

[113] Kaspar Schott's letters to Philip Vegelin 1661–1664

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Most of what we know about Kaspar Schott S.J.¹ is the result of his impressive list of publications. He often refers to his correspondence with scientists, and occasionally, he printed their replies to him in his books. However, just a few letters by him are known. Recently, through an article² by Noel Malcolm of the University of Oxford, the existence of an archive of letters in his own hand came to the attention of TEC.* We begin with an account of how we came to have the opportunity of working on this archive.

The discovery of the letters

In 2011, TEC finished a book,³ centered on a translation of parts of Otto von Guericke's *Experimenta nova (ut vocantur) Magdeburgica de vacuo spatio*.⁴ Any involvement with the life and achievements of Otto von

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¹ Kaspar Schott, * 5.II.1608 Königshofen im Grabfeld, S.J. 30.X.1627 Trier, † 22.V.1666 Würzburg (*Sommervogel* 7, pp. 904–912; *DHCJ* IV, pp. 3531–3532 erroneously gives 1607 as year of birth).

² Noel MALCOLM, "Six unknown letters from Mersenne to Vegelin", *The Seventeenth Century* 16 (2001), pp. 95–122.

³ Thomas E. CONLON, *Thinking about nothing: Otto von Guericke and the Magdeburg experiments on the vacuum*, London, Saint Austin Press, 2011.

⁴ Otto von GUERICKE, *Experimenta nova (ut vocantur) Magdeburgica de vacuo spatio*, Amsterdam, 1672.

Guericke (1602–1686) brings to one’s attention the remarkable and generous-minded Kaspar Schott, who, in 1657, fifteen years prior to the publication of the *Experimenta nova*, first published an account of von Guericke’s epochal vacuum experiments as an appendix to his own *Mechanica hydraulico-pneumatica*.⁵ In 2012, TEC began work on a translation of both the appendix to the *Mechanica* and also of Book 1 of Schott’s *Technica curiosa*,⁶ which gives a more extensive account of von Guericke’s work on the vacuum up to 1663. Aware of HJV’s long-standing interest in Schott, TEC obtained from Würzburg a copy of the quatercentenary Festschrift for Schott, *wunderbar berechenbar. Die Welt des Würzburger Mathematikers Kaspar Schott (1608–1666)*⁷ which contains an article⁸ by Harald Siebert on Schott’s correspondence.

In Schott’s correspondence with von Guericke, Philip Ernst Vegelin features as a person through whose good offices Schott obtained a copy of Robert Boyle’s *Nova experimenta physico-mechanica de vi aeris elastica et ejusdem effectibus*.⁹ Letters from Vegelin are also mentioned a number of times in the *Technica curiosa*. Thus, though one knew there had been correspondence with Vegelin, there was no reason for optimism that any of it had survived. The opening sentence of the Siebert article «Nur sehr wenige Briefe Schotts sind im Original erhalten» did nothing to dissipate pessimism on this score. However, while seeking biographical information for a footnote about Vegelin, TEC came across a summary of an article¹⁰ about him by Noel Malcolm, in which he remarked that the Vegelin archive

⁵ Kaspar SCHOTT, *Mechanica hydraulico-pneumatica*, Würzburg, 1657.

⁶ Kaspar SCHOTT, *Technica curiosa*, Würzburg, 1664.

⁷ Hans-Joachim VOLLRATH (ed.), *wunderbar berechenbar. Die Welt des Würzburger Mathematikers Kaspar Schott (1608–1666)*, Würzburg, Echter, 2007.

⁸ Harald SIEBERT, “Schotts Briefwechsel”, in: VOLLRATH, *wunderbar berechenbar*, pp. 35–39.

⁹ Robert BOYLE, *Nova experimenta physico-mechanica de vi aeris elastica et ejusdem effectibus*, Oxford, 1661.

¹⁰ Noel MALCOLM, “Philip Ernst Vegelin van Claerbergen (1613–1693)”, in: <http://insight.stanford.edu/content/kircher/texts/biographies/792.html>

at Leeuwarden contained some twenty letters from Kaspar Schott written between 1661 and 1664.

Nobilissime atq. Amplissime Domini,
Favores Colendissime.

Hactenus diu accipi Moguntia fecerunt librorum
vostorum à Genov. Domino Frederico Kœstl. Age
ingentes gratias, et una mecum B. P. Rector Col.
legi vestri, ceteris Patris omnes, parati vici.
suis gratificari Nobilissimo Dno V. si qua in
re poterimus. Libenter legam Tuntorum
vostorum monumenta, quibus et salutem hu.
manissimam meo nomine impertiri precor,
si adhuc in vivis sunt. Et Dno Descriptio ipsi.
me scribo. De, quæso, succursat, quod litteras
hæc includam. Illi Dno Boyle his scripsi,
sed responsum nullum accipi. Si presentia eius
reliqua, præter Experimenta de Aëre, sunt latini.
tate donata, dignetur quæso indicare. Audire
quendam Franciscum Linnæ nomine Londini
vobis de Tentatione de corporeborum inseparabili
vobis, in quo Experimenta de Vacuo hinc tractati.
una, quam Magisterburgis et Boyleus examinaverunt.
Curam cum Franciscanti inquiri, sed non fuit
victus. Proximè mundiis fortassis reperitur. Si
Dno Schottius et Angliis aliquid curati et in.
Domi. hinc mittat, qualem foret. 1661 Opt. Ma.
Nobilissimo Dno V. 1661 Opt. Ma.
Hæc ipse
6. 7. 1662

Propetius addidit
Kasparus Schott
S. 1.

Letter 11 from September 6th 1662; Tresoar Archive Leeuwarden

As this period overlaps with the period of his correspondence with von Guericke, TEC was interested in anything he may have written about von Guericke to Vegelin. Assuming at first that the existence and content of these letters might be already known in Würzburg, TEC contacted HJV. When it transpired they were not, he contacted Malcolm and, through him, the Tresoar archivist, Barteld de Vries. The latter, very kindly, forwarded

TEC scanned copies of the archive¹¹ manuscripts without putting any restrictions on their use, beyond the request that he should receive a copy of anything produced from them.

No.	Date	Address	Source	Sign
1	1 Jul. 1661	Vegelin	Leeuwarden	[SV.01.07.61]
2	1 Jul. 1661	Köth	Leeuwarden	[SK.01.07.61]
3	7 Sept. 1661	Vegelin	Leeuwarden	[SV.07.09.61]
4	10 Sept. 1661	Vegelin	Leeuwarden	[SV.10.09.61]
5	13 Sept. 1661	Vegelin	Leeuwarden	[SV.13.09.61]
6	19 Oct. 1661	Vegelin	Leeuwarden	[SV.19.10.61]
7	28 Dec. 1661	Vegelin	Leiden	[SV.28.12.61]
8	10 Jun. 1662	Vegelin	Leeuwarden	[SV.10.06.62]
9	5 Jul. 1662	Vegelin	Leeuwarden	[SV.05.07.62]
10	30 Aug. 1662	Vegelin	Leeuwarden	[SV.30.08.62]
11	6 Sept. 1662	Vegelin	Leeuwarden	[SV.06.09.62]
12	6 Sept. 1662	Köth	Leeuwarden	[SK.06.09.62]
13	24 Sept. 1662	Vegelin	Leeuwarden	[SV.24.09.62]
13a	24 Sept. 1662	Vegelin	Leeuwarden	[SV.24.09.62a]
14	2 Dec. 1662	Vegelin	Leeuwarden	[SV.02.12.62]
14a	2 Dec. 1662	Vegelin	Leeuwarden	[SV.02.12.62a]
15	6 May 1663	Vegelin	Leeuwarden	[SV.06.05.63]
16	6 Jun. 1663	Vegelin	Leeuwarden	[SV.06.06.63]
17	16 Feb. 1664	Vegelin	Leeuwarden	[SV.16.02.64]
18	27 Apr. 1664	Vegelin	Leeuwarden	[SV.27.04.64]
19	5 Nov. 1664	Vegelin	Leeuwarden	[SV.05.11.64]

Table: Numbers of letters

The letters are at first sight daunting. They come from a period when even a senior Jesuit would write his letters on torn out sheets of paper, erasing, sometimes only imperfectly, the previous writing. Except for two short ones in German, the letters are in Latin but with occasional short passages in German. The handwriting is often faint but, even when distinct, is of varying legibility. As much out of a sense of pietas towards Würzburg,

¹¹ Leeuwarden, Tresoar Archive, Nr. 323.3615.

where Schott had written them, as out of any expectation of a collaboration to transcribe them, TEC forwarded the letters to HJV. Unexpectedly, it turned out that our skills were complementary so that between us we could realistically hope to transcribe, translate and annotate these letters.

The primary aim of our collaboration was to produce an accurate transcription from manuscript to typescript. The secondary aim was to produce translations into English and German of the letters and to set them into their wider context by annotating them as fully as possible.

After our work on the letters from Leeuwarden was virtually completed, we discovered a new and substantial letter from Schott to Vegelin of December 28th 1661. This letter, also in Latin, had been transcribed and published in the *Oeuvres complètes de Christiaan Huygens*¹² as if it were a letter to Huygens. However, from its style and content it is clearly a letter to Vegelin who, one assumes, forwarded it to Huygens, perhaps because he thought that the mathematical content would be of interest to him. With further guidance and assistance from de Vries, we were able to obtain a copy of the manuscript from the librarian at the University of Leiden.¹³ The letters, the transcripts, and the translations are freely available on the Early Modern Letters Online (EMLO) internet site.¹⁴

Issues with the transcription and the translation

Reading such letters is a multi-layer process. The lowest layer is simply that of recognising the characters committed to paper. For digitised manuscripts, this task is greatly eased by the automated facilities for magnification and contrast enhancement, but it still requires a process of familiarisation with the calligraphy of the time and the idiosyncrasies of an author's penmanship.

In practice, it is impossible to separate the directly visual recognition of individual letters from the recognition that comes unconsciously from the

¹² Christiaan HUYGENS, *Œuvres complètes de Christiaan Huygens*, La Haye, Nijhoff, 1888–1950, Vol. 3, Letter 938, p. 432 et seq. In corrigenda, appended to Vol. 4, p. 582, the editors corrected the misattribution.

¹³ Leiden, Huygens Archive, University Library, HUG-45 .

¹⁴ <http://emlo.bodleian.ox.ac.uk/forms/advanced?people=Caspar+Schott>

knowledge that the letters must form a Latin word. Excepting small differences such as, for instance, the evolution of the meaning of «praelum» from «wine-press» to «printing press», Schott's vocabulary is standard classical Latin. Schott writes, as one would expect, straightforward, unaffected, well-punctuated Latin with correct word endings. The assumptions of standard vocabulary and correct endings help enormously in narrowing a range of possibilities, often the most that scrutiny of individual letters yields, to a more definite reading.

Background knowledge plays, of course, a much larger role in resolving the reading of proper names, while scope for making inferences from the restriction of vocabulary to standard Latin words, virtually disappears. However, it is more remarkable that so many of the people mentioned by Schott are still traceable than that a few¹⁵ have disappeared from the historical record.

Kaspar Schott

When Kaspar Schott wrote his letters to Vegelin, he was Professor of mathematics at Würzburg University and, since 1655, a member of the city's Jesuit College. He had begun scientific research and writing¹⁶ from 1652 while serving as Kircher's assistant at the Collegio Romano and in Würzburg, during the eleven fruitful and industrious years that remained to him, he combined these activities with teaching responsibilities. During these years he published eleven books on mathematics and on various scientific topics which have gained for him worldwide respect as a disseminator of scientific information.

Kaspar Schott was born in Königshofen im Grabfeld in 1608.¹⁷ In 1627 he entered the Society of Jesus at Trier and, two years later, began his philosophical studies at Würzburg University where Athanasius Kircher

¹⁵ E.g. we were unable to find any information about a certain Belgian, Wilhelm Hagen, mentioned in Letter 1.

¹⁶ In a monitio ad lectorem in the *Mechanica* Schott notes: «Opusculum hoc Appendice exceptâ Romae conscriptum, ac praelo praeeparatum fuit».

¹⁷ For Schott's biography we refer to: Julius OSWALD S.J., "Leben und Werk des Würzburger Mathematikers Kaspar Schott S.J.", *AHSI* 156 (2009), pp. 417–441.

S.J.¹⁸ was his professor of mathematics. When, in October 1631, the Swedish troops advanced to Würzburg, the Jesuit community fled the city. Schott was sent first to Tournai (Belgium), where he finished the prescribed study of philosophy and began that of theology in 1632. In 1633 he was sent to Caltagirone (Sicily) to continue his theological studies. Following his ordination to the priesthood in 1637, he worked in various Jesuit colleges and parishes in Sicily, ultimately becoming, in 1648, professor of mathematics in Palermo. In 1652, he was transferred to the Collegio Romano to work as Kircher's assistant with particular responsibility for the latter's celebrated museum. Three years later, he was sent to Mainz (Germany) whose Archbishop Elector and Bishop of Würzburg, Johann Philipp von Schönborn (1605–1673), had purchased from Otto von Guericke the apparatus with which the latter had, at the Reichstag at Regensburg in 1654, demonstrated various phenomena associated with the vacuum. Later, encouraged by the Archbishop's interest, Schott was to repeat von Guericke's experiments in the Marienberg Fortress, the episcopal seat of the Bishop of Würzburg.

In 1661, Kircher obtained the consent of the Order for Schott's recall to Rome as his assistant.¹⁹ At that time this was not a welcome prospect. In Letter 4 (September 10th 1661), possibly with the plan to transfer him to Rome in mind, he remarks to Vegelin how congenial Würzburg had become to him.

Apart from that, I am still in Würzburg and shall be remaining here for as long as it shall please God and my superiors. It is a convenient place to pursue my studies because of the well-stocked library and the proximity of Frankfurt and Nuremberg, whose bookshops are vieing with each other to publish, at their own expense, my books and have even gone into debt to publish them.

One month later, in Letter 6 (October 19th 1661) he made his private reluctance more explicit:

¹⁸ Athanasius Kircher, * 2.V.1602 Geisa, S.J. 2.X.1618 Paderborn, † 27. XI.1680 Rome (*Sommervogel* 4, pp. 1046–1077; *DHCJ* III, pp. 2196–2198 erroneously gives 1601 as year of birth).

¹⁹ OSWALD, "Leben und Werk", p. 433.

When I was in Rome (to which I am now again being summoned, but because of various problems I have excused myself and I am awaiting a response) Rev. Fr. Albertus Curtius²⁰ sent me this problem.

His superiors accepted his reservations about a transfer to Rome and decided that Schott could remain in Würzburg.

Schott always held his former mathematics teacher, Athanasius Kircher, in high esteem and regarded the opportunity of co-operating with him in Rome as a privilege. He had studied all his books and was deeply impressed by the breadth of Kircher's knowledge. Schott's publishing activity had its genesis in a desire to propagate more widely Kircher's work. His first book *Mechanica hydraulico-pneumatica* gives extensive accounts of interesting machines from the Museum Kircherianum. The influence of Kircher is ubiquitous and Schott's subsequent books rework and extend topics originally expounded by Kircher. It is thus no surprise that in Schott's works one finds illustrations that are only slight variants of ones occurring in Kircher's.

As one might expect, Schott's letters to Vegelin contain many allusions to Kircher. He refers to the latter's books in Letters **5**, **6**, **10**, **14**, **15**, **17** and in Letter **14** is seen to be acting as a selling agent for Kircher's works. The letters contain snippets about his time in Rome and about the impressive Museum Kircherianum. In Letter **15**, (May 6th 1663) on the grounds of having received a letter from him just a month earlier, he can even deny a rumour of Kircher's death that appeared to have gained some currency, exclaiming «P. Athanasius Kircherus in vivis est!»

Despite his admiration for his teacher, he did not feel obliged to accept all of Kircher's views. For example, in Letter **10** he responds to a question about the origin of the arithmetic digits. Vegelin rejected the theory of Mario Bettini S.J.²¹ that they had their origin in dots.

²⁰ Albert Curtz, * 1600 München, S.J. 1616, † 19.XII.1671 München (*Sommervogel* 2, pp. 1742–1744).

²¹ Mario Bettini, * 6.II. 1582 Bologna, S.J. 20.X.1598 Novellara, † 7.XI.1657 Bologna (*DHCJ* I, p. 432).



Dots as origin of figures²²

This theory, which Kircher supported, is described in *Technica curiosa*, p. 540, but Schott himself agreed with Vegelin and writes in Letter 10:

I am enormously taken by your noble lordship's conjecture and it is much more probable than the 'dots' alternative. Besides, I myself think that the characters we now use were the invention of Arab scholars, who in the interests of conciseness, wanted, by a notation based on the free use of these symbols, to express what both the Greek and the Jews and even, at an earlier period, the Arabs themselves, were indicating by letters of the alphabet. But perhaps what Fr. Kircher is going to publish is a more authoritative view.

Schott was part of the Jesuit international network and we often find him referring in his books to information received from other Jesuits. However his restless curiosity about novelties and his scientific zeal transcended confessional differences and among his known correspondents were, in addition to Vegelin, the eminent non-Catholic scholars Robert Boyle, Anton Deusing, Stanisław Lubiniecki and, above all, Otto von Guericke. With the latter he conducted an intensive and prolonged correspondence, lasting from 1656 to 1664, concerning von Guericke's researches on the vacuum and the atmosphere. He preserved substantial extracts from von Guericke's side of this correspondence in the Appendix to *Mechanica hydraulico-pneumatica* and in Book 1 of *Technica curiosa*.²³

Kaspar Schott was primarily a collector and disseminator of scientific news. His most impressive achievement is *Technica curiosa* (1664) with its

²² SCHOTT, *Technica curiosa*, p. 540.

²³ v. e.g. CONLON, *Thinking about nothing*, pp. 66–78.

wide range of topics, and spectacular illustrations.²⁴ During the early period of correspondence with Vegelin, Schott's work on the part of the *Technica curiosa* dealing with von Guericke's experiments was drawing to a close. However through the agency of Vegelin, he received the Latin edition of Boyle's book – *Nova experimenta physico-mechanica de vi aeris elastica et ejusdem effectibus* – at the very end of 1661 and was able to incorporate an account of Boyle's work into *Technica curiosa* as Book 2 – *Mirabilia Anglicana*. The correspondence with Vegelin shows him working intensively on *Technica curiosa* in 1662 and still open to including in it descriptions of new phenomena. The intended readership for Schott's work was not primarily other professional academics but an interested, educated, open-minded, public. In the preface to the *Magia universalis* he writes:²⁵

If to some I shall seem prolix, they will pardon me. I write for everybody even those who know hardly any mathematics. ... I prefer to be verbose rather than obscure.

Philip Vegelin was one of his readers.

Philip Vegelin

Philip Ernst Vegelin van Claerbergen (1613–1693) was descended from a Swiss Protestant family, which had moved to Neustadt in the Palatinate.²⁶ His father had served under Gustavus Adolphus and had been rewarded with the Claerbergen estate in Friesland. Nothing is known of his early life and education. He first comes to historical attention through his journeys to Paris and London in the late 1630s which gave him access to the most influential scientific networkers of the day – the Minim friar, Marin Mersenne (1588–1648) in Paris and his fellow German protestant, Samuel Hartlib (c. 1600–1662) in England. In fact it was through the agency of Vegelin that Mersenne was introduced to Hartlib's circle. By late 1641, Vegelin had travelled to the Hague where, at the suggestion of Constantijn

²⁴ Michael John GORMAN, Nick WILDING (eds.), *La "Technica curiosa" di Kaspar Schott*, Rome, Edizioni dell' Elefante, 2000.

²⁵ Kaspar SCHOTT, *Magia universalis naturae et artis*, Würzburg, 1657–1659.

²⁶ For biographical information about Vegelin we have referred to: MALCOLM, "Six unknown letters", pp. 95–122.

Huygens (1596–1687), he was employed by William Frederick of Nassau (1613–1664) in whose and whose family's service he remained, based mainly at Leeuwarden, for the rest of his life.

His position in his employer's household in 1661 is described by Anton Deusing, in the dedication of his *Disquisitio physico-mathematica, gemina, de vacuo* as «Aulae-Praefectus ac Consiliarius primarius; Cohortis militaris Capitaneus, etc.»²⁷ In 1643, he consolidated his inheritance by marrying a rich widow and their descendants would become one of the leading land-owning families in Friesland. He appears to have spent the rest of his life in discharging the responsibilities of his employment and in scientific networking and patronage. The former, by the evidence of both Schott's letters and Deusing's dedication, entailed considerable travel, and possibly created opportunities for the latter.

There appear to be no other sources for his intellectual interests and activities beyond his extant correspondence and the references to him in Schott's *Technica curiosa* and Deusing's *Disquisitio*.

In the 1640s there are letters from Mersenne²⁸ and Constantijn Huygens.²⁹ Vegelin wrote to Kircher on December 5th 1653 from Leeuwarden.³⁰ On February 15/25th 1654 the astronomer Samuel Kechelius wrote to him.³¹ In 1655 he was in contact with Matthias Pasor (1599–1658),³² the Groningen linguist, theologian and mathematician. The Schott letters straddle the years 1661 to 1664. From 1667 to 1668 there are letters from Anna Maria van

²⁷ Anton DEUSING, *Disquisitio physico-mathematica, gemina, de vacuo*, Amsterdam, 1661.

²⁸ Cornelis de WAARD, Bernard ROCHOT, Armand BEAULIEU, *Correspondance du P. Marin Mersenne*, 17 vol. , Paris, CNRS, 1932–1988; MALCOLM, "Six unknown letters", pp. 95–122.

²⁹ Leeuwarden, Tresoar Archive, Nr. 323.3615.

³⁰ Rome, Archive of the Pontifical Gregorian University Rome, APUG 557, 307rv-308v.

³¹ We thank Huib Zuidervaart of the Huygens ING for a copy of the manuscript of this letter.

³² Leeuwarden, Tresoar, (under the name Matthias Pasori), Nr. 323.3615.

Schurman (1607–1678),³³ a famous scholarly lady of Utrecht. There also exists correspondence with Bernard van Welderen³⁴ in 1678 and with Christiaan Huygens (1629–1695) from the years 1683–1690.

Schott's *Technica curiosa* refers to Vegelin on pp. 87–88, 180–181, 540–541, 862, 870.

Vegelin was both a man of sufficient financial means to patronise scholarship and of intellectual substance to participate directly in scientific discussions. Malcolm concludes that he had special personal interests in two fields: applied mathematics (perspective, sundials, navigation), and music. He was Schott's entrée into the world of northern European protestant science. Their correspondence, alongside that of Schott with von Guericke, illustrates how shared scientific passions eclipsed religious differences. While the correspondence with the Lutheran von Guericke is entirely free of any confessional allusions, the Vegelin correspondence has just one sentence, in Letter **10**, which might be so interpreted:

It is a matter of great regret to me that I am unable to share his other allegiances. (Doleo vehementer, quod alijs obsequijs correspondere nequeam.)

Anton Deusing

Anton Deusing (1612–1666) was a celebrated professor of the university of Groningen. He was born in Moers and educated at Leiden where he initially studied philosophy, mathematics and oriental languages but subsequently dedicated himself to medicine.³⁵ After the completion of a doctoral degree in 1637 he returned to Moers as a professor of mathematics. The following year he accepted a professorship of mathematics and physics at Hardenwijk. Here he also occupied the position of 'city doctor' and in 1642

³³ Anna Maria van Schurman (1607–1678) was a German-Dutch poet, artist, scholar, and linguist. She was the first female student of the University of Utrecht. With Jean de Labadie she was co-founder of a Christian community known as Labadists. There are two letters by her in Leeuwarden, Tresoar Archive, Nr. 323.3615.

³⁴ There is one letter in: Leeuwarden, Tresoar, Nr. 323.3615.

³⁵ August HIRSCH, "Anton Deusing", *Allgemeine Deutsche Biographie* 5, 1877, pp. 88–89 (Online).

was named professor of medicine. In 1646, despite the best efforts of the authorities of Hardenwikj to retain him, he accepted an invitation from Groningen to become that university's first professor of medical science. In 1648 he became Rector of Groningen and in 1652 personal physician to William Frederick, Count of Nassau. In this latter capacity he contracted a cold while journeying to attend the wounded Count and died.

Deusing is mentioned in Letters **1, 3, 4, 5, 6, 7, 11, 14, 16, 17, 18**. In *Technica curiosa*, Schott records two letters received from Deusing. The first of these, of June 16th 1663, is a long letter setting out Deusing's attempt to maintain an Aristotelian position on the vacuum despite the experiments of von Guericke and others.³⁶ The second, of 17th November 1662, is concerned with Deusing's book on the 'foetus Mussipontani',³⁷ of which Deusing sent Schott the chapter headings.³⁸ It is clear that Deusing and Schott were on cordial terms and that there was significant correspondence between them.

Deusing's numerous writings were concerned with philosophy, medicine, and natural sciences. He also engaged in disputes over medical questions with leading authorities of the day. The University of Groningen still honors him.

The genesis of the correspondence

It is not known for certain how the Schott Vegelin correspondence began. There are however a number of relevant facts which bear on the formation of an opinion. These may most conveniently be set out in chronological order. In 1652, Deusing became William Frederick's personal physician. As Vegelin was already in the latter's employ, it is reasonable to suppose that the warm relationship between Vegelin and Deusing dates from around that date. The letter to Kircher in 1653 evidences Vegelin's acquaintanceship with Pell, Mersenne and Harsdörffer and is clearly

³⁶ Schott, *Technica curiosa*, pp. 234–245.

³⁷ Anton DEUSING, *Foetus Mussipontani, extra uterum in abdomine geniti*, Groningen, 1662. Deusing's book analyses a case of an extra-uterine pregnancy in 1659 at Pont-a-Mousson which created widespread medical interest.

³⁸ Schott, *Technica curiosa*, pp. 865–866.

Vegelin's first communication with Kircher.³⁹ Unsurprisingly, Schott, who by now had been Kircher's assistant in Rome for more than a year, is not mentioned. Vegelin expressed his interest in obtaining any new work of Kircher on horology. In the Appendix to the *Mechanica hydraulico-pneumatica*, written probably in the autumn of 1657, Schott lists scholars who have studied the issues surrounding the vacuum but mentions neither Vegelin, nor Deusing. By 1661 Deusing had published his two part *Disquisitio* with a dedication to Vegelin. The first part is principally concerned with a refutation of views expressed by Jean Pecquet in his *Experimenta Nova Anatomica*⁴⁰ and the second largely with a similar attempt to refute von Guericke's views expressed in Schott's *Mechanica*. In the dedication of the *Disquisitio* he thanks Vegelin for forwarding material from Schott and acknowledges that the Appendix to the *Mechanica* had been the stimulus to the composition of the second part. Schott's Letter 3 of September 7th 1661 shows him sending material to Deusing via Vegelin in 1661 and subsequent letters provide evidence of further exchanges conducted through the good offices of Vegelin. From the evidence of *Technica Curiosa*, Deusing's *Disquisitio* and the letters there is no doubting the warmth of their mutual admiration. However Vegelin remained the facilitator of the relationship and not until November 1662 do we find a letter from Deusing to Schott directly.

These facts make it reasonable to suppose that Vegelin obtained a copy of the *Mechanica*, perhaps very shortly after publication in 1658, and passed it to his scholarly colleague Deusing, who was then preparing his *Disquisitio* aimed primarily against Pecquet. Deusing's interest in the Appendix and resolve to extend his *Disquisitio* to refute also the views of von Guericke, prompted Vegelin to initiate a correspondence with Schott. Letter 1, of July 1st 1661, refers to a letter from Vegelin of June 14th 1661 which was in turn a reply to an earlier letter of Schott. There is an easy, free ranging tone to the letters which suggests that the correspondence had been quite long standing before the earliest manuscript, possibly from as early as 1659.

³⁹ Rome, Archive of the Pontifical Gregorian University Rome, APUG 557, 307rv-308v.

⁴⁰ Jean PEQUET, *Experimenta Nova Anatomica*, Paris 1651, p.51 et seq.

The letters

The Schott-Vegelin correspondence comprises twenty-one documents. Of these two (Letters **2** and **12**) are in German and are apparently addressed to Frederick Köth, who, like Vegelin, was also a courtier of William Frederick of Nassau. Of the remaining nineteen, one (Letter **14a**), is not actually a letter but a draft of a dedication to Vegelin of Schott's *Anatomia physico-hydrostatica*,⁴¹ which was then in preparation. Letter **13a** is a duplicate in copperplate handwriting of Letter **13**. In Letter **3** Schott thanks Vegelin for a letter originally sent to Anna van Schurman, but apparently also copied to him and thus a possible explanation for the duplication is that Vegelin intended to forward Schott's Letter **13** to another of his correspondents, as he apparently did with Letter **7** which came to light among Huygen's papers rather than Vegelin's.

The two German letters are short and business-like. In July 1661 Frederick Köth, acting on Vegelin's behalf, sent two copies of Deusing's *Disquisitio physico-mathematica, gemina, de vacuo* to Schott, one of which was to be sent on to Nuremberg to George Philipp Harsdörffer. However Harsdörffer was already dead and Schott wrote to Köth thanking him for the books and informing him of the death. The second German letter, of September 2nd 1662, is just a note of acknowledgment of receipt and thanks for a parcel of books sent by Vegelin.

Schott had contact, either personal or through correspondence, with some of the most significant and historically interesting people of the first half of the 17th century.

From his Jesuit confrères, the following names occur. Firstly and most frequently mentioned is of course, Athanasius Kircher, his friend and mentor, but also Mario Bettini, Michael Boym,⁴² Niccolò Cabeo,⁴³ Philipp

⁴¹ Kaspar SCHOTT, *Anatomia physico-hydrostatica fontium ac fluminum*, Würzburg, 1663.

⁴² Michael Boym, * 1612 Lemberg, Ukraine, S.J. 16.VIII.1631 Krakau, †22.VIII.1659 Guangxi, China (*DHCJ* I, p. 517).

⁴³ Niccolò Cabeo, * 26.II.1586 Ferrara, S.J. 2.XI.1602 Ferrara, † 30.VI.1650 Genua (*DHCJ* I, p. 589).

Colbinus,⁴⁴ Melchior Cornaeus,⁴⁵ Albert Curtz,⁴⁶ Honoré Fabri,⁴⁷ François Line,⁴⁸ Martino Martini,⁴⁹ Giovanni Battista Riccioli,⁵⁰ and Niccolò Zucchi.⁵¹

Of these Michael Boym and Martino Martini were, as Jesuit missionaries to China, among the most intrepid spirits of the time. Both were also authors of scholarly works about China. Schott had met them in Rome in the mid-1650s before they returned to China where both died. In Letter **10**, Schott recalls a conversation with them to confirm information, which Vegelin had had from another source, about Chinese facility with calculation. Niccolò Zucchi, remembered as an astronomer and the inventor of the reflecting telescope, had also been at the Collegio Romano and, Schott recalls in Letter **14**, had given him a small magnet. Schott had solicited his and Kircher's opinion of von Guericke's vacuum experiments and had published their views in the *Mechanica hydraulico-pneumatica*.⁵² Melchior Cornaeus was his rector at the Jesuit College at Würzburg. He was also a

⁴⁴ Colbinus, Philipp; * 1607 Speyer (Maria REINDL, *Lehre und Forschung in Mathematik und Naturwissenschaften, insbesondere Astronomie, an der Universität Würzburg von der Gründung bis zum Beginn des 20. Jahrhunderts*, Neustadt an der Aisch, Degener, 1966, p. 57).

⁴⁵ Melchior Cornaeus, * IV.1598 Brilon, S.J. 14.VI.1618 Köln, † 13.III.1665 Mainz (*Sommervogel 2*, pp. 1467–1471).

⁴⁶ Albert Curtz, * 1600 München, S.J. 1616, † 19.XII.1671 München (*Sommervogel 2*, pp. 1742–1744).

⁴⁷ Honoré Fabri, * 1607 Grand-Abergement, S.J. 1626 Avignon, † 8.III.1688 Rome (*Sommervogel 3*, pp. 511–521).

⁴⁸ François Line, * 1595 London, S.J. 23.VIII.1623, † 25.XI.1675 (*Sommervogel 4*, pp. 1840–1842).

⁴⁹ Martino Martini, * 20.IX.1614 Trient, S.J. 8.X.1632 Rome, † 6.VI.1661 Hang-Zhou (*Sommervogel 5*, pp. 646–650).

⁵⁰ Giovanni Battista Riccioli, * 17.IV.1598 Ferrara, S.J. 6.X.1614 Novellara, † 25.VI.1671 Bologna (*DHCJ IV*, p. 3353).

⁵¹ Niccolò Zucchi, *6. XII.1586 Parma, S.J. 28.X.1602 Padua, † 21.V.1670 Rome (*DHCJ IV*, pp. 4085–4086).

⁵² SCHOTT, *Mechanica Hydraulico-pneumatica*, p. 463.

man with scientific⁵³ as well as theological interests and, one imagines, Schott found him a congenial superior. Philipp Colbinus, who was a fellow theological student of Schott at Tournai,⁵⁴ was rector at the Jesuit College at Mainz. He is mentioned in Letter **14** as someone to whom books for Schott could be sent and in Letter **18** as an interested observer of a solar eclipse. Giovanni Battista Riccioli, who, in 1636, was Schott's professorial colleague at Parma, is also noted as recording the eclipse in his *Novum almagestum*.⁵⁵ Albert Curtz was a fellow mathematics professor at the Jesuit College at Dillingen. In Letter **6** Schott refers to a letter received from «Curtius» claiming to have constructed a regular fourteen side polygon. (This claim cannot be taken at face value as some 130 years later Gauss proved that a 14 sided regular polygon was not constructible with a straight edge and compass.) Niccolò Cabeo is remembered today as the first person to record an observation of the phenomenon of electrostatic repulsion.⁵⁶ He appears in Letter **3** as the designer of a new type of mortar. Honoré Fabri is mentioned as the author of a work opposing the views of Huygens in Letter **18** and Mario Bettini in Letter **10** for his views on the origin of arithmetic digits. Finally the English Jesuit, Francis Line, had come to Schott's attention through his *Tractatus de corporum inseparabilitate* (1661)⁵⁷ and in Letter **11** he expresses a desire to obtain a copy.

Boyle is mentioned frequently in the letters, but Guericke not at all. After reading Schott's *Mechanica*, Boyle developed his own experiments on the vacuum and, in 1660, published a work in English – *New Experiments Physico-Mechanicall, Touching the Spring of the Air, and its Effects*.⁵⁸ In

⁵³ Melchior CORNAEUS, *Curriculum philosophiae peripateticae*, Würzburg, 1657 also discussed von Guericke's work on the vacuum.

⁵⁴ Julius OSWALD, "Kaspar Schott – Leben und Werk", in VOLLRATH, *wunderbar berechenbar*, p. 13.

⁵⁵ Giovanni Battista RICCIOLI, *Almagestum novum*, Bologna, 1653.

⁵⁶ Niccolò CABEO, *Philosophia Magnetica*, Köln, 1629, p. 192 gives a very brief description of the phenomenon.

⁵⁷ Francis LINE, *Tractatus de corporum inseparabilitate*, London, 1661.

⁵⁸ Robert BOYLE, *New Experiments Physico-Mechanicall, Touching the Spring of the Air, and its Effects*, Oxford, 1660.

Letter **7** of December 28th 1661 Vegelin is thanked for sending him the Latin translation of Boyle's book and asked to facilitate Schott's establishing contact with Boyle. In Letter **11** of September 6th 1662, he remarks that he has written to Boyle twice without receiving a reply. From Boyle's correspondence⁵⁹ we know that he replied to Schott around the end of 1662, declining to contribute to the *Technica curiosa*, but giving permission for Schott to describe his vacuum researches in Book 2 of *Technica curiosa – Mirabilia Anglicana*. It is unlikely that Schott would have proceeded with Book 2 had he not received Boyle's permission. In Letters **18** and **19**, of April and November 1664, Schott requests Vegelin's help to obtain a copy of Boyle's 1657 work, *De fluiditate et firmitate*.⁶⁰ Christiaan Huygens is also mentioned in Letter **18**, as someone of whose works Schott desired a copy and to whom he wished to write.

It seems strange that though he was in frequent correspondence with von Guericke during the years covering the letters, his name is not mentioned even once. The reason for this may have been a desire not to advertise his continuing friendship with a man, of whose views Deusing was engaged in writing a refutation in a work dedicated to Vegelin.

In Letters **11** (September 6th 1662) and **16** (June 6th 1663) Schott mentions another member of Vegelin's circle – a certain 'Dominus Schroterus'. This young man was Wilhelm von Schröder (1640–1688), the son of Wilhelm Schrötter, since 1660 the chancellor of Duke Ernst the Pious of Gotha. He had been a student of Law at Jena before abandoning, in 1660, Law for mathematical and scientific pursuits and setting out for places where he could follow his intellectual interests.⁶¹ He appears to have gone first to Holland as his letters⁶² to Schott of April and July 1661 are from Leiden.

⁵⁹ Michael HUNTER, Lawrence M. PRINCIPE, Antonio CLERICUZIO, (eds.), *The Correspondence of Robert Boyle*, Vol. 2, London, Pickering & Chatto, 2001, pp. 55–56.

⁶⁰ Robert BOYLE, *Tentamina quaedam physiologica: Historia fluiditatis et firmitatis*, London, 1661.

⁶¹ SCHOTT, *Technica Curiosa*, Book VI, Chapter 1 gives considerable information about Schroterus; Wilfrid HALDER, "Johann Wilhelm Freiherr von Schröder", *Neue Deutsche Biographie* 23, Berlin, 2007, pp. 577–578 (Online).

⁶² SCHOTT, *Technica curiosa*, pp. 371,372.

By the summer of 1662 he was in England. In June 1662 he wrote to Schott from London⁶³ promising to send him details of ingenious new English devices. In Letter **11** Schott expresses himself to the effect that such information, were it to be forthcoming, would be welcome. In September, Schroterus became a Fellow of the Royal Society⁶⁴ and at around the same time, on Schott's recommendation of him, appears to have met Boyle who refers to him as «Dr. Schroterus».⁶⁵ He apparently did not write to Schott again for in Letter **16**, Schott wonders where he now is. In 1673 he converted to Catholicism and spent the rest of his career in the service of Leopold I.

Schott and the Vacuum

It seems unlikely that Schott, amidst the welter of his other interests and preoccupations, would have taken a particular interest in the vacuum had it not been for the accident of his involvement with von Guericke's experiments. The involvement had occurred at the behest of Archbishop von Schönborn⁶⁶ and von Guericke's apparatus at Würzburg. Institutionally, through their attachment to Aristotle as mediated by St. Thomas, the Jesuits had a default position on the issue of the vacuum – without very good reason one should not depart from Aristotle's view that space was a plenum of substance and that a vacuum was a physical impossibility. Probably more telling for Schott than either the injunctions of the *Ratio studiorum* (1599) or the *Ordinatio pro studiis superioribus* (1651) in favour of the Philosopher, was the continued robust Aristotelianism of his mentor, Kircher. Despite being familiar with the experiments of Gaspar Bertus and Evangelista Torricelli adduced in support of the vacuum, Kircher, with undisguised irritation, had written in the *Musurgia universalis*⁶⁷ (1650):

⁶³ SCHOTT, *Technica curiosa*. p. 387.

⁶⁴ He is listed there as William Schroter.

⁶⁵ HUNTER: *The Correspondence of Robert Boyle*, Vol. 2, pp. 55–56.

⁶⁶ OSWALD, "Leben und Werk", pp. 428–430.

⁶⁷ Athanasius KIRCHER, *Musurgia universalis*, Rom, 1650, p. 11.

From this, like crass and insolent braggarts whooping in jubilation before any victory is secured, they have interminably prated nonsense not only offensive to the principles of nature but hazardous to orthodox teaching. They boast that they can demonstrate with this most subtle experiment that a located thing can naturally subsist without a location, and accidents without subjects.

and in a letter to Schott:⁶⁸

The experiments, while they certainly exhibit the presence of great forces, are very far from showing that a vacuum does exist. On the contrary, there can be no better demonstration that a vacuum does not exist. ... Can anyone conceive that nothingness can offer a resistance? Has anyone ever heard of such a thing in philosophy?

As quotations of this type illustrate, the nub of the matter was not the details of this or that experiment, but their interpretation in a manner irreconcilable with accepted metaphysics. To someone of Schott's background mind-set the view that such experiments could create a rent in the plenum of nature, in defiance of the *horror vacui* principle, to reveal an underlying nothingness was simply incoherent and unscientific. This acted not only against his ability fully to appreciate his singular good fortune in being a correspondent of von Guericke, one of the great scientist-philosophers of the day, but also led him into excessive admiration of Deusing's 'refutations' of Pecquet, Torricelli, von Guericke and Boyle.

Schott's correspondence with von Guericke began with a letter of June 4th 1656 seeking assistance with some details of the operation of the air pump. Von Guericke's reply on June 18th is recorded in Section 6 of the Appendix to the *Mechanica hydraulico-pneumatica*. The last reference to the correspondence occurs on p. 762 of Stanisław Lubieniecki's *Theatrum cometicum*.⁶⁹ Writing to the author in June 1665 Schott remarks: «Salutem humanissimam Nobilissimo Domino Gerickio, Residenti, cujus Dominus parens ab anno integro silet, nescio qua de causa.» indicating that a final letter had been received from von Guericke in the summer of 1664, some two years later than the last one recorded in the *Technica*.

⁶⁸ SCHOTT, *Mechanica Hydraulico-pneumatica*, pp. 454–455.

⁶⁹ Stanisław LUBIENIECKI, *Theatrum cometicum*, Amsterdam, 1668.

Judging by the extant parts of their correspondence von Guericke had, for a full seven years, patiently and at great length sought to resolve both Schott's conceptual and practical difficulties with the vacuum. Moreover Schott publically recorded his admiration for von Guericke in such glowing terms that von Guericke reproduced his encomium in the *Experimenta nova*'s Preface to the Reader. In the Prooemium to the *Technica* Schott writes:

I do not hesitate openly to acknowledge or unabashedly to proclaim that I have never seen, heard, read of, or imagined anything more marvellous of that kind. Nor do I believe that the sun has ever before shone on its like, not to speak of anything more wonderful. This is also the judgment of the most prominent and learned men to whom I have communicated these matters.

All this makes it somewhat extraordinary that he was equally admiring of Deusing's refutation. On October 19th 1661 (Letter 6) Schott writes:

With studious relish, I devoured the twin treatises on the vacuum of the most learned and distinguished Master Antony Deusing and have given it to other scholarly gentlemen to read, particularly to Rev. Fr. Melchior Cornaeus, currently our rector here at the College at Würzburg. Everybody was delighted by it. My sincere judgment and considered opinion (which your most noble lordship has seen fit to solicit) is that it is correct. The most distinguished gentleman applies the theory he has adopted with most formidable learning. He attacks his opponents so that they feel themselves keenly under pressure. However he does it in such a smoothly polished way that they can justly feel complemented to be attacked by such an adversary. In the meantime I am pleased that we are in agreement about the non-existence of the vacuum, against which I had taken a stand.

Deusing's attempt at an Aristotelian interpretation of von Guericke's 'weight of air' experiment, set out in the *Disquisitio*,⁷⁰ has a certain desperate ingenuity. He argues that as air was withdrawn from the Receiver, particles of aether from the surrounding air penetrated the glass

⁷⁰ DEUSING, *Disquisitio*, pp. 145 et seq.

wall of the Receiver replacing the lost air. This had the effect of causing the air in the immediate vicinity of the Receiver to become more dense, as air particles from elsewhere replaced the lost aether, and consequently the Receiver, being more buoyant in a denser medium, appeared lighter.

Von Guericke, writing in reaction to Deusing's *Disquisitio* at around the same time, – i.e. at some point between the end of 1661⁷¹ and March 1663, when he completed the *Experimenta nova* – is dismissive of Deusing. Taking him to task for his failure to appreciate that the key property of a fluid is that it exerts equal pressure across all planes, he writes:

It will come as no surprise that Dr. Deusing, in his treatise on the vacuum, wants to rebuke and find fault with M. Pecquet who shares our view. Dr. Deusing writes: “If the lower regions of the air were so greatly pressed upon by the air above them so that they become more compacted, it would follow that we mortals in this lowest region of the air, supporting on our heads the entire mass of the air above us, would be affected by this weight of the air would be knocked flat on the ground.” Dr. Deusing ought to have borne in mind that the air does not just press on our heads but flows all around us. Just as it presses from above on the head, it likewise presses on the soles of the feet from below and simultaneously on all parts of the body from all directions. Indeed, it so fills the body that it is completely immersed in air and all its crevices and empty spaces are filled with it. As fish do not perceive the pressure of the water around them, we do not perceive the pressure of the air around us.⁷²

Between October 1661 and the autumn of 1662 von Guericke's views appear to have prevailed with Schott. In *Technica curiosa* he publishes a long letter⁷³ from Deusing of November 17th 1662 in which the latter

⁷¹ In a letter to Schott of December 30th 1661, reproduced in Book I, Chapter XXII of SCHOTT, *Technica Curiosa*, von Guericke notes that he had received a copy of Deusing's *Disquisitio* but had not yet read it.

⁷² CONLON, *Thinking about nothing*, p. 288.

⁷³ SCHOTT, *Technica curiosa*, p. 234–245. The cited compliment is on page 235.

cordially acknowledges their disagreement and pays Schott this telling compliment:

You certainly show your mind to be completely unbiased by your friendship to me, because you freely dissent from my opinions and do not suffer affection to prejudice truth.

The last known expression of Schott's views on the vacuum are in early 1665. Huygens had written to Godefridus Kinnerus describing an experiment which appeared to show that mercury could climb to an arbitrary height in an evacuated tube. Kinnerus communicated this letter⁷⁴ to Schott in February 4th 1665. Schott's reply,⁷⁵ far from welcoming this apparent vindication of the *horror vacui* principle, shows him seeking an explanation completely within the new interpretive paradigm.

References to Schott's books in the letters

When Schott started his correspondence with Vegelin he was already an accomplished author. We were therefore interested in the references to his writing that occur in his letters. When the correspondence began in 1661 there had already appeared

Mechanica hydraulico-pneumatica, Würzburg, 1657;
Magia universalis naturae et artis, 1-4, Würzburg, 1657–1659;
Pantometrum Kircherianum, Würzburg, 1660;
Iter extaticum celeste, Würzburg, 1660;
Cursus mathematicus, Würzburg, 1661.

By its conclusion in 1664 he had also published

Physica curiosa, Würzburg, 1662;
Mathesis Caesarea, Würzburg, 1662;
Anatomia physico-hydrostatica fontium ac fluminum, Würzburg, 1663;
Technica curiosa, Würzburg, 1664;
Schola steganographica, Nürnberg, 1664.

Subsequently also appeared:

⁷⁴ Kaspar SCHOTT, *Physica curiosa*, 2nd ed., Nürnberg, 1667, p. 1383.

⁷⁵ SCHOTT, *Physica curiosa*, 2nd ed., p. 1385.

Ioco-seria naturae et artis, Würzburg, 1666;
Organum mathematicum, Würzburg, 1668.

From the appendix to the *Mathesis Caesarea* we know that he had plans for more books – *Mundus mirabilis*, *Dictionarium mathematicum*, *Compendium mathematici*, *Mechanica universalis*, and *Horographia universalis* – which he did not live to realise.

Some of these books are mentioned in letters to Vegelin. The *Technica curiosa* is mentioned most frequently. In Letter **10** (August 30th 1662) Schott writes:

I am presently working on the *Technica Curiosa* and, in connection with this work, have recently made a trip to Nuremberg where the figures are being engraved in copper and, when this process is completed, where it will be printed. I will issue it in sections. In it you will find unheard of wonders that have been sent to me by various people of various different nationalities. I trust your noble lordship will not neglect to send me anything he can to adorn a work of this type. In so doing he will do an honour to me and a great service to the Republic of Letters.

Vegelin responded to this invitation with information that was sent to him by Deusing concerning particularly the investigation of the vacuum in England. Schott thanked him in Letter **14** (December 2nd 1662):

I have received your letter of November 2nd from Utrecht and that of the 17th from Groningen, together with the enclosures from our English friend, from the most distinguished Deusing and the other material. For all of these I am duly grateful.

On p. 863 of the *Technica*, Schott gives further information on the content of the letter of November 17th.

Schott decided to publish in the *Technica* the catalogue of the Royal Society that he had received from Vegelin (Letter **14**).

I have now inserted the catalogue of experiments, which the most illustrious and commendable English Society has in part already carried out and in part plans to perform later, in my *Technica Curiosa* which is now almost ready for printing.

He hoped to get information from Deusing about Boyle's experiments.

I am eagerly awaiting the most distinguished Master Deusing's Considerations concerning Experiments of the Illustrious Knight, Boyle and his marvellous and very interesting account of the Mussipontano foetus.

Schott received the chapter headings of the *Foetus Mussipontano* in a letter of 17th November 1662 from Deusing and published them in *Technica curiosa*, pp. 865–866.

In Letter **14** of December 2nd 1662 he thanks Vegelin for sending him conchoid problems and for a method of finding the height of objects through the shadows cast.

I am grateful for the problems on the Conchoid and for the technique of finding the height of things using the shadows they cast. They will find a place in my Technica Curiosa.

He was as good as his word and Book XI Chapter XII of *Technica curiosa* takes up this theme with an acknowledgment to Vegelin.

Schott's work on the *Technica curiosa* took two more years. In Letter **17** (February 16th 1664) he wrote about the problem of a universal language:

In my Technica Curiosa, which is now almost in print, I show a device for a universal language, or rather a brief specimen of one. There, I also explain the device which Master Becher published in a most unclear fashion. Fr. Kircher has also published his own which does not substantially differ from Master Becher's. Many years ago Fr. Kircher recognised his own device and revealed it to the Emperor⁷⁶ and the Archduke Leopold⁷⁷ who also praised it in a letter, which Fr. Kircher has printed. Fr. Kircher writes that a certain

⁷⁶ Leopold I. (1640–1705) was Holy Roman Emperor from 1658 until his death.

⁷⁷ Archduke Leopold Wilhelm of Austria (1614–1662) was the brother of Kaiser Ferdinand III.

young German had seen his device at his secretary's and, on his return to Germany, had disclosed it to Master Becher.⁷⁸

Schott treated that problem in Book VII (p. 478 et seq.), and also in his *Schola steganographia* (1664). Finally, Schott could report in Letter **18** (April 27th 1664) that the book had at last appeared:

My Technica Curiosa, in which the names of your most noble lordship and that of Master Deusing frequently appear, has gone on sale in the markets at Frankfurt. I have begun a work with a title that begins: *Mars Panglottus, a New Device for Universal Writing* of which I have written elsewhere.

This projected work never appeared. It was presumably intended as a development of Book VII of the *Technica curiosa*.

But, although *Technica curiosa* had been published he still was working on problems he had discussed in it. In the last letter, Letter **19** (November 5th 1664), he writes:

For quite some time I have been unwell and afflicted by a general loss of energy. Now however (praise be to God) I am completely restored to health and I carry on working on my Mercurius Panglottus about which I have written elsewhere.

This was a reference to the discussion of the problem of a universal language in the *Technica*, p. 483.

Some of Schott's books are only mentioned in passing in his letters. He answers a request from Vegelin for advice on a pyrotechnic matters in Letter **3** (September 7th 1661) with a brief reference to his *Magia universalis*:

To some extent I discuss certain pyrotechnic and hydrotechnic devices in the Parts 3 and 4 of the *Magia* but these will hardly serve the purpose of your most noble lordship. He will find better by

⁷⁸ The reference is to: Johann Joachim BECHER, *Character, pro notitia linguarum universalium*, Frankfurt, 1661. Johann Joachim Becher (1635–1682) was a universal scientist in the service of Johann Philipp von Schönborn, when he wrote his book.

consulting Joannes Faulhaber's⁷⁹ *Academia Fortificatoria*, in Quarto, printed in Ulm in 1633.

In fact, Schott discusses pyrotechnical matters in Liber II of Volume 4 of *Magia universalis (Thaumaturgus physicus)*, pp. 91–223. It shows his well known interest in spectacular phenomena. We were not however able to find anything relevant to these topics in Volume 3 (*Thaumaturgus mathematicus*).

In Letter **15** Schott responds to a request about a certain cube. He is not sure of Vegelin's meaning and just refers him to a topic that he has treated elsewhere – *Magia universalis I (Optica), Liber IV, Caput II, Parastasis IV* entitled: «Per species in locum obscurum immissas quidlibet representare.»

In Letter **3** of September 7th 1661 Schott mentions two other books he has written and expresses the hope that he may have the opportunity to dedicate a book to Vegelin.

I am hugely grateful for the offer you have made regarding the printing of my books. I hope that your most noble lordship will not take it amiss if at some point some work of mine should bear on its frontispiece his glorious name. My *Physica Curiosa* is being printed and I shall shortly be submitting the *Mathesis Caesarea*. For both of these dedications have already been accepted – one by the most serene Archduke, the Emperor's brother, and the other by the most serene Elector of Heidelberg.

The title of the first book that he mentions, *Physica curiosa*, has nowadays an exasperating effect on the reader. Its two volumes greatly differ from each other. Volume I deals with occult phenomena and deformities ('monsters') while Volume II describes interesting animals. The book was dedicated to Karl Ludwig, Elector Palatine (1617–1680).

The second book, *Mathesis Caesarea*, was originally written at Munich in 1654 by Albert Curtz (under the pseudonym Siegfried Hirsch) with the title: *Amussis Ferdinandea*. It shows the use of proportional dividers, and

⁷⁹ Johannes FAULHABER, *Academia fortificatoria*, Ulm, 1633. Johannes Faulhaber (1580–1635) was a mathematician, surveyor and fortifications engineer. The *Academia fortificatoria* is written in German.

was reissued with a commentary by Schott in 1662. He dedicated it to Karl Joseph of Austria (1649–1664).

A year and a quarter after first mentioning the possibility, Schott was finally in a position to make a firm proposal for a dedication to Vegelin. In Letter **14** (December 2nd 1662) he writes:

I pray God that he will keep your most noble lordship safe for very many years. Shortly I shall be publishing a work which will carry on the frontispiece the most glorious name of your noble lordship. I shall refer to you in the same style as that which the distinguished Master Deusing uses in his work *De Vacuo*. If you would like any changes or additions, I would be glad if you could let me know. The work is called *ANATOMIA PHYSICO-HYDROSTATICA* concerning the origin of fountains and rivers. The most noble lady Anna Maria will be able to send some words of tribute to your most noble lordship which can be included in the dedicatory address. The distinguished Master Deusing and other scholars of your acquaintance could do likewise. I commend your most noble lordship to divine protection.

Letter **14a**, of which the introductory section is identical to Deusing's, is the proposed dedication and it seems likely to have been an enclosure with Letter **14**. The remainder of Letter **14a**, with its comparison of Vegelin to a long list of Emperors from Alexander the Great to Charlemagne, seems excessively fulsome even by the standards of the time. The proposal however came to nothing and when *Anatomia physico-hydrostatica* appeared in 1663 the dedication was to: «Christ the most powerful king of kings, most splendid saviour of the human race and fount of all wisdom, virtue and knowledge».

One might speculate on why Schott wanted Vegelin as a patron and why the plan came to nothing. The desire may of course have arisen from simple gratitude for the help that Vegelin had given him so far. He may also have had an eye to the prestige of publication in Amsterdam which he hoped Vegelin would be able to secure for him. After the extravagant flattery of the opening part of the draft dedication, he pays Vegelin this more measured compliment.

You have never met me. Because, however, you have become persuaded that my works could render some service to the Republic of Letters, you have sought in every possible way to promote their publication – by encouragement, by pressing me to write books, by providing other kinds of help even when you were in faraway places, and by offering advice and assistance with the printing by your Amsterdam contacts, who long have had an outstanding reputation for publishing. I would be most ungrateful if I did not wish publically to express my thanks.

The proposal's coming to nothing may have been owing to Vegelin's declining of the invitation at the last moment – very late 1662 or early 1663. Another possibility is that Schott's superiors, feeling that it was one thing for a Jesuit to be on privately cordial terms with prominent protestants, but quite another to be dedicating books to them, forbade it. Their correspondence continued without further mention of the proposed dedication.

In Letter **18** (April 27th 1664), Schott reported that his *Schola steganographica* was finished. In 1662, in an appendix to *Mathesis Caesarea*, he had announced his intention to publish a *Dictionarius mathematicus* and a *Horographia universalis*. By the end of the year he had revised the plan. In Letter **14** (December 2nd 1662), apparently replying to a query from Vegelin, he writes:

I am constantly asked by many people to produce a Dictionary of Mathematics. By God's grace, I shall see that their wishes are met. I shall probably not tackle the Horographia Universalis book because that enterprise would be extremely demanding and, because of the many figures to be drawn, very expensive. If someone else should wish to take the task upon himself, I shall certainly have no objection.

After some difficulties with his Order, Schott's last book, *Ioco-seria*, was published shortly after his decease under the pseudonym Aspasius Caramuelius. This book had also been mentioned in the appendix to the *Mathesis Caesarea*, but permission for publication had been refused by the

Order.⁸⁰ The book was written in the tradition of Jean Leurechon's S.J.⁸¹ *Récréations mathématiques*,⁸² Daniel Schwenter's *Erquickstunden*⁸³ and their continuation by Georg Philipp Harsdörffer,⁸⁴ who is mentioned by Schott as a friend in Letters **1**, **2**, **10**, and **15**.

Interesting items in Schott's letters

Schott was interested in spectacular scientific news that his books could pass on to a curious wider society. His readers could always expect to find fascinating phenomena and mysterious machines in his books. The letters, with their frequent requests for information about scientific developments, reveal the restlessly inquisitive side of him. They also record Vegelin's interest in certain items that Kircher and Schott had described in their books.

Schott's book *Pantometrum Kircherianum* dealt with the use of an instrument that had been invented by Athanasius Kircher, who had used it for surveying in the Spessart Mountains near Aschaffenburg, and at the top of the Italian volcano Mount Vesuvius.⁸⁵ Schott himself had worked with it at Kircher's museum at Rome. He called it 'Pantometrum Kircherianum'.

⁸⁰ OSWALD, "Leben und Werk", pp. 431–433.

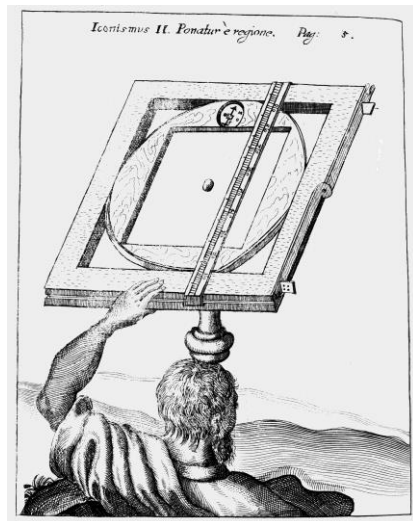
⁸¹ Jean Leurechon, *15.V.1591 Bar-le-duc, S.J. 17.8.1609 Tournai (Joannes Alexius), † 17.I.1670 Pont-à-Mousson (Sommervogel 4, pp. 1755–1761).

⁸² This book was published in 1624 in Pont-à-Mousson under the pseudonym H. van Etten.

⁸³ Daniel SCHWENTER, *Deliciae physico-mathematicae oder Mathemat: vnd Philosophische Erquickstunden*, Nürnberg, 1636.

⁸⁴ Georg Philipp HARSDÖRFFER, *Delitiae mathematicae et physicae. Der Mathematischen und Philosophischen Erquickstunden Zweyter Theil*, Nürnberg, 1651.

⁸⁵ Hans-Joachim VOLLRATH, "Das Pantometrum Kircherianum – Athanasius Kirchers Messtisch", in: Horst BEINLICH, Hans-Joachim VOLLRATH, Klaus WITTSTADT (ed.), *Spurensuche. Wege zu Athanasius Kircher*, Dettelbach, Röhl, 2002, pp. 119–136.



Pantometrum Kircherianum⁸⁶

Vegelin appears interested in it, and in Letter **8** Schott promised him such an instrument. The basic manufacture would be in Würzburg, but it would need be completed by «the hard working and highly skilled craftsmen» of the Netherlands.

In Letter **9**, Schott writes that the instrument has indeed been built, but communicates his disappointment about the quality of craftsmanship available at Würzburg:

I am sending you the Pantometer, but it has been so crudely made that I am embarrassed by it. The wealth and resources of this city of ours lie in wine which grows excellently and abundantly here. One would scarcely credit how few craftsmen we have who can actually make anything.

⁸⁶ SCHOTT, *Pantometrum Kircherianum*, p. 5.

One problem was a missing compass. But needles for compasses and magnets were rather rare at that period. There was however news of a new procedure for making compasses, which Schott related in Letter **1** and planned to publish. He writes:

I am grateful for Wilhelm Hagen's praxis that I have received. It is very good and very clever. So that it may benefit others I shall publish it for posterity. If he should come across anything else similar among his own Belgian people, he should not hesitate to send it to me. I am thanking Master Hagen by letter. If a needle, rubbed against a strong magnet, were to show the direction of the meridian line, in other words from south to north, that would be something of no small import. There will be no lack of people from your part of the world who, having tried this many times on both land and sea, will have observed the opposite.

Magnetism in general was a fascinating theme with many mysterious associated phenomena. Schott deals with magnetism in his *Magia universalis 3 (Thaumaturgus physicus)*, Liber III pp. 225–348. He was familiar with Kircher's books about magnetism,⁸⁷ had seen a lot of marvellous magnetic machines in the Museum Kircherianum in Rome, and could himself be considered as an expert on the subject. But, as he observed in Letter **14**, he himself only owned one small magnet that he had received from Niccolò Zucchi in Rome. Vegelin however could help, and, in Letter **17** Schott acknowledges his assistance:

I received the magnet shortly after I sent the book parcel. It was brought from Mainz by the person to whom Master Köth had entrusted it. I am hugely grateful. It will be a permanent testimonial both for me, and for the professors of mathematics who succeed me, of that remarkable warmth towards me that you have always shown, both by word and by deed.

Vegelin had obviously heard about a 'horologium magneticum', a mysterious machine, and had asked Schott for information. Schott replies in Letter **10**:

⁸⁷ Athanasius KIRCHER, *Ars magnesia*, Würzburg, 1631; Athanasius KIRCHER, *Magnes*, Rome, 1641, 1643, 1654.

I have not had the time to provide a description and a sketch of the magnetic horologium. I myself saw the device in Fr. Kircher's museum. In it a little man, suspended by an extremely fine thread in the middle of a glass, was indeed made to turn but the wheel concealed underneath was not operated by a weight and moving slowly over the course of twenty-four hours, but by a rope, which had been tied around the wheel. By pulling on this rope with one's hand one can freely make the rotation faster or slower as one chooses.

He is referring to an instrument which Kircher and he had described in their books.

Weapons and fortifications are of perennial interest to governments. Prior to the years covered by the correspondence, the Netherlands had suffered a period of warfare on its soil. There was a general sense of need for improvement in fortifications. Schott had just written on this topic in *Cursus mathematicus*⁸⁸ and was in a position to ask relevant questions. In Letter 1 he asks Vegelin for information about technical developments about which he had recently heard:

I would like to know whether the fortifications at Kalkar and at Harburg were constructed using the new discovery of Colonel Gorgas⁸⁹ which not long ago he showed me and of which he gave me a very able account. He replicates the flanks of the defence and makes two or three formations over each other, which, in contrast to a rampart and a ditch, one can defend with muskets.

But today we are very familiar with the relentless arms race of the development of better fortifications in response to stronger weapons, and of stronger weapons in response to better fortifications. This remains a 'Teufelskreis'. It is not therefore surprising to find Vegelin asking Schott about more powerful weapons. He had heard of a 'bombard'. In Letter 3, Schott could relate to him:

⁸⁸ SCHOTT: *Cursus mathematicus*, pp. 486–508.

⁸⁹ Possibly Major General Johann Georg Gorgas who served in the army of the bishop of Münster and who on September 21st 1665 led an army of 20,000 into Twenthe, a district of the Overijssel province of the Netherlands.

Some years ago someone in Italy thought up and successfully implemented a new kind of more powerful bombard which entails less expense in casting and fewer difficulties in transport and firing than is the case for those currently in use.

Schott gives a detailed description of this mortar referring to Niccolò Cabeo's *In quatuor libros meteorologicorum Aristotelis* 3.⁹⁰

To return to peaceful pursuits, we find Schott in Letter **10** reporting about a Chinese abacus, which he had mentioned earlier in his *Cursus mathematicus*⁹¹ with a reference to his confrère Martino Martini. Schott writes:

What the most excellent Master Cunaeus has reported about the speed of the Chinese in arithmetic computation is absolutely true. At Rome Fr. Martino Martini and Fr. Michael Boym, who had come from China and have now returned there, showed me their method. In Book 1 of his *Sinicae Historiae Decas Prima*⁹² Fr. Martini describes this method and explains it with an appropriate diagram. It is not dissimilar to the method of our merchants. However what our people do with pebbles (with Rechenpfennige) the Chinese accomplish with spherical beads connected along an iron wire.

This information was the result of an exchange of knowledge among members of the Society of Jesus, who formed an international polyglot network for which Latin provided the common medium of communication. Schott himself was not a virtuoso linguist – he is recorded as knowing (only) Italian, German and Latin – and it is notable that he asks Vegelin only for publications from England written in Latin. Then as now, failing a universal language, the prospect of automating translation was an attractive one to an international organisation.

Kircher and Schott both were optimistic that they had found the solution. But they wished to keep their ideas secret. Nevertheless in Letter **13**, he disclosed some information to Vegelin.

⁹⁰ Niccolò CABEO, *In quatuor libros meteorologicorum Aristotelis*, Rom, 1646.

⁹¹ SCHOTT, *Cursus mathematicus*, p. 52.

⁹² Martino MARTINI, *Sinicae historiae decas prima*, München, 1658, p.16.

Something I had wanted to know for a long time came into my head. When I was still in Rome, Fr. Athanasius Kircher reported that he knew a method by which someone, knowing only one language, would be able to read and understand all languages. I was never able to get him to give me even an inkling of how his system worked. ... I had been often thinking about them during these past days and, last night, when I was lying awake and could not sleep any more, I was pondering these and other matters. All at once there came into my mind an easy and completely sure way by which anyone understanding just one language (whatever it might be) could write in the languages of all the nations and by this same method could read, understand and interpret written works in all these same languages. I think it is the very same method that Kircher had.

The idea was to develop a universal language – a simplified Latin – and dictionaries for other languages following the same system. With the methods of steganography it would then be possible to translate a simple text from one language into another. In addition, this could be done by the ‘Arca Glottotactica’, a machine that was developed by Kircher and had been described in his *Polygraphia nova et universalis* (1663).⁹³

Conclusion

The earliest occurrence of Vegelin’s name in Schott’s works is in the preface to the *Physica curiosa*, published in 1662 where Vegelin is thanked for information about recent work of Boyle. Subsequently he is more frequently mentioned in *Technica curiosa* (1664). Correspondence with Anton Deusing is reproduced in *Technica curiosa* in connection with the vacuum and the Mussipontano foetus. The letters throw much light on the triangular relationship among the three men. The letters show his ardent seeking of contacts with English science, particularly with Robert Boyle and the nascent Royal Society, through the young nobleman Wilhelm Schroterus. They also give a vivid snapshot of Schott’s intellectual preoccupations – apart from the vacuum, on which his views were conflicted, the uncertain status of the magnetic compass as a usable instrument, the automation of translation, geometry problems especially

⁹³ Athanasius KIRCHER, *Polygraphia nova et universalis*, Rome, 1663.

quadratures, improvements in munitions and fortifications, horology, and surveying instruments. The letters show Schott, the energetic gatherer and disseminator of scientific information, collaborating across confessional boundaries. Above all they vindicate a picture of Schott as an enthusiastic, selfless, generous-minded, incredibly industrious servant of the Republic of Letters.

Summary

Recently some 20 letters from the years 1661 to 1664 of the Würzburg mathematician, Kaspar Schott S.J., to Philip Vegelin were discovered in the Tresoar Archive in Leeuwarden. The authors have transcribed and translated these letters and made them publically accessible on the EMLO website. In addition to the Leeuwarden letters, a further letter to Vegelin from the Huygens archive at Leiden has also been similarly published. This correspondence took place while Schott was composing his *Technica curiosa*, which contains several references to Vegelin. The letters provide a direct insight into Schott's enthusiasm for gathering and disseminating scientific and technical knowledge across a wide range of topics. Our article sets these letters in their historical context, provides biographical detail on most of the personalities Schott mentions, traces the allusions to other writings, and clarifies the more technical topics that occur. While Schott was writing these letters, he was particularly exercised by the question of the vacuum, which he discussed extensively in Book 1–4 of the *Technica*. We compare the view of the vacuum advocated in these letters by Vegelin's friend Anton Deusing with the sharply contrasting one being simultaneously pressed upon him by letters from Otto von Guericke.

Zusammenfassung

Kürzlich wurden etwa 20 Briefe des Würzburger Mathematikers Kaspar Schott S.J. an Philip Vegelin aus den Jahren 1661 bis 1664 im Tresoar Archiv in Leeuwarden entdeckt. Die Autoren haben diese Briefe transkribiert, übersetzt und im Internet auf den Seiten von EMLO zugänglich gemacht. Zusätzlich wurde ein weiterer Brief an Vegelin aus dem Huygens Archiv in Leiden aufgenommen. Der Briefwechsel fand in einer Zeit statt, in der Schott an seiner *Technica curiosa* arbeitete. Die Briefe geben ein Einblick in Schotts Bestreben, wissenschaftliche und technische Kenntnisse über einen weiten Bereich zu sammeln und zu

verbreiten. Unser Beitrag erläutert ihren historischen Kontext, gibt biographische Hinweise auf die von Schott genannten Personen, deutet die gegebenen Literaturhinweise und erklärt die eher technischen Probleme der aufgeführten Gegenstände. Während Schott diese Briefe schrieb, war er insbesondere mit Fragen des Vakuums beschäftigt, die er in den Büchern 1–4 der *Technica* behandelte. Wir machen deutlich, in welchem scharfen Gegensatz die in den Briefen befürworteten Ansichten von Vegelins Freund Anton Deusing zu den Ansichten standen, die gleichzeitig Otto von Guericke in seinen Briefen vertrat.