy: An Introduction," *The British Journal for the History of Science*, 45 (2012), 153–164.

9 Cf. e.g., William Eamon, *Science and the Secrets of Nature: Books of Secrets in Medieval and Early Modern Culture* (Princeton, NJ, 1994); Thomas L. Hankins and Robert J. Silverman, *Instruments and the Imagination* (Princeton, NJ, 1995); Brian P. Copenhaver, *Magic in Western Culture: From Antiquity to the Enlightenment* (Cambridge, 2015); Sander, *Magnes*, 510–596.

10 Cf. Vermeir, "Athanasius Kircher's Magical Instruments."

assumptions about the nature of its workings. In other words, authors were keen not only to invent a useful instrument for which they would find buyers, but at the same time they imagined that they were manufacturing a device that would disprove a metaphysical axiom: given the right design, they dared to believe that action at a distance would be shown to be possible!

2 Origin, Dissemination, and Further Development

The first written account of the idea of a magnetic telegraph is Giambattista della Porta's *Magia naturalis* (1558). As is well known, the natural magician della Porta invented numerous tricks and gimmicks that relied on the hidden force of magnetism, including the ability of the magnet to act through other bodies on iron.[11] Probably having this physical effect in mind, della Porta concluded his chapter on the magnet somewhat enigmatically: "Finally they make contact with the help [of the magnet] over great distances and simultaneously talk to each other."[12] Della Porta does not explain this in any further detail, nor does he mention the compass or any sort of 'sympathy' among magnets in this context.[13]

As will be outlined shortly, della Porta picked up and elaborated upon his idea in 1589. But before that, two other scholars were either inspired by della Porta's short statement of 1558 or arrived at similar ideas independently. In the preface to his 1586 edition of the writings of his teacher and uncle Fernán Pérez de Oliva, Ambrosio de Morales, a humanist and historian, reported that the latter had found a magnetic method for two persons far apart to speak to each other.[14] But the preface contains no explanation of how this was supposed

11 Cf. Sergius Kodera, "The Laboratory as Stage: Giovan Battista Della Porta's Experiments," *Journal of Early Modern Studies*, 3 (2014), 15–38; Raffaella De Vivo, "Tecnica e scienza nelle opere di Giovan Battista Della Porta," in *La "mirabile" natura: magia e scienza in Giovan Battista Della Porta (1615–2015): atti del convegno internazionale, Napoli Vico Equense, 13–17 ottobre 2015*, ed. Marco Santoro (Pisa, Rome, 2016), 137–145; Sander, *Magnes*, 522–523, 548–595.

12 See Giambattista della Porta, *Magia naturalis sive De miraculis rerum naturalium libri 4* (Naples, 1558), 90: "Tandem eius commoditate per longinqua intervalla allocuntur simul, et simul nuntiant."

13 In della Porta's early work on cryptology, *De furtivis literarum notis* (1563), the procedure is not mentioned either; likewise, it remains unmentioned in *De occultis literarum notis* (1593). On the telegraphic procedure of the unpublished *Criptologia*, see notes 20 and 21 below.

14 Cf. Fernán Pérez de Oliva, *Las obas del maestro Fernan Perez de Oliva*, ed. Ambrosio de Morales (Cordova, 1586), 2r. Cf. also William Atkinson, "Hernán Pérez de Oliva: A

to work. And despite his standing as an advanced researcher of magnetism, nor does Pérez de Oliva mention this method in his manuscript *De magnete* (around 1527).[15] Then there was Blaise de Vigenère, whose work on cryptography (*Traicté des chiffres*, 1587) reported that some people imagined communicating with each other via the 'sympathy' of two magnetic needles and an alphabet.[16] But while he, too, fails to provide exact instructions, he is the first to mention, in print, the idea of a telegraphic alphabet compass.[17]

When della Porta republished his *Magia* in an extended version in 1589, in the introduction to the book contained therein on the "wonders of the magnet," he referred to the telegraphic compass. In a more detailed account than that provided in 1558, he explains that two friends, even if one of them was in prison, could send messages to each other (*nuntiare*) over a long distance, and that this could possibly be achieved (*fieri posse non vereor*) with two compasses surrounded by the letters of the alphabet.[18] Beyond the introduction, however, della Porta does not further elaborate on this, so it would appear to have been more of an idea than a proven device. It is not until we read his unpublished *Taumatologia*, which was written between 1606 and 1615, that we find testimony to the attempts at designing such a method of sympathetic communication. There, della Porta addressed a crucial point, namely the range of the magnetic force.[19] He understood that an ordinary magnet had a limited

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Biographical and Critical Study," *Revue hispanique: recueil consacré à l'étude des langues, des littératures et de l'histoire des pays castillans, catalans et portugais*, 71 (1927), 309–484, at 335; Fernán Pérez de Oliva, *Cosmografia nueva*, ed. Cirilo Flórez Miguel (Salamanca, 1985), 28, n. 4.

15 On Pérez de Oliva, see Atkinson, "Hernán Pérez de Oliva"; Pérez de Oliva, *Cosmografia nueva*.

16 See Blaise de Vigenère, *Traicté des chiffres, ou Secrètes manières d'escrire* (Paris, 1587), 16v–17r. According to Fahie, *History of Electric Telegraphy*, 5, this idea was already mentioned in Titus Livius and Blaise de Vigenère, *Les cinq premiers livres de l'histoire romaine de Tite Live Padoüan, excellent entre tous les autheurs Latins: depuis la fondation de la ville, iusques à ce qu'elle fuit prise & destruicte par les Gaullois*, vol. 1 (Paris, 1579), 1316. I cannot corroborate this, however, as the indicated page does not mention magnetic telegraphy.

17 Gerolamo Cardano already wrote an alphabet around a perpetuum mobile which was supposedly designed by Antonius de Fantis; see Sander, *Magnes*, 568–569, and Gerolamo Cardano, *De rerum varietate libri XVII adiectus est capitum, rerum & sententiarum notatu dignissimarum index* (Basel, 1557), 373–374; perhaps Vigenère or his source were inspired by this.

18 Giambattista della Porta, *Magiae naturalis libri XX* (Naples, 1589), 128: "Et amico longe absenti, etiam carceribus occluso possumus incumbentia nuntiare, quod duobus nauticis pyxidibus, alphabeto circumscrpisit, fieri posse non vereor. Pendet ex hoc principia perennis motus et mirabiliora, qua praetermittenda duximus."

19 Cf. Fritz Krafft, "Sphaera activitatis – orbis virtutis. Das Entstehen der Vorstellung von Zentralkräften," *Sudhoffs Archiv*, 54 (1970), 113–140; Dana Jalobeanu, "'Borders', 'Leaps'

sphere of activity. In this unfinished work, he claimed that he wanted to write about how to infinitely increase the magnet's power, how to transmit messages magnetically over long distances, and how to equip compasses for this.[20] Unfortunately, he did not go on to do any of this.

Also in the *Taumatologia* and in his unpublished *Criptologia*, Della Porta mentions moreover a different, yet related form of communication that did not involve any magnetic effects, but was often associated with these effects in the decades that followed.[21] Two friends were to write the letters of the alphabet around a wound. The sender would then pierce their skin at the corresponding letter with a needle dipped in the recipient's blood. The recipient would then experience this painful sensation in his own body via the so-called "sympathy of the blood."[22]

Although it remains rather implicit here, it seems – in della Porta's view, a view shared by many of his contemporaries dealing with the 'occult' and 'magic' – that action at a distance was rendered possible by the powers of sympathy and antipathy. This concept had already been invoked in ancient natural philosophy and magic, and it aimed in particular to explain specific, often surprising causal relations in nature. So, for example, magnets' attraction of iron was attributed to 'sympathy' and water's power of extinguishing fire to 'antipathy.'[23] By the middle of the sixteenth century, the whole field of natural

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and 'Orbs of Virtue': A Contextual Reconstruction of Francis Bacon's Extension-Related Concepts," in *Boundaries, Extents and Circulations*, ed. Koen Vermeir and Jonathan Regier (Dordrecht, 2016), 229–254; Sander, *Magnes*, 629–632.

20 Giambattista della Porta, *Taumatologia e criptologia*, ed. Raffaele Sirri (Naples, 2013), 6: "Come si moltiplichi la virtù della calamita in infinitum. Come, movendosi un ferro se ne muovano molti e si possa avisar di lontano un concetto. Come si preparino due bussole di naviganti ch'abbino l'alfabeto descritto intorno, che, muovendosi il ferro di l'una, si muova quello dell'altra molto di lontano, e duo amici si possano, ad ore determinate, avisarsi di quello che si vogliano." Cf. Gioacchino Paparelli, "La 'Taumatologia' di Giovambattista della Porta," *Filologia romanza*, 2 (1955), 418–429.

21 See Porta, *Taumatologia e criptologia*, 121–122. This discussion is related to the "Unguentum sympaticum" and thus refers back to ideas that come from the Paracelsian tradition of the so-called weapon salve; see further below, as well as Roberto Poma, *Magie et guérison: la rationalité de la médecine magique* (*XVI^e–XVII^e*) (Paris, 2009).

22 See Porta, *Taumatologia e criptologia*, 6–7: "Come duo [sic] amici, facendosi una piaga in un braccio o gamba, che stia sempre aperta, con un alfabeto scritto intorno, pungendosi una lettera con uno stile bagnato del sangue dell'amico, l'altro di lontano si senta pungere nella medesima lettera co'l medesimo dolore c s'avisino di quel che si voglino"; see also ibid., 121: "supra vulnera fiant duo circuii magni vel parvi secundum plagae quantitatem, et circa ea describatur alphabetum eodem loco et modo, eiusdem mensurae et capacitatis."

23 See, e.g., Daryn Lehoux, *What Did the Romans Know? An Inquiry into Science and Worldmaking* (Chicago, IL – London, 2012), 133–154.

magic seemed to subscribe to a research agenda aiming at the discovery of these secret relationships of sympathy and antipathy in nature. This was an agenda conceived for the technological benefit of humankind. Although both the metaphysical underpinnings and precise explanations of how this sympathy worked remained mostly implicit or outright elusive, it still seemed to provide theorists as well as practitioners with a suitable concept, a point of departure from which to work.

The intertwinement between sympathy and magnetism is a complicated issue not to be addressed here in detail, but it is no coincidence that many early modern authors considered certain effects to be 'magnetic' which were, in reality, more akin to 'sympathy.' Such effects were not caused, nor were they claimed to be caused, by the mineral magnetite or by iron, but only resembled magnetic powers, insofar as the effect was caused at a distance. Della Porta's ideas about communication through the medium of blood – which he understood as taking place through 'sympathy', not magnetism – was already closely tied to one of the major medical controversies of the first half of the seventeenth century. In the so-called weapon salve controversy, it was debated whether the pseudo-Paracelsian weapon salve was able to heal wounds at a distance by applying an organic cure to the weapon (which had inflicted the wound) instead of to the wound itself or to the injured person. This miraculous cure was originally supposed to work by 'sympathy' with the patient's blood. Soon, its proponents claimed that the cure actually worked by magnetism, thereby trying to naturalize the effect to some extent. However, they were not referring to the actual mineral, the magnet, but to a broader force in nature. Similar concepts also informed certain discussions about the magnetic telegraph. Although the magnetic compass was mostly seen as the basis for magnetic telegraphy, the 'connectivity' between the two compass needles was nothing typically observed in natural magnetism; it required additional presuppositions, notably a presumed 'sympathy' between the two needles.

Della Porta's ideas were clearly the most prominent point of departure for later authors who wrote about the telegraph. Well-connected as they were with the curator of della Porta's writings, Cassiano Dal Pozzo, there were several Jesuit commentators who, having gained insights into his unpublished *Taumatologia* and *Criptologia*, quoted the aforementioned passages in their own printed works.[24] In a treatise of 1611, which was published under

24 The passage from the *Taumatologia* reads, as quoted in Caspar Schott's *Magia universalis naturæ et artis: sive, Recondita naturalium & artificialium rerum scientia, cujus ope per variam applicationem activorum cum passivis, admirandorum effectuum spectacula, abditarumque inventionum miracula, ad varios humanæ vitæ usus, eruuntur*, 4 vols. (Würzburg,

the pseudonym Petrus Arlensis de Scudalupis, the author, who calls himself a "friend and fellow citizen" of della Porta, allegedly tried to strengthen the magnet's power so that he would be able to carry out della Porta's telegraphic experiment. He claims having tried it "more often than often," but never managed to strengthen the magnet sufficiently.[25] Similar attempts to amplify the magnet's power were promoted by others at this time, especially in Paracelsian circles.[26]

The writings of Daniel Schwenter probably present the most complex and vivid example of how different approaches to sympathetic, magnetic, and optical telegraphy became intertwined. Schwenter was professor of mathematics, Hebrew and oriental studies at the University of Altdorf and had already authored writings on cryptology in 1616, which had remained unpublished, however.[27] In 1618, he published the first edition of his *Steganologia et steganographia*

1659), 4: 51: "Come si praeparino due bussole di Naviganti, che habbino l'Alfabeto descritto intorno, che movendosi il ferro dell'una, si muova quello dell'altra di lontano, e doi amici si possono ad hore determinate auvisarsi di quello che essi vogliono." Schott claims to have been shown the manuscript by Cassiano dal Pozzo in Rome. Athanasius Kircher, *Magnes; sive, De arte magnetica opvs tripartitvm*, 3rd ed. (Rome, 1654), 282, quotes from the *Criptologia*, which he claims to have received from dal Pozzo as well. Cf. also Aschoff, *Geschichte der Nachrichtentechnik*, 1: 94. On dal Pozzo and della Porta, cf. also Christoph Sander, "Early-Modern Magnetism: Uncovering New Textual Links between Leonardo Garzoni SJ (1543–1592), Paolo Sarpi OSM (1552–1623), Giambattista Della Porta (1535–1615), and the Accademia Dei Lincei," *Archivum Historicum Societatis Iesu*, 85 (2016), 303–363.

25 See Camillo Leonardi and Petrus Arlensis de Scudalupis, *Speculum lapidum Camilli Leonardi. Cui accessit Sympathia septem metallorum ac septem selectorum lapidum ad planetas* (Paris, 1610), 275; Camillo Leonardi, Petrus Arlensis de Scudalupis and Petrus Constantius (Villanovensis) Albinius, *Speculum lapidum, et D. Petri Arlensis de Scudalupis Presbyteri Hierosolymitani, Sympathia septem metallorum ac septem selectorum lapidum ad planetas* (Hamburg, 1717), 210–211: "Tradunt in Montibus Aethiopiae mineram inesse tali praeditam qualitate et praestantia, ut una pars unciae partem ferri duarum librarum attrakt hat et omnes partes mundi ostendat: qui de tali have poterit, henceforth aliquas operations adhucitas tacitas, erst nondum inventas experiri possit, et praecipue quae a Joan. Baptista Porta meo concive et amico promittuntur, puta de loquutione in distantia, quod experimentum saepe saepius tentavi, instrumentaque accomodavi, nec tamen unquam ad finem pervenire potui, licet exactissime totum magisterium peractum fuisse." On author and work, see Sander, *Magnes*, 239–245.

26 See Sander, *Magnes*, 87–92.

27 Some hints to Schwenter and his *Steganologia* can be found in Fahie, *History of Electric Telegraphy*, 6–8; Donald R. Dickson, *The Tessera of Antilia: Utopian Brotherhoods & Secret Societies in the Early Seventeenth Century* (Leiden, 1998), 47; Reeves, "Of Language and the Lodestone," 10–13; Aschoff, *Geschichte der Nachrichtentechnik*, 1: 100–102; Hans-Joachim Jakob, "Ein Altdorfer Fachmann der 'Zifferantenkunst.' Daniel Schwenters Steganologia & Steganographia NOVA (um 1620) und ihre Verbindung zum ersten Band der Mathematischen und philosophischen Erquickstunden (1636)," in Peter Hesselmann, ed.,

nova, which was reprinted, revised, and extended as *Steganologia et steganographia aucta*, probably in 1622 (and reprinted in 1633).[28] None of these editions were published with dates and all, moreover, were issued under pseudonyms.[29] Shortly after Schwenter's death in 1636, his *Mathematische und philosophische Erquickstunden* were printed; these may be regarded as an extended and revised translation of Jean Leurechon's *Récréation mathématique*.[30] All these works mention different forms of magnetic telegraphy.

In his *Steganologia*, Schwenter deals with numerous procedures and techniques for enabling two persons, called "Mars" and "Mercurius," to send secret messages to each other. The magnet was used in three different ways. First, Schwenter refers to magnetism by way of comparison. The magnetic force of

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Simpliciana: Schriften der Grimmelshausen-Gesellschaft. Jg. XXXVI (2014) (Bern, 2015), 241–258. On his early engagement with cryptology, cf. the manuscript in Erlangen, University Library, Ms. Lat. 819, fols. 313–340: "Libellus de secretis organicis seu de secretis grammatis quomodo videlicet occulte loquendum et scribendum. Ex optimis quibusque auctoribus congestus a. M. Daniele Schwentero. Anno 1616. In schimpff und ernst zugebrauch(en)." This Ms. contains: "Secreta organica & Literae synthematicae, oder verborgene geheime Schreib=Kunst, aus alten Historicis und Scribenten fleissig zusammen getragen." See Hans Fischer, *Die lateinischen Papierhandschriften der Universitätsbibliothek Erlangen* (Erlangen, 1936), 480.

28 Cf. Daniel Schwenter, *Steganologia & steganographia nova: Geheime magische, natürliche Red vnd Schreibkunst, einem in der nähe vnd ferrne Alsbalden oder in gewiser Zeit, so woln in Schimpff als Ernst, etwas verborgens vnnd geheimes zu eröffnen durch Reden, Schreiben vnd mancherley Instrumenta: item wie verborgene Schrifften zu machen, auffzulösen, vnd mit sonderlichen Künsten zu schreiben* (Nuremberg, 1618); idem, *Steganologia & steganographia aucta: geheime, magische, natürliche Red unnd Schreibkunst; auff vielfältigs Begeren guter Freunde, auffs Neue revidirt, an etlichen Orten corrigirt, was verborgen geschrieben detegirt* (Nuremberg, 1622); idem, *Steganologia & steganographia aucta: Geheime, Magische, natürliche Red vnnd Schreibkunst: auss vielfältigs begehren guter Freunde, auffs neue revidirt, an etlichen Orten corrigirt, was verborgen geschrieben detegirt, mit schönen vnd wunderlichen Künsten, der Steganologiae vnnd Steganographiae zugethan, augirt, vnd dann zum drittenmal in Truck verfertiget* (Nuremberg, 1633). The dates remain uncertain, but Schwenter, *Steganologia & steganographia nova*, 50, reports that "two years ago," the publication of Franz Kessler's *Unterschiedliche bißhero mehrern Theils secreta oder verborgene geheime Künste* (Oppenheim, 1616) had appeared. This reference has escaped bibliographical dating until now. The dating of the editions of 1622 and 1633 is taken from the secondary literature. The editions of 1622 and 1633 are identical.

29 His pseudonyms were "[by] Resene Gibronte Runeclus Hanedi" (1618) and "Janus Hercules a Sunde" (1622 and 1633). According to later sources, Schwenter was suspected of magic. Perhaps this is the reason for the decision to publish under a pseudonym; see Dickson, *Tessera of Antilia*, 47, n. 93.

30 Cf. Daniel Schwenter, *Deliciae physico-mathematicae, oder, Mathemat. und philosophische Erquickstunden darinnen sechs-hundert drey und sechsig schöne, liebliche und annehmliche Kunststücklein* (Nuremberg, 1636). This is the first volume before Georg Philipp Harsdörffer took over the publication of another two volumes.

attraction and the ability of the magnet to act through other bodies are taken to be as inexplicable as the idea of communicating via sympathy in the way that was already described by della Porta.[31] Schwenter describes the idea according to which – once a sympathy by blood had been established between two persons – the one could feel the pain of the other in their wounds reciprocally and they could thereby 'talk' over a long distance. However, this sympathy also comes with a great risk, Schwenter explains. The death of one person will bring about the rotting of the body part of the other person sympathetically connected.[32] To illustrate this, Schwenter tells his readers that a surgeon in Italy replaced noses by taking tissue from the patient's arm.[33] Since this surgery was of course very painful, a wealthy man, yet without a nose, had bought tissue from the arm of a poor man and was thus temporarily provided once more with a nose. When the poor donor died, however, the rich man's nose also began to rot – for Schwenter, this was a clear sign of sympathy between the two pieces of tissue.[34]

Schwenter's second mention of magnetism relates to a technique of optical telegraphy. Here, a sighting instrument and a telescope are used to decipher messages encoded in light signals sent from a distant location at night and interpreted as letters.[35] Schwenter learned of this method from Franz Kessler, who had designed it in 1616.[36] For Kessler and Schwenter, the bearing of the light signals required a magnetic compass to record the angular positions of

31 Cf. Schwenter, *Steganologia & steganographia nova*, 111–116; idem, *Steganologia & steganographia aucta* (1622), 142–146.

32 Cf. Schwenter, *Steganologia & steganographia nova*, 114: "Wie wunderbar und seltzam aber diese Kunst ist/ so gefehrlich ist sie auch/ dann wann Mars an dem ort deß Arms welchs er verwundet/ etwan schaden lidte/ und verletzt würde/ müste solchs Mercurius auch entgelten/ unnd mit Marte schaden und schmertzen leiden. Stürbe dann Mars, so were zubesorgen/ das auch dem Mercurio sein Arm möchte anfahen zu faulen […]."

33 On a similar nose surgery, cf. Jean-Chrysostôme Magnen, *Democritus reviviscens: sive vita et philosophia Democriti* (Leiden, 1648), 197–198. The method was famous and known as the "Italian method"; its invention was commonly attributed to Gaspare Tagliacozzi.

34 This would today be called a fallacy of the type "post hoc ergo propter hoc," but it also played an important role in explaining the efficacy of the weapon salve. In this case, it motivated Schwenter to confirm his notion of sympathy, which should by extension also work for his esoteric telegraphic technique. Cf. Marcel Mauss, *A General Theory of Magic*, transl. Robert Brain (London, 2001), 114–115: "This happens in all magical experiments. Fortuitous coincidences are accepted as normal facts and all contradictory evidence is denied."

35 Cf. Schwenter, *Steganologia & steganographia nova*, 50–56; idem, *Steganologia & steganographia aucta* (1622), 62–82.

36 See Kessler, *Unterschiedliche bißhero mehrern Theils secreta oder verborgene geheime Künste*, 19–37. Schwenter modified Kessler's technique slightly and extended his own design in his 1622 version.

transmitter and receiver during the day. The receiver would thereby know where to look for the signals in the dark.[37] This form of telegraphy is not based on magnetic powers, and merely uses the magnetic compass as a tool for orientation.

The third mention of magnetism in Schwenter's *Steganologia*, however, may be called 'magnetic' in a proper sense, and it corresponds exactly to what was first conceived by della Porta as magnetic telegraphy: "To send messages using a compass to someone who is two or three miles away and can neither be seen nor heard."[38] Schwenter, in fact, is the first author to describe an exact procedure, but – true to his métier as an Altdorf orientalist – he encrypted his 1618 instructions by exotic technical terms, "so that not every farmer understands it" (*das es nicht ein jeder Bauer verstehe*). In 1622, Schwenter offered a somewhat less cryptic explanation, "to the benefit of the artisan" (*dem Kunstliebenden zu gute*).[39] Despite this late effort toward clarification, his procedure remains complicated and difficult to understand. But testifying as it does to Schwenter's ingenuity, it therefore deserves a brief account.

Schwenter instructs his readers to make two compasses, but to not magnetize the needles yet. The compasses should be inscribed at the four cardinal points with four letters of the alphabet each, forming the repertoire for possible codes (see Fig. 1).

Then, a piece of iron in the form of a diamond was to be made, probably with a pyramid-shaped tip formed by four triangular faces.[40] This substance,

37 A good description can be found in Aschoff, *Geschichte der Nachrichtentechnik*, 1: 97–100; see also Uta Lindgren, "Land Surveys, Instruments, and Practitioners in the Renaissance," in *Cartography in the European Renaissance*, 2 vols., ed. David Woodward (Chicago, IL, 2007), 1: 477–508.

38 Cf. Schwenter, *Steganologia & steganographia nova*, 97–106; idem, *Steganologia & steganographia aucta* (1622), 229–236: "Auff zwo oder drey Meil/ einem/ den man weder sehen noch hören kan/ durch einen Compasten etwas zuverstehen zu geben."

39 See also August the Younger, Duke of Brunswick-Lüneburg, *Gustavi Seleni Cryptomenytices et cryptographiae libri IX. In quibus et planissima stenographiae à Johanne Trithemio … magicè & ænigmaticè olim conscriptae, enodatio traditur. Inspersis ubiquè authoris ac aliorum, non contemnendis inventis* (Lüneburg, 1624), 425, with reference to both of Schwenter's editions of 1618 and 1622: "Quod artificium, in prima editione, hermetica nebula obscuratum, in aucta demum Steganologia ipse aliquo modo detexit."

40 The corresponding diamond cut is documented in Anselmus de Boodt, *Gemmarum et lapidum historia qua non solum ortus, natura, vis & precium, sed etiam modus quo ex iis olea, salia, tincturae, essentiae, arcana & magisteria arte chymica confici possint, ostenditur: opvs principibvs, medicis, chymicis, physicis, ac liberalioribus ingeniis utilissimum: cum variis figuris, indiceq. duplici & copioso* (Hanau, 1609), 70; see also Alois M. Haas, Ludwig Hödl and Horst Ernst Schneider, *Diamant: Zauber und Geschichte eines Wunders der Natur* (Berlin – New York, 2004), 215.

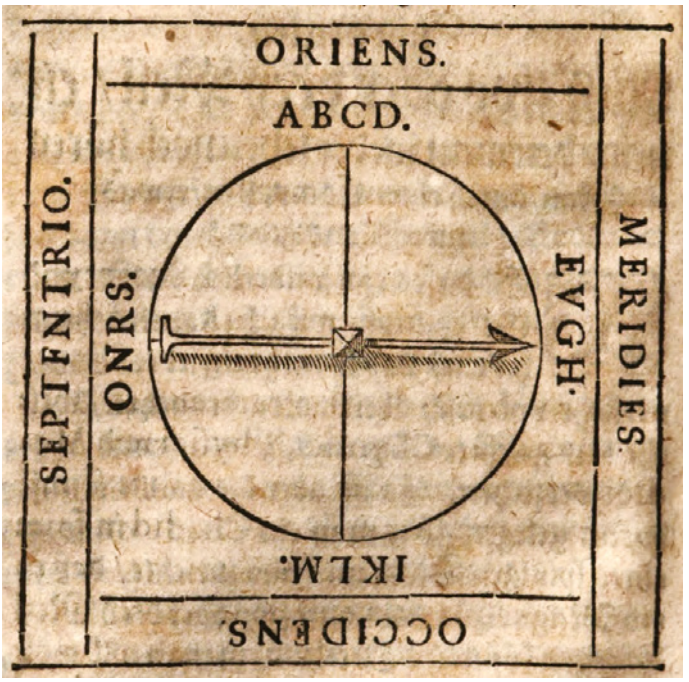

FIGURE 1 Telegraphic compass according to Daniel Schwenter, *Steganologia & steganographia nova: Geheime magische, natürliche Red vnd Schreibkunst, einem in der nähe vnd ferrne Alsbalden oder in gewiser Zeit, so woln in Schimpff als Ernst, etwas verborgens vnnd geheimes zu eröffnen durch Reden, Schreiben vnd mancherley Instrumenta: item wie verborgene Schrifften zu machen, auffzulösen, vnd mit sonderlichen Künsten zu schreiben* (Nuremberg, 1618), 98
SOURCE: BAYERISCHE STAATSBIBLIOTHEK MÜNCHEN, RES/PATH. 801#BEIBD. 4. (URN:NBN:DE:BVB:12-BSB10926734-6)

in 1618 called by the arcane name of "Chadid," was to be rubbed in one direction by four different kinds of magnet, each corresponding to one cardinal direction.[41] This had to be done twice, once while the "Chadid" was hot and then when it was cold. Moreover, the iron had to be aligned in the direction of each of the four cardinal points, i.e., north, south, east, and west.[42]

41 This procedure of magnetizing consisted in rubbing the magnet in one direction across the iron stick. The practice looks somewhat like the sharpening of a knife.

42 Reeves, "Of Language and the Lodestone," 12, outlines the procedure in a few sentences and says the needles would be "baptized with cabalistic names." But neither the concept

In 1618, Schwenter encrypted these four types of magnet with arcane expressions, which he partially explained in 1622. For the south-sided kind of magnet, he uses the "Almagritum"; for the north, the "Theamedes"; for the east, the "Almas largont"; and for the west, he uses the "Galamitro." The first probably refers to the ordinary magnet (S); the second to "theamedes" (N) which was already mentioned by Pliny. The third refers to the diamond (E) and the fourth to an unidentifiable substance (W) about which Schwenter claims to have heard from Leonardo Fioravanti's *Physica*.[43] After this procedure of magnetization, the "Chadid," i.e., the four-times magnetized piece of iron, was used to sweep the needles of both compasses. Once manufactured in this manner, the first compass needle was supposed to deflect in the same direction when the second compass needle was deflected with the magnetic iron. When the needle deflected several times to the same side of the compass, the four letters assigned to this side of the compass could be interpreted; bouncing twice south gave the letter B, for example – in a manner similar to a digital codification of letters. With the help of a small bell, against which the deflecting needle would strike, the incoming message could even be announced with an alarm signal; a veritable 'push notification' *avant la lettre*.

Schwenter is making every effort to explain the magnetization and signal transmission processes with detailed descriptions so that they could be reproduced step by step. However, the Altdorf cryptographer gives his readers precious few insights into why he produced a fourfold direction-sensitive magnetization with four different sorts of magnets. When viewed against the historical background, however, his approach may appear less arbitrary and less inexplicable. First of all, and in the nautical context also, many believed that a compass needle could be magnetized differently, so that it would point either north, south, west, or east.[44] This idea is fundamental to Schwenter's

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of baptism nor the Kabbalah play an explicit role in Schwenter, who prescribes, however, that the successively magnetized sides of the "Chadid" should be inscribed with the initial letters of the four cardinal points, but only in order to be able to distinguish these sides.

43 In the German translation, Leonardo Fioravanti, *Physica: Das ist: Experientz und Naturkündigung: Jetzund ausz dem Italiänischen ob seiner unsäglichen Fürtrefflichkeit … wegen ins Teusch versetzt* (Frankfurt a.M., 1604), of Leonardo Fioravanti, *Della fisica dell'eccellente dottore et caualiero m. Leonardo Fiorauanti bolognese diuisa in libri quattro* (Venice, 1582), this substance is not mentioned. On this author, cf. William Eamon, *The Professor of Secrets: Mystery, Medicine, and Alchemy in Renaissance Italy* (Washington, D.C., 2010). Johann Georg Brengger and Helisaeus Röslin, *Praematurae Solis apparitionis in Nova Zembla causa vera: & De magneter* [*sic*] *non nulla* (Strasbourg, 1612), B2r, however, refer to Laurenzio Fioravanti in connection with the magnet.

44 See Sander, *Magnes*, 506–508; E.G.R. Taylor, "The South-Pointing Needle," *Imago Mundi*, 8 (1951), 1–7.

method. In addition, many thought that a compass needle, when magnetized individually by a specific magnet, would receive a magnetic declination that had been specific to the magnet used.[45] This basically explains Schwenter's assumption that the two compasses must be magnetized simultaneously and with the same substances.

Schwenter's arcane naming of the four types of magnets was criticized as alchemical jargon in contemporary works, such as those by Ulisse Aldrovandi, Athanasius Kircher, and Caspar Schott. Distinguishing different kinds of magnets was quite common, especially in sixteenth-century mineralogy and was well known in seventeenth-century alchemy.[46] Yet, Schwenter's fourfold division was unique and unwarranted from a mineralogical point of view. Kircher pointed out that the word "Chadid," i.e., the magnetized piece of iron, originated from the Arabic word for iron, "chadad."[47] Schwenter's "Almagritum" strikingly resembles the Arabic name for the magnet, "Hager almagritos," as would have been known to early modern authors; knowing Arabic to some extent, it is surprisingly that Kircher himself did not uncover this.[48] A south-pointing compass needle was quite commonly presupposed for making and using sundials.[49] Moreover, the "theamedes" had made a spectacular career as an anti-magnet in the sixteenth century. It emerged from a probably corrupt reading of Pliny's *Natural History* and was understood as a kind of magnet which, unlike other magnets, was able to repel iron. Later 'theamedism' was subsumed as a paronym into the alchemical lexicon to denote repulsive forces or for forces which were opposed to magnetic effects.[50] Thus, it seems quite apt that it was envisaged as a north-pointing magnet, the south-pointing magnet being the default type. The claim that a compass could be magnetized with a diamond had already been made by della Porta and was often discussed in Schwenter's time.[51] The linguist in Schwenter can be seen at work in his designating the east-sided magnet "Almas largont," which was

45 See Sander, *Magnes*, 500–505; as an example, cf. Ursula Lamb, "The Sevillian Lodestone: Science and Circumstance," in *Cosmographers and Pilots of the Spanish Maritime Empire*, ed. Ursula Lamb (Brookfield, VT, 1987), VII, 29–39.

46 Cf. also Christoph Sander, "Magnetismus und Theamedismus. Eine Fallstudie zur Kenntnis der magnetischen Abstoßung in der Naturkunde der Frühen Neuzeit," *Sudhoffs Archiv*, 101 (2017), 42–72.

47 Cf. Athanasius Kircher, *Magnes; sive, De arte magnetica opus tripartitum* (Rome, 1641), 384.

48 See Sander, *Magnes*, 21, n. 57.

49 See note 44, above.

50 Cf. Sander, "Magnetismus und Theamedismus."

51 See Sander, *Magnes*, 43–48.

the Russian name for diamond.[52] However, no one had ever heard of its power to point eastwards.[53] "Galamitrum" may have been a corrupted form of the Italian "calamita," an expression which, particularly in the magical and medical contexts, was very familiar beyond the Italian-speaking world.[54] It might also derive from the Latin "calamistrum," which denotes a small iron tube that was made hot and used to curl hair.

For Schwenter, acquiring these four types of magnet was a key task. Within the circle of Duke August the Younger of Brunswick-Lüneburg, the correspondence provides substantial testimony to Schwenter's efforts. The German Duke himself dealt extensively with cryptography and sent the first printed sheets of his own work *Cryptomenytices et cryptographiae libri IX*, to Prince Christian I of Anhalt-Bernburg on 6 January 1624.[55] In this work, the Duke also mentioned Schwenter's magnetic telegraphy, referencing both editions of the *Steganologia* (of 1618 and 1622).[56] On 16 January, Prince Christian thanked

52 Cf. Leonhard Thurneisser zum Thurn, *Melîsā kai hermēneia: das ist ein Onomasticum vnd Interpretatio oder aussführliche Erklerung* (Berlin, 1583), 13: "Almas largont: Ist Moscowitisch oder Reuschisch gred/ und bedeut ein Diemant stein."

53 Perhaps the association with the East was also determined by the fact that Russia lies in the East. But, on the magnet, see, e.g., Sagrario Rodríguez M. Montalvo, ed., *Lapidario* (*según el manuscrito escurialense H.I.15*) (Madrid, 1981), 21: "Y cuando la mediana de ellas sube en el horizonte, de parte de Oriente, hará mayor fuerza, y más virtud en todas estas obras que hemos dichas"; see also the medieval lapidary *Coelatio lapidum* in Johannes G. Mayer and Konrad Goehl, "Antike Gemmen: Steinmagie und Liebeszauber bis ins christliche Mittelalter. Der Jude 'Techel' oder 'Cheel' und die 'coelatio lapidum' mit Edition und Übersetzung zweier Steinbücher," in *Editionen und Studien zur lateinischen und deutschen Fachprosa des Mittelalters: Festgabe für Gundolf Keil*, ed. Konrad Goehl (Würzburg, 2000), 265–316, at 289: "Et sicut magnes aspicit septentrionem, sic chrysolithus orientem." Similar commentary is found also in *De quindecim stellis*; see Louis Delatte, ed., *Textes latins et vieux français relatifs aux Cyranides* (Liège – Paris, 1942), 264.

54 See Sander, *Magnes*, 540–543; Henry Kahane, "Calamita 'Lodestone': A Western Reflex of Hellenistic Egyptian Magic," *Romance Philology*, 13 (1959), 269–278; and Gianni Mazzucchelli, "La calamita bianca della Monaca di Monza, o il caro prezzo di un banale amuleto," *Quaderni di semantica*, 32 (2011), 147–154.

55 Cf. Klaus Conermann, ed., *Briefe der Fruchtbringenden Gesellschaft und Beilagen: die Zeit Fürst Ludwigs von Anhalt-Köthen 1617–1650*, vol. 1 (Tübingen, 1992), 234–235.

56 See August the Younger, *Gustavi Seleni Cryptomenytices*, 425: "Secundum Modum exhibet nobis Schvventer. lib. 3. p. 97. quod fiat duarum nauticarum pyxidum, artificiosa confectione, ac mutua sympathia. Quod artificium, in prima editione, hermetica nebula obscuratum, in aucta demum Steganologia ipse aliquo modo detexit. Qui volet ipsum adeat, atque articificium ulterius perscrutetur. Tertius Modus fit, partis alicuius, duorum corporum, mutua vulneratione et instillatione aliquot guttarum sanguinis: Quo certae tantum res, inter absentes notificari possunt. De eo etiam agit Schwenterus, p. 111. ubi tradit et ostendit non leve incommodum simul incurrere, qui hoc institutum amplectentur." He also mentions the "blood method," see above, note 32.

him for these references to Schwenter's work and reported on his first impressions after beginning to read it. He noted that he did not believe in the sympathetic transmission of messages and that he himself had heard of a man who was supposed to know forty different ways of 'magnetic' messaging.[57] Yet, he confessed that he was not a specialist and that the matter was "too high" for him anyway. On 25 January, the Duke then addressed Schwenter's magnetic method in greater detail:

> There is one in Altdorf, by the name of M. Daniel Schwenter, who claims to have found a way to send secret messages over many miles with two compasses: But he lacks the fourth side of the magnet; he already acquired the third side, and he calls this side "Galamitrum." When he succeeds in getting this stone, he claims he will present miracles in this science: It would be a great achievement, and very useful in higher matters.[58]

Apparently, Schwenter had asked the Duke for help, presumably with the promise that his invention would be highly useful for matters of the state.

In all likelihood, Schwenter never acquired all the magnets he claimed to need for his device; evidence of further efforts is not to be found in the correspondence nor in other sources. The idea spread nonetheless. In 1623, Robert Fludd, as it were, plagiarized Schwenter's compass telegraphy method in his work *De anatomia*, but provided new woodcuts (see Figs. 2 and 3) and introduced some modifications to the method.[59]

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57 Cf. Conermann, *Briefe der Fruchtbringenden Gesellschaft und Beilagen*, 1: 244–245: "Alleyn zweyffell ich sehr Ob die repraesentatjo Sympathica Jn re & natura zu finden muglich Es wehre dan per vnicam harmonjam superiorjs & Inferioris, So doch fast mehr ob suj Entis Exigujtatem pro conceptu idealj quam Realj gehalten werden mochte, Mihr ist eyner bekandt so vber die 40 vntterschiedliche modos virtutis magneticæ in diuersis et distinctis subjectis ad sensum repraesentiren will, Aber was hilfft solches zu eyner so fürtreffliche Distanz vnd vielfeltiger mutatjon vnd affectjon dadurch die jntentjones Anjmj vorstanden werden solten, Jch bekenne aber gar gerne das diese materia für mich zu hoch, Habe allejn solches andeuten wollen damit E. l. zu sehen ich zu dergleychen Jngenjosis grose lust getragen, befhele E.l. darmit dem lieben Gott vnd verbleyb […]."

58 Ibid., 248: "Sonsten ist zu Altorf einer, nahmens M. Daniel Schwenter, der vermeynet mit zweyen Compasten, über viele meyle dieses geheyme schreiben auch zu wercke zu richten: Es mangelt ihm aber quartum Latus Magnetis; dan tria Latera hat er albereit gar just: Und nennet er dieses Latus, Galamitrum. Wan ihm nuhn dergleichen Stein möchte werden, vermeynet er in illâ arte, damit miracula zu præstieren: Es wehre ein vortrefliches werck, in hoch-Angelegenen Sachen sehr nützlich zu gebrauchen."

59 See Robert Fludd, *Sectionis primae portio tertia De anatomia triplici: in partes tres divisa* (Frankfurt a.M., 1623), 234–236. Fludd also mentions the "blood method."

FIGURES 2 & 3 Telegraphic compass and iron with wooden handle, according to Robert Fludd, *Sectionis primae portio tertia De anatomia triplici: in partes tres divisa* (Frankfurt, 1623), 235
SOURCE: STAATLICHE BIBLIOTHEK REGENSBURG, 999/4MED.202 (URN:NBN:DE:BVB:12-BSB11069402-7)

Fludd arranged the letters differently on the compass, added a wooden handle to Schwenter's fourfold magnetic iron so that it could be heated more comfortably, and avoided the arcane vocabulary.[60] In addition, Fludd increased the radius considerably when he scaled Schwenter's "two or three" miles to "40 or 50." Fludd admitted, however, that he had not personally tried out the procedure, but he still considered this idea very promising, since the sympathy of the world spirit manifested itself in many different ways. In Fludd's worldview, in which the effect of the aforementioned weapon salve was also conveyed by this sympathy, there was nothing that precluded the possibility of communicating through a compass, at least no constraint of a natural-philosophical nature.[61]

60 It is arguable that Fludd already had access to the 1622 edition, as he deciphered the Russian 'secret name' of the diamond.

61 See Sander, *Magnes*, 245–250; Allen G. Debus, "Robert Fludd and the Use of Gilbert's De Magnete in the Weapon-Salve Controversy," *Journal of the History of Medicine and Allied*

In any case, he claims to have heard of a white magnet from Avignon that had been used to magnetize two compass needles.[62] One needle remained within the city wall, the other outside, and one would always move in alignment with the other. However, he did not know whether their simultaneous movement could be maintained at a larger distance.

In a 1636 work, posthumously printed, Schwenter accuses Fludd of having lifted his method, so to speak, and for having concealed his source.[63] Here, he then goes on to described the device following the description given in the *Récréation mathématique* (1624) by the Jesuit Jean Leurechon. This French work, which Schwenter revised and translated into German, in turn drew on della Porta's idea of the telegraph. Schwenter initially agrees with Leucheron's opinion that the effect of the magnet is not sufficient to move a compass needle over a distance of miles. Yet, he continues by arguing that the technology would require the very processes and kinds of magnet that he had himself described in his *Steganographia* (*es kämen dann diejenigen Stein darzu/ derer ich in meiner Steganographie gedacht*).[64] Thus, Schwenter continued to proclaim the efficiency of his own projected model of a telegraphic compass.

Schwenter's concept of the telegraphic compass, first articulated in 1618, certainly marked the apogee of the idea, but not its end. Between 1600 and 1650, the telegraphy idea spread in many works that mentioned it briefly, without referring to a particular designer and without offering substantial criticism.[65]

Sciences, 19 (1964), 389–417; Johannes Rösche, *Robert Fludd: Der Versuch einer hermetischen Alternative zur neuzeitlichen Naturwissenschaft* (Göttingen, 2008).

62 See Fludd, *De anatomia triplici*, 236: "Ego vero de lapide magnets, candidi coloris, et venis repleto in civitate Avegnionensi, cognovi duo instrumenta huiusmodi, facta findendo magnetem per venam eius albicantem […] Sed an vis illa magnetica per longiorem distantiam se extenderet, hoc nesciebam."

63 Cf. Schwenter, *Deliciae physico-mathematicae*, 347.

64 Schwenter, 347; see also below, note 92.

65 Cf. Guido Pancirolli, *Rerum memorabilium libri duo*, transl. Heinrich Salmuth (Amberg, 1602), 568; Benedetto Ceruti and Andrea Chiocco, *Musaeum Franc. Calceolarii iun. Veronensis: in quo multa ad naturalem, moralemque philosophiam spectantia, non pauca ad rem medicam pertinentia erudite proponuntur, & explicantur; non sine magna rerum exoticarum supellectile* (Verona, 1622), 266; Ole Worm, *Museum Wormianum: seu historia rerum rariorum, tam naturalium, quam artificialium, tam domesticarum, quam exoticarum, quæ Hafniæ Danorum in ædibus authoris fervantur* (Leiden, 1655), 63; Mario de Bignoni, *Serafici splendori da gli opachi delle piu celebri Academie rilucenti tra l'ombre di vaghi geroglifici compartiti in concetti tratti dalle diuine lettere, contrapuntati dalle professioni humane per li giorni ordinarij di Quaresima: opera scritturale, erudita, curiosa, sacra, morale, & utile* (Venice, 1649), 363–364; Samuel Hartlib, "The Hartlib Papers," 2002, here 29/2/14A, <www.dhi.ac.uk/hartlib>, accessed 14 October 2022. In 1606, Johannes Kepler had mentioned the telegraph idea without discrediting it as nonsense: see Johannes

Boodt (1609), for example, considered the idea impossible, but nevertheless described a test scenario in which two compasses could be influenced synchronously by a single magnet across a floor (*per tabulatum*) so that messages could be exchanged. He described a small statue that sat in the middle of the telegraph compass, surrounded by the alphabet, holding a wooden scepter with a magnet at its tip.[66] If one turned the doll, the magnet turned along with it; this affected the compass needle, which then rotated and pointed to a letter that could be read on the sympathetically influenced 'receiver device' by the corresponding movement of the needle.

In his criticism, Boodt referred to the limited radius of the magnet's power as certainly the biggest obstacle to effective magnetic telegraphy.[67] Many scholars thought about increasing the magnet's power for various reasons, which were often linked to hopes for economic profit.[68] Della Porta and Arlensis had already worked on such an increase in order to render the magnetic telegraph possible. Pierre Jean Fabre, in his *Palladium spagyricum* (1624), designed an alchemical process to increase the forces of the magnet considerably, with that one application explicitly in mind: that the project of magnetic telegraphy would thereby come within reach.[69]

The idea of magnetic telegraphy was also taken up in the domain of literature. In his *Prolusiones academicae* (1627), the Jesuit Famiano Strada describes a competition between poets – certainly, a fictitious contest – held before Pope Leo X.[70] Among the participants was the famous humanist Pietro Bembo. According to Strada, Bembo wanted to distinguish himself with a poem in the style of Lucretius and chose magnetic telegraphy as his theme, which he described in detail in forty-five verses in dactylic hexameter. The poem is clearly Strada's own, not Bembo's who had died decades before, in 1547. Although Strada refrained from passing any judgment about the workings of the instrument, he pointed out that both compasses would have to be magnetized with

Kepler, *Gesammelte Werke*, eds. Walther von Dyck and Max Caspar, 22 vols. (Munich, 1938–2002), 1: 187.

66 See Boodt, *Gemmarum et lapidum historia* (1636), 466.

67 Della Porta had already thought about extending this radius, and Arlensis said that he had failed in his practical attempt; see note 25.

68 Cf. Sander, *Magnes*, 905–909; Eileen Reeves, "Occult Sympathies and Antipathies: The Case of Early Modern Magnetism," in *Wissensideale und Wissenskulturen in der frühen Neuzeit* ["*Ideals and Cultures of Knowledge in Early Modern Europe*"], ed. Wolfgang Detel and Claus Zittel (Berlin, 2002), 97–114.

69 See Pierre Jean Fabre, *Palladium Spagyricum* (Toulouse, 1624), 78–79.

70 See Famiano Strada, *Prolusiones academicae* (Lyon, 1627), 306–307. Cf. also Haskell, *Loyola's Bees*, 134–137; Passannante, *Lucretian Renaissance*, 1–3.

the same magnet, thereby implying theoretical assumptions about the 'connection' between the two devices.[71]

The Capuchin Mario de Bignoni, in his homiletic manual *Serafici splendori* (1649), even appeared to promote della Porta's telegraph idea.[72] This work was placed on the *Roman Index of Prohibited Books* in 1674, perhaps also because of the theological role it assigned to the magnetic telegraph.[73] De Bignoni's theological analogy is indeed daring: as between two telegraph compasses, so also a similar "simpatia" also existed between God and the human soul. If one soul formed heretical concepts or showed sinful inclinations in violation of the Divine Law (*divina legge*), the 'compass' of the soul would deflect accordingly. The needle in God's 'compass' would accordingly deflect as well, which would thereby instantaneously indicate the violation of His law (*notifica à Dio la trasgressione*). This peculiar idea of divine mind control, which is also illustrated by an instrument taken from the suspicious tradition of natural magic and from a censored author such as della Porta, was probably just as theologically risky in Bignoni's time as it was undoubtedly creative.[74]

3 Skepticism, Refutation, and New Ideas

Numerous contemporary authors responded to the early modern idea of magnetic telegraphy with either cautious skepticism or vehement criticism. In his *Dialogo* (1632), Galileo Galilei ridiculed the idea with pointed irony and a certain degree of arrogance:

> This reminds me of a man who wanted to sell me a secret method of communicating with a person two or three thousand miles away, by means

71 In 1634, another Jesuit, Silvestro Pietrasanta, in the context of an emblematic work, referred to Strada's poem, also without criticism: see Silvestro Pietrasanta, *De symbolis heroicis libri IX* (Antwerp, 1634), 143–148.

72 See Bignoni, *Serafici splendori* (1649), 363–365. On this work, see Guido Laurenti, "Tra 'divine lettere', 'umane erudizioni' e 'vaghi geroglifici': l'enciclopedia dei 'concetti' predicabili nei Serafici splendori di Mario Bignoni," in *Prediche e predicatori nel Seicento*, ed. Maria Luisa Doglio and Carlo Delcorno (Bologna, 2013), 111–159.

73 See Laurenti, "Tra 'divine lettere'," 115; J.M. de Bujanda et al., eds., *Index des livres interdits*, 11 vols. (Québec, 1984–2002), 11: 269; see also the reissue in Mario de Bignoni, *Serafici splendori: da gli opachi delle più celebri Academie rilucenti tra' l'ombre di vaghi gieroglifici compartiti in Concetti tratti dalle Diuine Lettere, contrapuntati dalle Professioni Humane per li giorni ordinarij di Quaresima; opera scritturale, erudita, curiosa, sacra, morale, & utile* (Venice, 1654).

74 Cf. also note 95, for additional theological uses of the telegraph as analogy.

> of a certain sympathy of magnetic needles. I told him that I would gladly buy, but wanted to see by experiment and that it would be enough for me if he would stand in one room and I in another. He replied that its operation could not be detected at such a short distance. I sent him on his way, with the remark that I was not in the mood at that time to go to Cairo or Moscow for the experiment, but that if he wanted to go I would stay in Venice and take care of the other end.[75]

Since he evidently lacked all confidence in this technology, Galileo abstained from providing natural-philosophical criticism, and from offering sincere support for the commission of the required experiment. His assumption presumably was that if this method worked, he would have heard of it. And indeed, not even the engineers of magnetic telegraphy themselves were able to provide reports of unambiguous empirical success.

The first comprehensive natural-philosophical refutation of the underlying metaphysics of magnetic telegraphy can be found in a copy of the treatise on magnetism, the *Trattato delli maravigliosi effetti della calamita et delle cause loro*, attributed to the Jesuit Leonardo Garzoni.[76] That this particular manuscript was composed after 1589 can be seen from the fact that it takes into its considerations della Porta's *Magia* published in that year, including, as it seems, the allusion to the telegraph.[77] According to Garzoni, this idea is "false, superstitious, and based on principles which are neither true nor natural" (*falsa, superstitiosa, et fondata sopra principii non veri, ne naturali*).[78] His critique initially emphasizes the heterodox nature of certain forms of *magia*, and accuses all sorts of charlatans (*Ceretani*) of making up various 'secrets' just to burnish their own reputations.[79] Garzoni then focuses primarily on the methodological and philosophical principles underpinning the telegraphy idea. If the claimed

75 Galileo Galilei, *Dialogue Concerning the Two Chief World Systems, Ptolemaic and Copernican*, transl. Stillman Drake, 2nd ed. (Berkeley – Los Angeles, CA, 1967), 95. Cf. Galileo Galilei, *Le opere di Galileo Galilei*, ed. Antonio Garbasso and Giorgio Abetti, 20 vols. (Florence, 1968), 7: 120.

76 See the manuscript in Madrid, Biblioteca Nacional de España, MS 2020, fols. 207r–209r. Cf. Sander, "Early-Modern Magnetism." A digital scan and transcription of the manuscript are now available at <https://doi.org/10.48431/hc-trans/011f-9ea5> as part of <www.rara magnetica.de>, edited and curated by the author of this article.

77 However, the author did not seem to rely solely on della Porta, since he described the compass telegraph in more detail and designed the scenario that one of the compass telegraphs was in Venice, the other in Istanbul.

78 Cf. Ms. 2020, fol. 207r.

79 The word "cerratano" stands at the etymological root of the word "charlatan." Cf. Bruno Migliorini, "I cerretani e Cerreto," *Romance Philology*, 7 (1953), 60–64.

effect did not occur, he says, the advocates of magic could easily fall back on the excuse that something was not executed in exactly the prescribed way. The meticulous details provided for their procedures were therefore mainly used as a back door by which they could blame the manufacturer or operator for the method's failure. This methodological criticism may be considered a typical feature of early modern responses to occult technology in general.[80]

As for Garzoni's natural-philosophical criticism, it attacks the concept of sympathy and the associated assumption of action at a distance, which had already been denied by Aristotle. Compared to the discussion of the topic of action at a distance by other Jesuits, such as Francisco Suàrez, Garzoni's refutation of this principle is more polemical than philosophical, however.[81] In one of his more empirical arguments for the limited magnetic "sphere of activity," Garzoni claims that magnetic deposits on Elba were not even able to deflect the compass of a passing ship: how should a magnetic needle or a magnet be able to achieve this?

Garzoni's line of criticism was taken up by a fellow Jesuit, Niccolò Cabeo, who was one of very few scholars who knew Garzoni's work.[82] In his *Philosophia magnetica* (1629), Cabeo starts with a methodological attack, which he embeds in a religious and ethical line of argumentation: Science is greatly undermined when supposedly supernatural and marvelous powers are ascribed to the magnet. On the one hand, scholars get distracted from researching the true properties of the magnet by the proclamation of its marvelous – but fake – powers; on the other hand, the widespread attribution of these fake powers to the magnet

80 Cf. Francis Bacon, *The Works of Francis Bacon*, ed. James Spedding, Robert Leslie Ellis, Douglas Denon Heath, 15 vols. (London, 1861), 5: 161–162: "which commonly is the excuse of magical medicines when they fail, that they were not made under a fit figure of heaven."

81 See Sander, *Magnes*, 625–328; Ulrich Gottfried Leinsle, *Dilinganae Disputationes: Der Lehrinhalt der gedruckten Disputationen an der Philosophischen Fakultät der Universität Dillingen 1555–1648* (Regensburg, 2006), 316–323; Dennis Des Chene, "Suarez on Propinquity and the Efficient Cause," in *The Philosophy of Francisco Suárez*, ed. Benjamin Hill and Henrik Lagerlund (Oxford, New York, 2012), 89–100; Silvia Parigi, "I gesuiti e l'azione a distanza," in *Cristoforo Clavio e la cultura scientifica del suo tempo: Atti del convegno tenutosi presso il Liceo "Ennio Quirino Visconti," 18 ottobre 2012*, ed. Paola Vasconi (Rome, 2015), 93–102.

82 Cf. Niccolò Cabeo, *Philosophia magnetica* (Ferrara, 1629), 301–306; see also Mark A. Waddell, *Jesuit Science and the End of Nature's Secrets* (Farnham, 2015), 46. Already in Laurenz Forer and Fridericus Wirzburger, *Disputatio philosophica de sympathia et antipathia* (Ingolstadt, 1618), 15; Laurenz Forer, *Viridarium philosophicum: hoc est disputationes aliquot de selectis* […] *in philosophia materiis* (Dillingen, 1624), 246, magnetic telegraphy is rejected by a Jesuit for reasons of natural philosophy.

leads scholars to doubt its true properties.[83] According to Cabeo, anyone pursuing this sort of pseudo-research should be beaten with "philosophical rods" (*male mulctandi essent philosophica ferula*). For him, the fairytales about the magnet include the magnetic telegraph and the weapon salve. After repeating other authors' detailed description for the construction of telegraphic compasses, Cabeo points out, just like Garzoni, that these detailed instructions are intended as a failsafe or disclaimer. The great many of instructions would make people hesitant to even try constructing the device (and thus discovering that the telegraph does not work); in those situations where the reader made so bold as to follow the instructions and attempt the construction, it was the fault of the constructor not exactly sticking to the instructions when the resultant device inevitably failed to work. The *actio in distans* involved in the sympathy between the two needles contradicted not only Aristotelian natural philosophy, as taught by the Jesuits, but would contradict any true philosophy.[84]

83 Cf. Cabeo, *Philosophia magnetica*, 301: "Iniurii sane fuere in magnetem omnes illi, qui quedam invexere portenta in hanc philosophiam, quae omnem superant fidem hoc enim illud idem effecerunt proportionaliter, quod Haeretici et infideles dum sanctorum gestis falsa affingunt et miracula extra omnem ordinem et legem. Vel enim homines a causarum investigatione deterrentur etiam in rebus veris, quia hoc omnino se assequi non posse pertimescunt, vel omnia suspecta redduntur etiam quae vera sunt. Hoc quod hic propono, unum est ex his: unde non solum exsibilandi, sed etiam male mulctandi essent philosophica ferula, fabularum isti procusores, qui suis portentis deterrent homines a praeclarissimo causarum studio. Dixerunt ergo aliqui posse duos, qui etiam longissimo distent inter se intervallo, immo quorum unus delitescat arctissima inclusus custodia, alter vero procul omnino arceatur, sibi invicem animi sensa aperire magnetis beneficio et versorii cuspide, quasi muta quadam lingua, quascunque malint, voces efformare, quas alter oculis hauriret certissimis. Tali autem hoc dicunt fieri posse artificio."

84 Ibid., 304: "At vero dicere, quod res aliquae per sympathiam vel antipathiam sentiant se invicem et effectus quosdam edant ad quancumque distantiam, quocunque interposito corpore et quod illa duo versoria, quia sympathica ponuntur, debeant simul moveri, quocunque tandem in loco et in quacunque sint distantia, nulla habita ratione medii, non solum repugnat peripateticae, sed omnino verae philosophiae. Nec ullus in toto naturae theatro effectus usquam reperietur, quantum ego scio, qui talem agendi vim inferat necessario. Fuerunt quidem aliqui et vero viri gravissimi, qui quoddam solutivorum medicamentorum genus se ostendere posse polliciti sunt, quod ad quamlibet distantiam suam vim in corpus ostentaret. Verum quamvis enixe rogarim, nunquam impetrare potui, ut fidem oculis facerent. Nihil enim magis optassem in philosophia, quam videre aliquod agens quod evidenter sua in aeque vim ostenderet nulla habita ratione distantiae"; see also ibid., 306: "Verum nimis etiam immoror in re clarissima, gratis conficta, nullo experimento roborata et ut verbo dicam fabula, quae non solum universa philosophia magnetica, sed etiam tota physica repugnante, per sympathicos motus et conformationes, quarum nullum habemus argumentum in natura, vult posse fieri motus ad quamcunque distantiam quocunque interposito. Non igitur versoria invicem commoventur, nisi in convenienti positione, nec ullo artificio, aut exquisita equalitate talia fieri possunt, quibus

The admission of action at a distance had become a controversial subject for early modern natural philosophers long before Garzoni and Cabeo, and magnetic attraction had always been used as evidence for the possibility of action at a distance. More importantly for the Jesuit context, Jesuit superiors issued acts of censorship, explicitly requiring philosophy teachers to refute action at a distance in natural philosophy classes.[85] The admission of action at a distance was seen as a red line for the Jesuit-Aristotelian philosophical identity, as it had major implications for theological questions, and was therefore subject to official decrees.[86]

The magnetic telegraph was supposed to exceed by far the range through which magnetic attraction was effective. The reach of the telegraph, in comparison to the reach of the magnet attracting a piece of iron, was the major and most important point of the seventeenth-century criticism of the magnetic telegraph idea, starting with Boodt's main argument in 1609.[87] Many authors of the seventeenth century – across virtually all philosophical camps or confessional backgrounds or agendas – counted the telegraph among the fairytales of magicians and denied its functionality.[88] Differently from the weapon salve

duo sibi invicem animi sensa quasi describant. Quod erat ostendendum." On the concept of 'true philosophy,' cf. Christoph Sander, "The War of the Roses: The Debate between Diego de Ledesma and Benet Perera about the Philosophy Course at the Jesuit College in Rome," *Quaestio*, 14 (2014), 31–50.

85 Cf. Leinsle, *Dilinganae Disputationes*, 316.

86 While its theological relevance is mostly overlooked, discussions of action at a distance in theological textbooks and disputations authored by scholastics illustrate how important the theological implications were for these authors; see Sander, *Magnes*, 626.

87 See Boodt, *Gemmarum et lapidum historia* (1636), 464–466; see also note 5, above.

88 Cf. Marin Mersenne, *Quaestiones celeberrimae in Genesim: cum accurata textus explicatione* (Paris, 1623), 547, 643; Juan Eusebio Nieremberg, *Curiosa filosofia, y tesoro de maravillas de la naturaleza, examinadas en varias questiones naturales* (Madrid, 1630), 162r; Marin Mersenne, *Cogitata physico-mathematica in quibus tam naturæ quàm artis effectus admirandi certissimis demonstrationibus explicantur* (Paris, 1644), 251; idem, *Correspondance du P. Marin Mersenne, religieux minime*, ed. Paul Tannery and Cornelis de Waard, 17 vols. (Paris, 1932–1988), 8: 687. For a similar Jesuit remark concerning a communication over long distances, cf. a letter from Paul Guldin from Rome to Johann Lanz in Munich of 13 February 1611, edited in August Ziggelaar, "Jesuit Astronomy North of the Alps: Four Unpublished Jesuit Letters, 1611–1620," in *Christoph Clavius e l'attività scientifica dei Gesuiti nell'età di Galileo: atti del convegno internazionale, Chieti 28–30 aprile 1993*, ed. Ugo Baldini (Rome, 1995), 101–132, at 117: "Et quodnam hoc silentium; quae caussa cessationis litterarum nostrarum? omniane P. Scheinero ad atramentum et chartas usque concessit? Mathematicum profecto etiam sine iis loqui posse Mathematico non dubito. instrumentum quo sonum voce editum, quo cogitata animis eminus emittat excogitandum erit; quemadmodum multo maiore intervallo disiuncta inconspicuaque ad nos pertraximus astra. si sensa animi communibus aperire signis Alphabeticis non placet,

controversy, the discussion about the telegraph amounted neither to a confessional polemic nor an attempt by the philosophers to explain the alleged sympathy of the two compasses, e.g., by *effluvia*, or corpuscles, or in any other sophisticated way. By contrast with the weapon salve controversy, moreover, the 'ordinary' magnetic telegraph was to act in the same way as any 'usual' magnet or magnetic compass, albeit at a greater distance. Promoters did not have to ontologically extend the concept of 'magnetism' *per se*, and critics did not have to engage with the concept of magnetism as such, but confined themselves to methodological, philosophical, and empirical criticisms.

With reference to Strada's (or, pseudo-Bembo's) poetry, in 1643 Martin Schoock echoed the scorn that Galileo had heaped upon the idea of magnetic telegraphy: if these sympathies actually existed, why then have such applications not been around for a long time?[89] Proponents of the idea took refuge in such "magnetisms" quite in vain, since the magnet had a limited sphere of activity and therefore was not suitable for the applications of which they dreamed.[90] In 1641 John Wilkins, also referring to Strada, declared with Cabeo: "But this invention is altogether imaginary, having no foundation in any real experiment."[91]

Criticism was also contained in the popular magical-mathematical-technical works – constitutive of a tradition that had been established by Leurechon's

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loquamur numerorum notis, loquantur nodi in filo aut ad numeros, aut ad proportionata Mathematica intervalla distincti. nihilne simile adinveniet nostra Algebra? nullane uis occulta Magneti? Dicet V.[estr]a R.[everenti]a talium multa in promptu fare; sed non dari actionem in distans, deesse qui perferat, qui applicet." Cf. also the manuscript "De magnete libri tres" by Leone Allacci in Rome, Biblioteca Vallicelliana, Allacci LXXVII, fols. 39r, 111r; see also Christoph Sander, "Magnetism for Librarians: Leone Allacci's *De Magnete* (1625) and Its Relation to Giulio Cesare LaGalla's *Disputatio de Sympathia et Antipathia* (1623)," *Erudition and the Republic of Letters*, 5 (2020), 274–307.

89 See Martin Schoock, *Examen Magiae licitae, abominandorumque mysteriorum magiae illicitae, ad sanioris philosophiae amussim exactum* (Groningen, 1643), 12: "Eiusdem farinae est recentius Magnetis illud mysterium, quo arcanae amici cogitationes in maxima distantia communicari posse perhibentur. Quod style Lucretiano hinc in modum decantavit Jesuita Famianus Strada lib. 2. Prolus: 6."

90 See Schoock, *Examen Magiae licitae*, 14: "Sed si hoc naturaliter per Sympathicas Magnetis vires fieri posset, cur ad praxin non revocatur? Si quid publice unquam fuit utile, hoc utilissimum erit. At omnibus haec operatio non procedet: quia non omnes eodem monitors familiariter utuntur. Nec est quod quis confugiat ad Magnetismos? Magnes habet propriam activitatis sphaeram intra quam tantum agit."

91 See John Wilkins, *Mercvry, or, The Secret and Svvift Messenger: Shewing, How a Man May with Privacy and Speed Communicate His Thoughts to a Friend at Any Distance* (London, 1641), 146; see also Magnen, *Democritus reviviscens*, 196; and Thomas Browne, *Pseudodoxia Epidemica, or, Enquiries into Very Many Received Tenents, and Commonly Presumed Truths* (London, 1646), 77.

Récréation mathématique (1624) – albeit less harsh than the criticism meted out by the aforementioned commentators. In his *Récréation*, Leurechon describes how to communicate with two compasses between Rome and Paris, but concludes: "The idea is pretty, but I doubt that anywhere in the world you will find a magnet with such power."[92] Caspar Ens completely omits the telegraph in his Latin translation of this book (1636), while Schwenter in his German adaptation agrees with Leurechon in principle, although on this point he alludes defensively to his own special process of magnetization, which has been sketched in section 2 above.[93] In his *Mathematische vermaeck-lyckheden* (1641), Wynant van Westen transfers one of the two interlocutors from Paris to The Hague, but nevertheless sees the pretty idea fail due to the magnet's limited force.[94]

As the main criticism targeted the distance between the two compasses, authors such as Samuel Ward (1637), Wilkins, or Thomas Browne (1644) were therefore quite willing to admit that a communication through a wall was certainly within the realm of possibility.[95] Browne wrote about this as follows:

92 Jean Leurechon, *Récréation mathématique: composée de plusieurs problèmes plaisants et facétieux: En faict d'Arithmetique, Geometrie, Mechanique, Optique, Catoptrique et autres parties de cette belle science; Ensembles les Figures adjoustées au commencement de chacune Proposition ce qui n'a point encore esté fait aux precedentes Impressions* (Lyon, 1627), 99: "L'invention est belle, mais ie n'estime pas qu'il se trouve au monde un aimant, qui ait telle vertu." Cf. Jean Leurechon and Claude Mydorge, *Examen dv livre des Recreations mathematiqves et de ses problemes en geometrie, mechanique, optique, & catoptrique. Où sont aussi discutées & restablies plusieurs experiences physiques y proposees* (Rouen, 1639), 144.

93 Cf. Schwenter, *Deliciae physico-mathematicae*, 347. Caspar Ens, *Thavmatvrgvs mathematicvs, id est, Admirabilivm effectorvm e mathematicarvm disciplinarvm fontibvs proflventivm sylloge* (Cologne, 1636), 113, opens the chapter like Leurechon, but with an illustration of the alphabet compass rose.

94 See Wynant van Westen, *Mathematische vermaeck-lyckheden. Te samen ghevoeght van verscheyden ghenuchlijcke ende voertige werk stucken, soo upt arithmetica, geometria, astronomia, geographia, cosmographia, musica, physica, optica, catoptrica, architectonica, sciotetica, als upt andere onghehoorde mysterien meer. Ghetranslateert uyt het Fransch in Nederduytsche tale: endee verrijckt, vermeerdert, ende verbetert met verscheyden observatien ende annotatien, dienende tot onderrrichtinge van eenige duystere questien, ende mis-flaghen inden fransichen druck* (Arnhem, 1644), 136.

95 See Wilkins, *Mercvry*, 148; Browne, *Pseudodoxia Epidemica*, 77. Wilkins refers to Samuel Ward, *Magnetis reductorium theologicum tropologicum* (London, 1637), 154; Cabeo, *Philosophia magnetica*, 287. Ward describes such a wall experiment, Cabeo does not. See also Maximilian van der Sandt, *Maria magnes et magnetismus Marianus* (Cologne, 1645), 280–281: "Sed credamus bona fide ita fieri, ut non nemo arbitratur. Certe, posse fieri per qualitatem reciprocam Magneti caelitus communicatam, stylisque inditam divinitus, dubitari non potest. Quod si ita fieret quanta in eo esset nunciandi et enunciandi subito quidvis ad quemcumque locum maxime dissitum commoditas?"

> And this we will not deny may in some manner be effected by the Loadstone; that is, from one room into another; by placing a table in the wall common unto both, and writing thereon the same letters one against another: for upon the approach of a vigorous Loadstone unto a letter on this side, the Needle will move unto the same on the other. But this is a very different way from ours at present; and hereof there are many ways delivered, and more may be discovered which contradict not the rule of its operations.[96]

It is exactly this "very different way" that Athanasius Kircher chose, who, of all the above-mentioned authors, probably devoted himself most extensively to the various methods of magnetic telegraphy. Fascinated and devoted to natural magic from an early stage in his career, Kircher dealt with the magnetic "Steganologia" already in his first work on the magnet, the *Ars magnesia* of 1636.[97] After criticizing superstitious forms of cryptology, he refers to an anonymous German work which, with some certainty, must be Schwenter's *Steganologia*. Kircher suspects that the author was inspired by Strada's verses but does not explain Schwenter's method of magnetic telegraphy, since he considers the assumed effective range between the two compasses to be illusory. He presents however a different method (*alius modus*) for how the magnet might help transmitting a message from one room to another: On each side of a wall, an alphabet board was to be placed, identical to one another and hanging symmetrically at the same place on the wall. Using a magnet, one could now move a piece of metal on the other side to the letters on the blackboard and thus transmit a message without the transmitter and receiver being able to see each other – a "spectaculum ingeniosum."[98]

For his *Magnes* (1641), Kircher comprehensively revised and supplemented his ideas on magnetic steganology.[99] He begins again with a polemic against

96 Browne, *Pseudodoxia Epidemica*, 77.

97 Cf. Athanasius Kircher and Johann Jacob Schweigkhard von Freihausen, *Ars magnesia: hoc est disquisitio bipartita empeirica seu experimentalis, physico-mathematica de natura, viribus et prodigiosis effectibus magnetis* (Würzburg, 1631), 35–41.

98 Cf. Kircher and Schweigkhard von Freihausen, *Ars magnesia*, 38. Kircher also gives a detailed and illustrated explanation of the optical telegraph that Schwenter had taken over from Kessler and in which light signals are tracked over a distance using a sighting compass. He relies on Schwenter's account but modifies it slightly, as he describes the magnetic instrument as semi-circular – an improvement Schwenter had introduced with respect to Kessler's circular "Ortsforscher."

99 Cf. Kircher, *Magnes* (1641), 380–393. On some aspects of his magnetic steganology, see also Saussy, "Magnetic Language"; Kircher's magnetic telegraphy, however, is hardly mentioned here.

a variety of cryptological techniques.[100] This time, Kircher not only quotes Strada's poem, but also sums up Schwenter's procedure for the making a compass telegraph.[101] Kircher refutes these and other alchemical and astrological practices that aimed to strengthen the magnet so that it would be powerful enough for magnetic telegraphy.[102] These efforts were all in vain, because the magnet can only move a needle in a very limited sphere of activity. Complying with Jesuit censorship, Kircher claims that there cannot be any action at a distance (*actio in distans non datur*).[103] Once again, Kircher sketches his idea of magnetic communication through a wall, which he now also illustrates with a woodcut.[104] However, he also presented another method here for the first time, and this too is accompanied by an illustration (see Fig. 4).[105]

This engraving shows numerous pivoted and rotatable vessels which must be set up at small distances, encapsulating a hidden magnet and a small figure with a pointer stick. Letters are to be written on the vessels' outer shells so that the figures' pointers can point to these letters. Since the magnets are all aligned, so long as they are sufficiently close to each other, a rotation of the magnet of the first cylinder causes a corresponding rotation in the second, this one in the third, and so on. It would only be necessary that the magnets are equally strong and that the distances between them are equal. By connecting several magnets in a series, Kircher bypasses the weighty distance problem of his predecessors without entering into a natural-philosophical discussion on the issue of action at a distance. Kircher was certainly aware that this was more of a museum feat than a practicable instrument of communication. However, in view of the nature of his work and the apparatus probably being part of his *Musaeum Kircherianum*, this was very much in line with Kircher's approach to 'applied metaphysics.'

100 Cf. Kircher, *Magnes* (1641), 389. Kircher also explicitly mocks Schwenter's idea of telegraphy by means of a wound. Kircher mocks Schwenter for his history of nasal surgery (cf. above, note 27), finding that it belongs rather to "rhinurgia" ('work of the nose') instead of "chirurgia" ('work of the hand') and decreeing that it took place not in Italy, but in "Utopia."

101 Cf. Kircher, *Magnes* (1641), 382–385.

102 Kircher also mentions the requirement to make the compass in accordance with certain astrological rules. This idea could not be found in any of the sources investigated.

103 Cf. Kircher, *Magnes* (1641), 386.

104 Ibid., 387–389. Kessler's optical procedure is also described once again, cf. ibid., 389–392.

105 Ibid., 392–393. The actual apparatus is more complex than the illustration suggests.

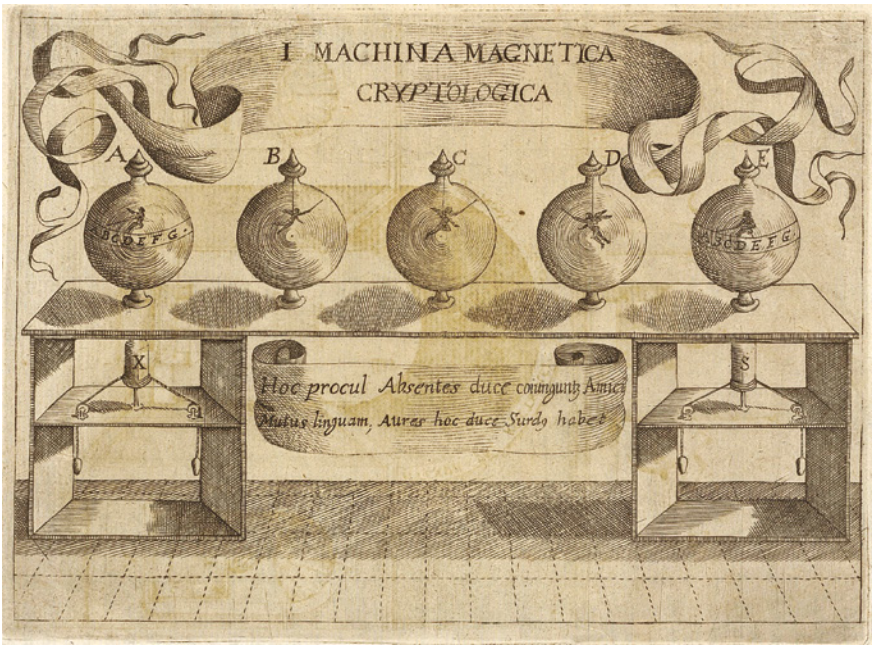

FIGURE 4 'Cryptological magnetic machine' designed by Athanasius Kircher, *Magnes; sive, De arte magnetica opus tripartitum quo Universa Magnetis Natura, eiusque in omnibus Scientijs & Artibus usus, nova methodo explicatur*, 3rd ed. (Rome, 1654), 290 (engraving identical with the one used in the 1641 and 1643 editions)
SOURCE: ZENTRALBIBLIOTHEK ZÜRICH, NP 1 | G <HTTPS://DOI.ORG/10.3931/E-RARA-36064>

4 Conclusion

In 1558, Giambattista della Porta had been the first to mention the possibility of using two compasses to transmit a message from one place to another. Many authors took up this idea and elaborated upon it, most importantly Daniel Schwenter in 1618. They added letters to the compasses to enable textual messaging, and imagined how to extend the spatial range or to force the needle's orientation in different directions. These ideas originate in a worldview that takes for granted a sympathy between the two compasses by magnetizing the needles with one and the same magnet – a concept that, as we have seen, was mostly just presupposed but never really explained in this context. The assumption was that the individual magnet would calibrate both needles and thereby create their sympathetic connection. The criticism of such conceptions, which began to emerge at the end of the sixteenth century, primarily

aimed at the central issue of action at a distance, which had always been highly problematic in natural philosophy. Magnet, compass needle, and iron, according to the critics, interacted only within a very limited spatial radius – and not over miles – through the band of some occult sympathy. The idea of magnetic telegraphy soon came to be considered a harmful deception and an impediment to actual research on the real effects of the magnet and the compass.

Despite, or even because of, this fundamental criticism, some authors refused to let go of the idea that the magnet could be used for the transmission of messages over short distances. For example, the compass might not have been able to help send and receive messages directly, but it could be used to isometrically align optical devices for optical telegraphy. Other authors, such as Athanasius Kircher, opened up a third way by using the magnetic effect as a medium and implementing it technically while fully acknowledging the limited range of the magnetic sphere of activity. This way messages could be sent, not from Paris to Rome, but through a wall, for example, from the bedroom to the dining room.

The nature of the controversy around magnetic telegraphic instruments was not a purely theoretical dispute, and there was very little spelling out of any underlying metaphysical foundations. Rather, it was a discussion revolving around the application of action at a distance in an imaginary instrument. Although sources did not report actual material demonstrations, several promoters of the instrument tried to provide as many details as possible for the manufacturing so as to make others believe that the instrument could actually work. In this regard, the telegraphy controversy very much resembles the better-known and much more virulent weapon salve controversy of the same time, by blending alchemical ideas, disputed and edgy natural-philosophical concepts, occult beliefs, a dedication to 'secrecy', quasi-empirical commitments, and an emphasis on practical use.

In contrast to the weapon salve, however, the telegraph ideally contained actual magnets and iron needles, and not only a metaphorical sort of 'magnetism.' Moreover, the telegraph was designed as an instrument, which illustrates that metaphysical discussions and polemics were also relevant within the discourse on technology and instruments – often called 'natural magic' at that point in time. One could argue that these imaginary magnetic instruments were employed as means of persuasion for the acceptance of forces like sympathy and long-distance-magnetism; in this sense, they are instances of 'applied metaphysics.' Moreover, in the early modern period, the proclamation of the use of hidden forces in technology for the benefit of humankind was a typical argument in favor of natural magic. The promise of a working telegraph aimed to undermine the a priori exclusion by most philosophers of action at

a distance. The underlying, quasi-empirical line of thought must have been this: if it is manufactured correctly, the telegraph will prove that action at a distance is possible, so that the rigid and categorical tenet *actio in distans non datur* would have been rebutted. This pseudo-inductive argument was in turn categorically denied by many natural philosophers. If the a priori premise *actio in distans non datur* was not to be disproved by experience, then it was presupposed, as it grounded any experience at a more fundamental level. Therefore, one could deduce that the telegraph could not work – or if it did work, it was either only an apparent case of action at a distance or else it violated the course of nature and was therefore of a demonic origin. But its critics were not just armchair logicians. They also, quite empirically, pointed out that the effects presupposed for the telegraph to work had simply not yet been observed in nature. Magnets and compasses just did not behave as would be required for the telegraph to signal messages.

It seems that by the middle of the seventeenth century, the telegraph obtained no further support. But even at the time when the first actual cable-bound telegraphs were developed in the 1770s, the more radical early modern idea of magnetic telegraphy was still 'in the air', and whether it managed to influence some of the pioneers of electromagnetic telegraphy has yet to be examined. For example, the Polish nobleman and army general Seweryn Rzewuski owned and (lightly) annotated a copy of Niccolò Cabeo's *Philosophia magnetica* (Cologne, 1629). Exactly at the page where the Jesuit refuted the idle idea of magnetic telegraphy, Rzewuski remarked at the bottom of the page: "The famous Comus in Paris had two magnetic clocks. When he moved the pointer of one clock, the pointer of the second one also moved. I saw them myself in 1779."[106] Comus, also known as Nicolas-Philippe Ledru, was an experimenter, physicist, and illusionist who indeed performed magnetic experiments in Paris in September 1779, "devant M[onsieur] le Comte de Falkenstein," probably referring to Joseph II, Holy Roman Emperor and Archduke of Austria,

106 The copy of Niccolò Cabeo, *Philosophia magnetica in qua magnetis natura penitus explicatur, et omnium quae hoc lapide cernuntur, causae propriae afferuntur, nova etiam praxis construitur, quae propriam poli elevationem, cum suo meridiano, ubique demonstrat, multa quoque dicuntur de electricis, et aliis attractionibus, et eorum causis: additis figuris variis, tam aeneis, quam ligno incisis* (Cologne, 1629) is today held at John J. Burns Library, Boston College (QC751 .C32 1629). The annotation on page 302 reads: "Comus sławny w Paryżu miał dwa zegary magnesowe. Jak on posunął skazówkę na jednym zegarze, posuwała się ona i na drugim. Te je sam widziałem w roku 1779." I thank Michał Czerenkiewicz for the transcription into modern Polish and his help with the translation. When Rzewuski speaks of "magnetic clocks" (*zegary magnesowe*), he probably refers to magnetic compasses or portable sundials equipped with a magnetic needle.

who at the time travelled all over Europe incognito.[107] Whether Comus also presented his magnetic telegraph on this occasion and whether Rzewuski was present, too, are questions beyond the scope of this article. Yet, it is striking that Rzewuski relates his memory to his reading of Cabeo and thereby, speaking as a layman, gives credibility to the not-yet defeated idea of magnetic telegraphy, even in the midst of the Enlightenment and on the very verge of the emergence of a global long-distance communication network powered by cables and electromagnetism.

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107 Cf. "Numéro 251: Mercredi 8 SEPTEMBRE 1779, de la Lune le 29," *Journal de Paris* (Paris, 1779), 1021–1024.