CRYPTOLOGIA October 1998 Volume XXII Number 4

THE NUMERICAL-ASTROLOGICAL CIPHERS IN THE THIRD BOOK OF TRITHEMIUS'S STEGANOGRAPHIA

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ABSTRACT: I solved both Trithemius's cipher and Heidel's encrypted solution in 1993 and published amonograph on the subject in 1996[1]. In addition to drawing on my previous research, the following article includes several new observations and references, especially with regard to the chronology of the work, additional manuscript copies of the *Steganographia*, and the position of the Third Book within Trithemius's complete cryptological oeuvre.

KEYWORDS: Johannes Trithemius, Wolfgang Ernst Heidel, *Steganographia*, *Polygraphia*, numerical ciphers, astrological ciphers.

Accidentia cernis: substantia manet invisibilis.[2]

A BRIEF CHRONOLOGY OF THE STEGANOGRAPHIA

Trithemius's first treatise on secret writing - the second being the *Polygraphia* of 1508 - has come down to us under the collective title of *Steganographia*. When the work first appeared in print in 1606, it actually contained, under separate title-pages and with new pagination, three parts: the *Steganographia* proper, the short *Clavis generalis triplex*, and the *Clavis Steganographiae*, thus reflecting two layers of composition in reverse order. The *Clavis specialis Steganographiae*, thus titled in a manuscript dated 1521[3] - contains an early version of the *Steganographia*,

[1] Thomas Ernst, "*Schwarzweiße Magie: Der Schlüssel zum dritten Buch der Steganographia des Trithemius*," Daphnis: Zeitschrift für Mittlere Deutsche Literatur, 25/1 (1996), 1-205.

[2] "You distinguish inessential properties, while the substance remains hidden." All translations in this article are mine. *Polygraphiae libri sex Ioannis Trithemii* [...] (Basel: Ioannes Haselberg, 1518), preface, f. b2r.

[3] Johannis Trithemij [...] *SteganographæLib. 3 cum Clave, tàm generalj, quàm specialj, ad literam magnis laboribus et sumptibus è MSS. codice strenuj et praenobilis dominj Ioann: de Woesbruck magnj Telonej Brigensis Magistrj descriptj. M D XXI* (Wolfenbüttel: Herzog August Bibliothek, *Cod. Guelf. 91.1 Extrav.*), f. 241r. Other manuscripts and printed editions omit "*specialis*."

composed between December 1498 and March 1499, in which Trithemius explains and exemplifies, step by step and in plain language, a variety of enciphering techniques, often interspersing suggestions for their embellishment and/or improvement.

The *Steganographia* proper presents a thoroughly revised and expanded reworking of the earlier *Clavis specialis*, which Trithemius begun after March of 1499 and discontinued in April of 1500. This second version distinguishes itself from the earlier one both with regard to content and rhetorical expression. Trithemius rewrote most of the fictitious letters exemplifying his encryption techniques and, in many cases, redated these letters. At the same time, he dropped several of the older cipher examples altogether (in particular the 11 modi of the second chapter of the *Clavis specialis*) and added numerous new variations (especially chapters 17-32 of Book 1, and the fragmented 3rd Book). Let me illustrate this reworking process with an arbitrary example: in the *Clavis*, Trithemius exemplifies the reading plaintext a = cipher s both in an "easy" version (alternation of cryptologically insignificant and significant letters, with the accompanying cipher letter dated January 10, 1499), and a "complicated" version (only significant letters, with the accompanying cipher letter dated February 23, 1499). For inclusion in the *Steganographia*, Trithemius dropped the more complicated version and revised the easier one, adding the new the date, April 17, 1500, to the revised cipher letter.[4]

More significantly, however, Trithemius eradicated any trace of his earlier plain-language instructions and explanations by translating them into a very personal rhetorical metaphor: the well-known pseudo-universe of astral spirits and their retinue for the various hours of the day and the night, and their conjuration by means of pseudo-magical formulae. Trithemius achieved this rather compelling rhetorical transformation through his use of "*Arkansprache*" (arcane language) - a procedure which is of great consequence for a true understanding of his *modus operandi*, especially with regard to the Third Book:

> Arcane language describes a scientific fact or a practical procedure in a manner which is only comprehensible to the initiated. Besides secret writing and encrypted clues it also uses symbols, metaphors, fictitious persons, and mythological narrations of diverse fantastical settings, while the significance of individual elements may change from case to case.[5]

[4] The examples given are II/5 and I/36 of the *Clavis specialis*, and II/17 ("Sanayfar") of the *Steganographia*. Not all the cipher letters are dated. In many cases, the revisions are limited to improving the syntax and vocabulary of the early versions.

[5] "*Arkansprache stellt einen wissenschaftlichen Sachverhalt oder eine praktische Arbeitsweise so dar, daß es*

The brief *Clavis generalis triplex*, dated March 14, 1499 in *Cod. Guelf. 91.1 Extrav.*[6] appears somewhat enigmatic at first glance, but actually constitutes the slender centerpiece in Trithemius's cryptological triptych. Here the author lays out - in rudimentary fashion - various principles of letter substitution and the alternation of cryptologically significant and non-significant letters, as well as the means of rhetorically transforming the early plain-language explanations to his ciphers into arcane language. Some of these ideas he dropped in the final reworking (such as the pure vowel substitutions), others he applied, such as the alphabet substitutions in Book II, embedding the clues to the sequence of cryptologically significant and non-significant letters in the form of pseudo-magical conjurations, and translating their numerical count into the legions of the subspirits

Trithemius finished the first two books of the arcane *Steganographia*, but broke off his efforts at the end of the first chapter of the Third Book. The author himself gave several reasons for why he discontinued the work: fear of the possible misuse of his ciphers by people with bad intentions, the disproportion of the great labor intensity to the the author's poor remuneration, and the risk of being accused by the non-initiated of dabbling in the black arts.[7]

The last reason may be corroborated by the events that ensued after Trithemius had been visited in Sponheim by the French mathematician and theologian Charles de Bovelles in 1503 (or 1504 - the year is unclear). All too eager to promote his own ingenuity and reputation, the generous host supposedly tried to impress his curious guest with various sleights of hand, and finally let him browse through the arcane version of the *Steganographia* without providing as much as the smallest hint as to its true cryptological nature. Upon his return to France, and for reasons that might have been political in nature, Bovelles openly criticized the work and its author for dealing with the occult.[8] Trithemius bitterly complained about this sudden turn-around and publicly defended himself, in no

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nur dem Eingeweihten verständlich ist. Sie benützt dazu außer Geheimschriften und Geheimwörten auch Symbole, Metaphern, fingierte Personen und mythologisierende Erzählungen von verwirrender Phantastik, wobei die Bedeutung der einzelnen Elemente von Fall zu Fall abgeändert werden kann." Gerhard Eis: Mittelalterliche Fachliteratur (Stuttgart: J. B. Metzlerische Verlagsbuchhandlung, 1962), 57.

[6] *Cod. Guelf. 91.1 Extrav.*, f. 241r; date omitted in the *editio princeps* of 1606.

[7] Letters to Johannes Capellarius (August 16, 1507) and Rutger Sycamber (August 31, 1507). Trithemius, "*Epistolae familiares*," *Opera historica*, ed. Marquard Freher (Frankfurt: Claudius Marnius, 1601), II, 555-556, 563.

[8] Bovelles gave a detailed account of this visit in his (in)famous letter to Germain de Ganay, a common acquaintance of both Trithemius and Bovelles. Carolus Bovillus, "*Philosophice epistole*," *Liber de intellectu. Liber de sensu. [...] De Geometricis Corporibus. De Geometricis Supplementis* ed. Franciscus de Hallevvin (Amiens: Henricus Stephanus, 1510), f. 172v. Agrippa's student Johannes Wier (of all people) helped to propagate Bovelles's proclamations by including excerpts from this letter in his popular *De praestigiis daemonum* (edition used: Basel: Ioannes Oporinus, 1564, 130).

uncertain terms, against the ignorant "maligner" Bovelles, quipping about his "bovine readership" in general[9], but to no avail. As late as 1515 he insisted on witholding the "*corpus delicti*" from the inquisitive eyes of Germain de Ganay, under the pretense of not having an amanuensis available to copy it.[10]

In addition to the chain of misunderstandings initiated by the arcane version of the *Steganographia* and the unwillingness of its author to assist in its explanation (a stance expressed repeatedly in the prefaces to both the *Steganographia* and the *Polygraphia*), there remained the problem of the textual tradition itself. Supposedly at the instigation of Count Palatine Frederic II (1544-1556), son of the dedicatee, Count-Elector Philip of the Palatinate, the autograph of the *Steganographia* had been burned by a librarian in Heidelberg.[11] However, long before this autodafé, and both with and without the author's blessing, the text had been copied by and for friends or students of Trithemius, such as Agrippa, Johannes de Woesbruck, Johannes Evriponus, Johannes Capellarius, probably even Nicolas Baselius. Later sixteenth century accounts by Blaise de Vigenère, Jacques Gohory, Johannes Wier, Giordano Bruno, and John Dee, to name a few[12], as well as a glance at known manuscript copies[13], inform us that during the 100 years before the *editio princeps*, the text circulated in widely differing stages of completeness throughout Europe. It appears that the two *Claves* were copied with much less frequency than the arcane final version[14]. Manuscripts of the latter often show large textual omissions, especially in Book II, while the text of Third Book is usually copied with much more precision (and even more text) than in the printed versions. When Blaise de Vigenère observes in his *Traicté de chiffres* in 1586 that he has encountered various manuscripts of the *Steganographia* but could not make anything of their contents[15], he reflects the typical reception of this work during the sixteenth century: without the benefit of the *Clavis specialis* in particular, the *Steganographia* was all but

[9] Trithemius, *Polygraphia*, preface, f. b1v.

[10] Letter to Germain de Ganay, then bishop of Orléans, of June 20, 1515. Klaus Arnold, "*Ergänzungen zum Briefwechsel des Johannes Trithemius*," Studien und Mitteilungen zur Geschichte des Benedektiner-Ordens und seiner Zweige, 83 (1972), 203-204.

[11] Accounts of this autodafé vary. The Heidelberg librarian is referred to as Franciscus Junius, or Franciscus Hussitus, and may even have acted at his own instance. The fact remains that the *Steganographia* seems to be no longer extant in Trithemius's hand.

[12] For the reception of the *Steganographia*, see Ernst, 70-129.

[13] A helpful, albeit not complete list, is provided by: Klaus Arnold, *Johannes Trithemius (1462-1516). Zweite, bibliographisch und überlieferungsgeschichtlich neu bearbeitete Auflage* (Würzburg: Kommissionsverlag Ferdinand Schöningh, 1991), 253-254.

[14] So far, I am aware of four pre-1606 manuscript copies of the *Clavis specialis*, and only one of the *Clavis generalis*.

[15] Blaise de Vigenère, *Traicté des chiffres* (Paris: Abel L'Angelier, 1586) f. 12v, 13r, 182r.

unintelligible. The first recorded reference to the *Clavis specialis* known to me occurs in the *Steganographia nova* (1601) of Count Friedrich von Oettingen-Wallerstein (1556-1615), where the author very plainly states that all the enciphering techniques contained in the first two books of the *Steganographia* can be inferred easily from the analogous explanations and examples contained in the *Clavis specialis*[16]. When the entrepreneurial protestant Johannes Berner finally dared to have the ill-reputed work published in Frankfurt in 1606[17], the two *Claves* were bound to the end of the main text (occasionally missing), which further aided the widespread misconception that these "keys" were actually conceived as an explanatory afterthought, as was indeed the case with the *Clavis Polygraphiae*[18]. Following Count Friedrich's notion, in 1624, Duke August the Younger of Braunschweig-Wolfenbüttel was able to assemble a very detailed and carefully edited survey of all the enciphering techniques encountered in Books I and II of the *Steganographia* and their corresponding earlier versions in the *Clavis specialis*[19].

This, however, also put into even greater relief the incomprehensibility of the fragmented and comparatively brief Third Book. It could not be explained by taking recourse to any early plaintext-draft, since it only exists in its arcane version, and its general rhetorical make-up and supposed content seemed to differ too widely from that of the first two books to yield any clues, even by analogy.

CONTENT[20] AND RECEPTION OF THE THIRD BOOK

In the preface to the Third Book, Trithemius explains how he has gathered from the treatise of an old Indian[21] philosopher by the name of Menastor the art of

[16] *Steganographia Comitis Friderici Öttingensis in Wallerstein* (Wolfenbüttel: Herzog August Bibliothek, Cod. Guelf. 56 Aug. 4°), f. 75v. Three manuscripts of this text are known, which has never been printed.

[17] *Steganographia: Hoc est: Ars per occultam scripturam animi sui voluntatem absentibus aperiendi certa [...]. Praefixa est huic operi sua clavis, seu vera introductio ab ipso Authore concinnata [...]* (Frankfurt: Matthias Becker, 1606); second, revised edition: Frankfurt: Ioannes Savrius, 1608; third, revised edition: Darmstadt: Balthasar Aulaeander, 1621. All three editions were "at the expense" of the Frankfurt publisher Ioannes Berner.

[18] *Clavis Polygraphiae* Ioannis Tritemii [...] (Basel: Ioannes Haselberg, 1518).

[19] *Gustavi Seleni Cryptomenytices et cryptographiae Libri IX. In quibus et planissima Steganographiae a Johanne Trithemio [...] Enodatio traditur [...]* (Lüneburg: Johannes & Henricus Stern, 1624), 35-129. August used the manuscript of 1521 and the first printed edition of 1606 as references.

[20] For a comparative edition of the Latin text of the Third Book, see Ernst, 49-69.

[21] "*Indorum*" in *Cod poet. et phil 4° 63* (Stuttgart: Württembergische Landesbibliothek, 1556), f. 66r, Peniarth 423D (Aberystwyth: National Library of Wales), f. 48r, and *Cod. Vat. Reg. lat. 1344* (St. Louis: Washington University Library, 1595), f. 34r; "*Judeorum*" in *Cod. C 16* (Fulda: Hessische Landesbibliothek, 1588), f. 80v; no attribute in 1606, 160. "Indian" is the most likely reading because of later allusions to India, not at last the numerals themselves. The variations on this minor detail are symptomatic for the textual tradition of all

communicating one's thoughts to a distant friend within twenty-four hours, without words, letters, or a messenger. In order to do so, the sender would have to enlist the aid of the rulers of the seven planets and their 21 intelligences. Obviously Trithemius - who, after only a short while, can no longer be distinguished from the fictitious Menastor - envisioned a subdivision of his book into 28 chapters, which would have resulted in a suitable complement to the first two books. Saturn being the most remote planet, his four rulers Orifiel, Sadael, Pomiel, and Morifiel are introduced first. Before conjuring these spirits, it is necessary to precisely chart the position and course of the planets in the heavens, especially with regard to the zodiac. Since the commonly-known methods of astronomical calculations are not precise enough, Trithemius subdivides the normal 360 degrees of a circle and expounds these additional figures in lengthy tables. The actual process of communication is illustrated with a specific example, configured for Saturn/Orifiel, 28 April 1500. The sender is to depict on wax or a piece of paper the figure of Orifiel as a nude bearded figure standing on a multicolored bull and holding a book in his right hand, and a writing instrument in his left, then he is to inscribe this image with both his name and that of the recipient. A second drawing will represent the recipient and is to be similarly inscribed (Trithemius insists that neither drawing has to be craftsman-like, and that a rough outline will do), upon which the sender speaks the appropriate conjuration, folds both pieces together, puts them in a container which the Indians call "*pharnat alronda*," covers it, and places it in a secret place. Within 24 hours, the recipient would be informed, in the most precise manner, of the sender's message. Trithemius even suggests recycling at least the image of the planetary intelligence for future mailings. - The two final - and much shorter - sections of the first chapter of the Third Book are dedicated to the Saturnian intelligences Sadael and Pomiel, and before Morifiel's skills are introduced, the text abruptly breaks off.

Since this text apparently provides no clue as to its underlying meaning - if, indeed, there was such a thing - readers during the past 500 years took the following interpretational recourse: the Third Book was either a manual for black magic, or a manual for neoplatonic metaphysics, or it described some unknown technical exploit, or it actually contained means of secret communication.

The advocates of black magic - Bovelles, Bodin, Del Rio, to name just a few, might have contributed to the indexation of the *Steganographia* on September 7, 1609[22], but need otherwise not concern us here.

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of the Third Book.

[22] Franz Heinrich Reusch, *Der Index der verbotenen Bücher* (1885), II/1 (Aalen: Scientia Verlag, 1967), 182-183.

More scientifically minded readers directed their attention to the apparently central problem of a 24-hour-communication without words, letters, or messengers, and attempted a solution of this problem via technical speculation: Paracelsus envisioned a pre-telephonic communication system through an extensive underground pipeline (1537), Giovanni Battista Porta foresaw the construction of gigantic concave lenses that could project letters to the full moon (1558), Johann Georg Gödelmann related the semi-hypnotic out-of-body experience of a citizen of Rostock (1591), Count Friedrich described sympathies of the blood and parallel sensations of pain (1601), and Gaspar Schott speculated on huge loadstones that would turn the hands on alphabet clocks (1665)[23].

During the first decade of the seventeenth century, the recent indexation of the *Steganographia* caused a team of two Jesuits and two Benedictines to attempt a purely cryptological explanation of the Third Book. The brothers Karl and Georg Stengel and the well known Hebrew scholar and scientist Adam Tanner were aware that only a convincing explanation of the Third Book could free the *Steganographia* from its magical reputation. For almost four years (1612-1616), they unsuccessfully tried to uncover the cryptological contents of the Third Book, and finally settled on the possibility of a hieroglyphic or encaustic alphabet. When Abbott Sigismund Dullinger of Seeon joined their efforts in the summer of 1616, he seemed to have become the first to hint at the possibility of a numerical cipher alphabet, but he never followed up on this intuition[24]. Athansius Kircher, John Wilkins, and Georg Wallin decided on a semi-telegraphic system of light communication, well known since antiquity[25], while Gaspar Schott had the good grace to exit quietly from the field of untenable explanations: "*sed cum haec incerta sunt, ad alia progredior.*"[26]

The seemingly most authoritative evaluation of this mysterious system of communication within 24 hours was given by Trithemius's prodigy Agrippa in the expanded version of his *Occulta philosphia* (1533). Agrippa offered several solutions, among them a form of metaphysical telepathy with the aid of celestial impressions, which came with the enigmatic guarantee: "*Et ego id facere novi*

[23] Further details in Ernst, 70-129.

[24] For the efforts of the brothers Stengel, Tanner, and Sigismund see: Anton Dürrwächter, "*Adam Tanner und die Steganographie des Trithemius*," *Festgabe [...] Hermann Grauert zur Vollendung des 60. Lebensjahres* (Freiburg: Herdersche Verlagshandlung, 1910), 354-376. The possibility of a numeric "Caesar alphabet" was reiterated as late as 1982, with an unsuccessful attempt to draw on Kircher's *Polygraphia* nova for a possible solution: Wayne Shumaker, *Renaissance Curiosa: John Dee's Conversation with Angels*, Girolamo Cardano's *Horoscope of Christ, Johannes Trithemius and Cryptography*, George Dalgarno's *Universal Language* (Binghamton: medieval & renaissance texts & studies, 1982), 131.

[25] Polybios, Hist. X, 45-47, and repeatedly observed by both Kircher and Schott at the Sicilian coast.

[26] "Since all of this is uncertain, I will continue with something else." Gaspar Schott, *Schola steganographica, in classes octo distributa [...]* (Nürnberg: Endter, 1665), 246.

et saepius feci; novit idem etiam fecitque quondam abbas Trithemius."[27] The ever-critical Vigenère distanced himself from this putative juxtaposition: "*les promesses et asseurances de ces deux Tritheme et Agrippe, ont incité beaucoup de bons entendemens, à enquerir le moien de ceste transmission de pensee, sans sortir hors de la nature, comme ils l'afferment*," and he wisely hinted at "*le danger et inconvenient qu'il y a d'adiouster legierement foy à tout ce qu'on trouve dedans les livres.*" On the other hand, he suggested keeping an open mind about yet inconceivable technical inventions: "*on ne doibt pas du tout reiecter, n'y tenir à fable et mensonge beaucoup de choses, qui de prime-face surpassent notre apprehension.*"[28]

In the twentieth century, however, the explosive mix of Agrippa's pseudo-magical interpretation and the revival of Hermetic and Neoplatonic studies lead directly to a completely uncritical appropriation of the Third Book as a treatise on astral magic. The most influential - since most frequently quoted - exponent of this juxtaposition was D. P. Walker: "But the Third Book, which is unfinished, does not, like the other two, contain any examples of enciphered messages. [...] I believe, then, that Trithemius' *Steganographia* is partly a treatise on cryptography in which the methods of encipherment are disguised as demonic magic, and partly a treatise on demonic magic."[29] In the wake of this assessment, Trithemius's own arcane metaphors were used to completely obliterate even the possibility of a cryptological reading: "In book three there is no possibility that the magic is a cover for cryptography, there being no examples of encipherment, which is unnecessary since the message is transmitted directly by the spirit to the recipient."[30]

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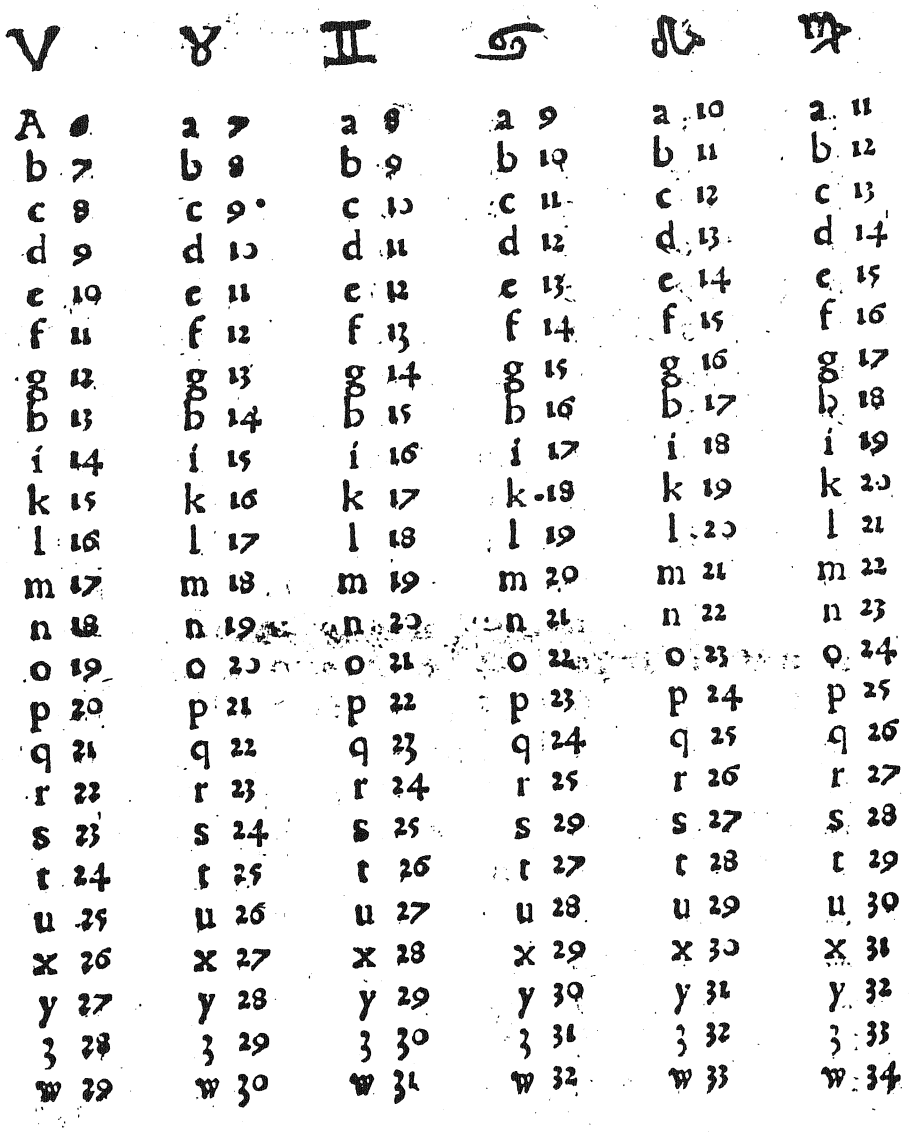
[27] "And I know how to do this and have frequently done it, [while] Abbot Trithemius also knew how to do it and used to do it." Cornelius Agrippa, *De occulta philosophia libri tres*, ed. V. Perrone Compagni (Leiden, New York, Köln: E. J. Brill, 1992), I/6, 98 (lunar writing), 96-97 (celestial telepathy). This passage is not yet contained in the early version of the book which Agrippa had sent to Trithemius in 1510.

[28] "The promises and assurances of those two, Trithemius and Agrippa, have generated quite a few hypotheses with regard to the means of this transmission of thought, without leaving the boundaries of nature, as they affirm," "the danger and inconvenience of placing faith too easily in anything found in books," "one should neither completely reject, nor consider as fable or lie many of the things which, on first glance, seem to surpass our compehension." Vigenère, f. 16v, 14r.

[29] D. P. Walker, *Spiritual and Demonic Magic from Ficino to Campanella* (London: The Warbug Institute, 1958), 89. This assessment was reiterated by - to name but a few! - Frances A. Yates, *Giordano Bruno and the Hermetic Tradition* (Chicago: The University of Chicago Press, 1964), 145; Ioan P. Couliano, *Eros and Magic in The Renaissance*, transl. Margaret Cook (Chicago: The University of Chicago Press, 1987), 172, 174; Umberto Eco, *Die Suche nach der vollkommenen Sprache*, transl. Burkhart Kroeber (München: Verlag C. H. Beck, 1994), 136.

[30] Nicholas H. Clulee, *John Dee's Natural Philosophy Between Science and Religion* (London, New York: Routledge, 1988), 137.



Singulis duodecim zodiaci particionibus alphabeta per numeros assignauimus singula, ut signũ arietis pro a, habeat ziphara numeralem 6. ♉, 7. ♊, 8. cancri, 9. ♌, 10. ♍, 11. & ita per totum alphabetum.

Figure 1. Numerical ciphers alphabets with their zodiac/planetary headers from Book VI of the *Polygraphia* (1518, f. r3v-r4v).

THE SOLUTION TO THE THIRD BOOK OF THE STEGANOGRAPHIA

My guidelines for the solution were purely historical-cryptological in that I placed the Third Book of the *Steganographia* within the context of the numerical-astrological ciphers presented near the end of Book VI of the *Polygraphia*, and in that I kept my expectations within the cryptological repertoire marked out by Trithemius himself in his writings. Therefore, I started with the following basic assumptions: as they do in *Polygraphia* VI, the numbers in *Steganographia* III indeed represent encryption devices; the numbers do not hide a code (unlike Alberti, Trithemius never devised a code, not even in his *Polygraphia*), and probably not a nomenclator (unusual for Trithemius); the numbers will represent individual letters (perhaps letter pairs); the cipher-alphabet in question can be either monoalphabetic (with the possible inclusion of homophones), or polyalphabetic (with the use of a key); both the cipher-alphabet and the encrypted texts will be either in Latin or German; the plaintexts may contain amusing German messages of the kind encountered in Books I and II, a classical quote, or perhaps a title, but probably not an actual explanation of the enciphering technique *per se* (like the conjurations in Book I and II).

Let us look briefly at the final section of Book VI of the *Polygraphia* and the corresponding passage in the *Clavis Polygraphiae*[31]. After the presentation of a purely numerical cipher alphabet and its two variations, Trithemius expands the principles of numerical substitution to include the twelve signs of the zodiac (Aries through Pisces) and the seven signs of the planets (Saturn through Moon, which, along with the sun, was considered a planet). These 19 numerical cipher alphabets contain 24 plaintext letters each and are incremented by one step, from 6-29 through 24-47 (Figure 1). If only one of these alphabets is used, the additional zodiac/planetary symbol serves as a monoalphabetic identifier, similar to the insertion of "proper signs" in the letters of Books I and II of the *Steganographia*. If several or all alphabets are used simultaneously, the astrological signs turn into true polyalpabetic keys. In addition, Trithemius stresses the purely steganographic, even psychological quality of these signs: if enciphered messages are arranged in vertical columns and properly adorned, they will look like astrological or horoscopic computations and be further removed from suspicion[32].

The values from 725 to 26 encountered in the Third Book of the *Steganographia* raised two fundamental questions: how many letters does the plaintext

[31] Trithemius, *Polygraphia*, f. r1r-r4r; *Clavis Polygraphiae*, f. C3r-v. For further details and illustrations see Ernst, 132-138.

[32] Vigenère made the most astute observations on this point, *Traicté* f. 194v-195r.

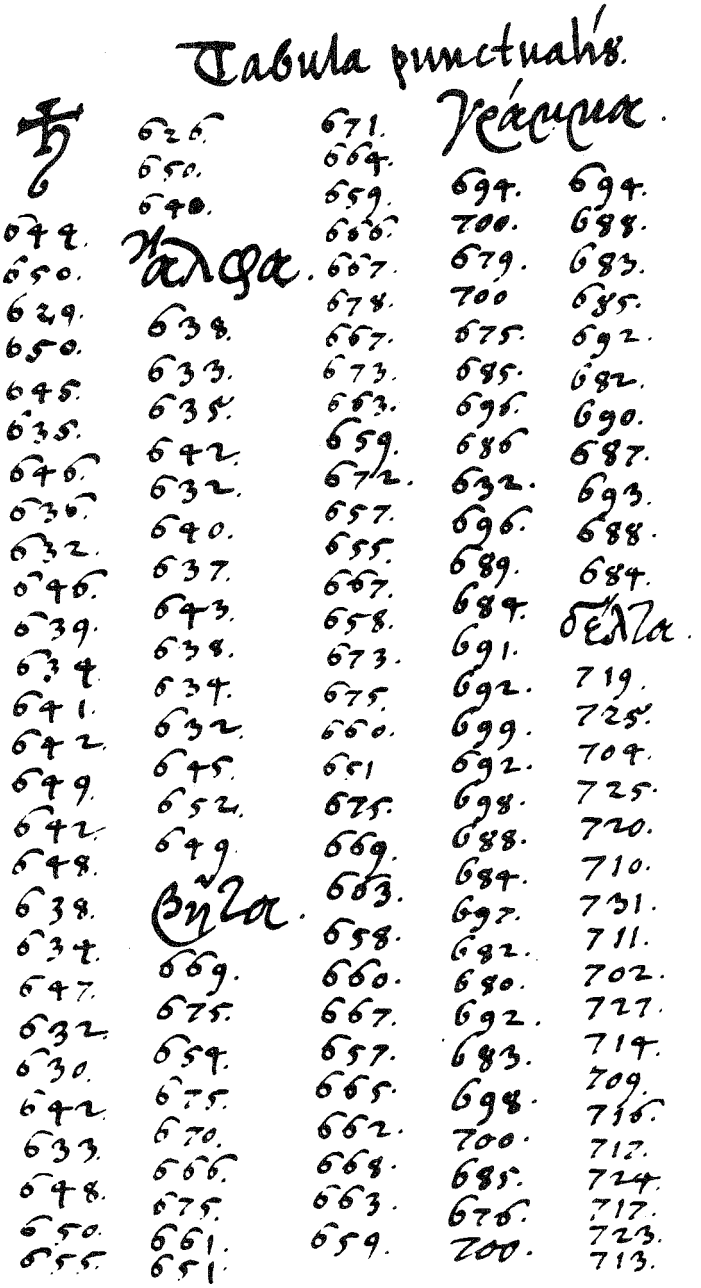


Figure 2. The four initial encipherments of "*gaza* [. . .]," followed by "*liber getruver [. . .].*" *Cod. Guelf. 91.1. Extrav.* (Wolfenbüttel, Herzog August Bibliothek), f. 214v-215r. The 1521 manuscript contains an unusually high amount of erroneously copied numbers. The (probably inauthentic) addition of the last vertical column on the right (numbers 718-20) is unique.

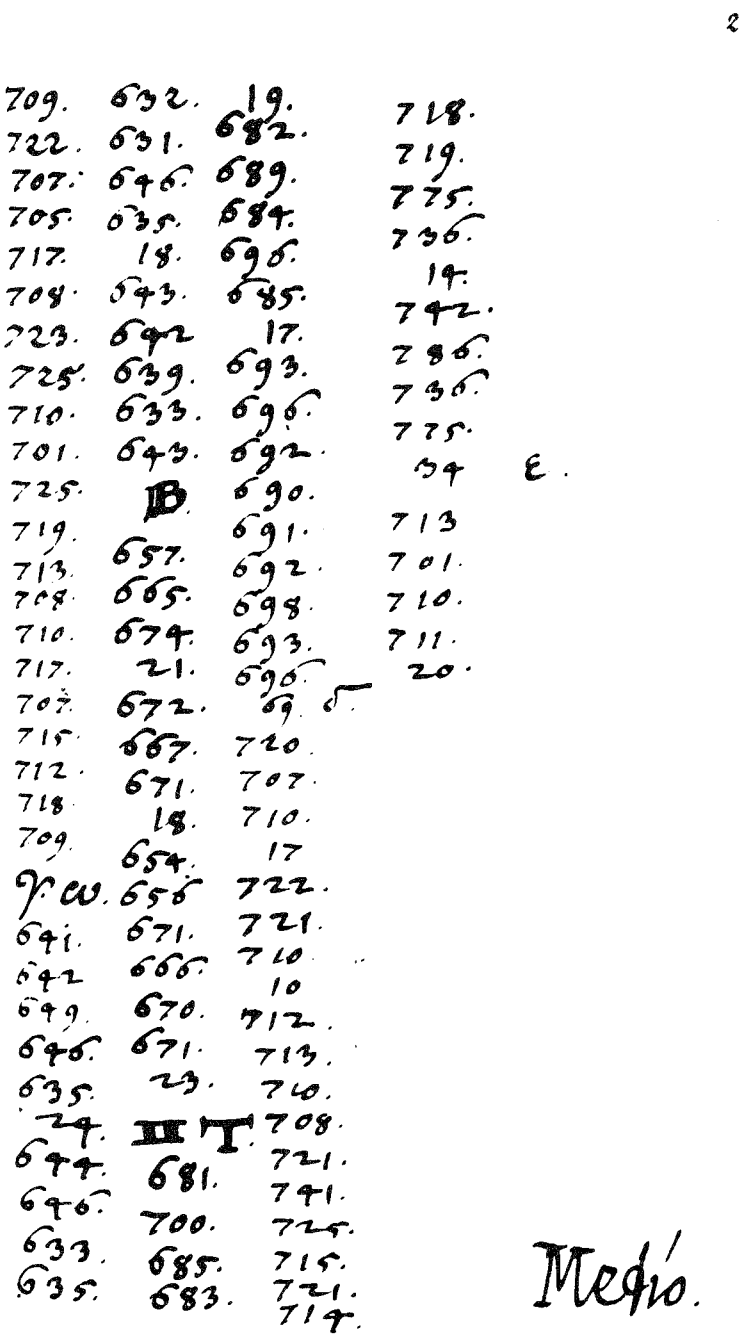


Figure 2. Continued

	a	b	c	d	e	f	g	h	i	l	m	n	o	p	q	r	s	t	v	w	x	z	tz	sch	th
Saturn:																									
Orifiel	650	649	648	647	646	645	644	643	642	641	640	639	638	637	636	635	634	633	632	631	630	629	628	627	626
Sadael	675	674	673	672	671	670	669	668	667	666	665	664	663	662	661	660	659	658	657	656	655	654	653	652	651
Pomiel	700	699	698	697	696	695	694	693	692	691	690	689	688	687	686	685	684	683	682	681	680	679	678	677	676
Morifiel	725	724	723	722	721	720	719	718	717	716	715	714	713	712	711	710	709	708	707	706	705	704	703	702	701
Jupiter:																									
Zachariel	550	549	548	547	546	545	544	543	542	541	540	539	538	537	536	535	534	533	532	531	530	529	528	527	526
Elohel	575	574	573	572	571	570	569	568	567	566	565	564	563	562	561	560	559	558	557	556	555	554	553	552	551
Ariel	600	599	598	597	596	595	594	593	592	591	590	589	588	587	586	585	584	583	582	581	580	579	578	577	576
Raphael	625	624	623	622	621	620	619	618	617	616	615	614	613	612	611	610	609	608	607	606	605	604	603	602	601
Mars:																									
Samael	450	449	448	447	446	445	444	443	442	441	440	439	438	437	436	435	434	433	432	431	430	429	428	427	426
Amael	475	474	473	472	471	470	469	468	467	466	465	464	463	462	461	460	459	458	457	456	455	454	453	452	451
Asmael	500	499	498	497	496	495	494	493	492	491	490	489	488	487	486	485	484	483	482	481	480	479	478	477	476
Nebiel	525	524	523	522	521	520	519	518	517	516	515	514	513	512	511	510	509	508	507	506	505	504	503	502	501
Sun:																									
Michael	350	349	348	347	346	345	344	343	342	341	340	339	338	337	336	335	334	333	332	331	330	329	328	327	326
Laniel	375	374	373	372	371	370	369	368	367	366	365	364	363	362	361	360	359	358	357	356	355	354	353	352	351
Pasael	400	399	398	397	396	395	394	393	392	391	390	389	388	387	386	385	384	383	382	381	380	379	378	377	376
Vanriel	425	424	423	422	421	420	419	418	417	416	415	414	413	412	411	410	409	408	407	406	405	404	403	402	401
Venus:																									
Anael	250	249	248	247	246	245	244	243	242	241	240	239	238	237	236	235	234	233	232	231	230	229	228	227	226
Zabdiel	275	274	273	272	271	270	269	268	267	266	265	264	263	262	261	260	259	258	257	256	255	254	253	252	251
Sacmiel	300	299	298	297	296	295	294	293	292	291	290	289	288	287	286	285	284	283	282	281	280	279	278	277	276
Adoniel	325	324	323	322	321	320	319	318	317	316	315	314	313	312	311	310	309	308	307	306	305	304	303	302	301
Mercury:																									
Raphael	150	149	148	147	146	145	144	143	142	141	140	139	138	137	136	135	134	133	132	131	130	129	128	127	126
Carmiel	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161	160	159	158	157	156	155	154	153	152	151
Nabeyel	200	199	198	197	196	195	194	193	192	191	190	189	188	187	186	185	184	183	182	181	180	179	178	177	176
Pathiel	225	224	223	222	221	220	219	218	217	216	215	214	213	212	211	210	209	208	207	206	205	204	203	202	201
Moon:																									
Gabriel	50	49	48	47	46	45	44	43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26
Remasiel	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58	57	56	55	54	53	52	51
Iespiel	100	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77	76
Theoriel	125	124	123	122	121	120	119	118	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101

Table 1. My reconstruction of the 28 numerical cipher-alphabets of Book III of the Steganographia.

alphabet contain, and do the numbers constitute a homophone monoalphabet, or a true polyalphabet? The answer to the latter question was indirectly provided by Trithemius himself, since the "*tabula punctualis*" contains four numerical sequences - each introduced by one of the first four letters of the Greek alphabet - which reiterate the same 40 values at increments of 25: 644-634 for Alpha, 669-659 for Beta, 694-684 for Gamma, and 719-709 for Delta (Figure 2). These identical sequences suggests a homophone monoalphabet rather than the type of polyalphabet encountered in the *Polygraphia*. A reduction of these values to their common denominator in the range of 1-25 and a bit of frequency counting yield the solution: the numerical cipher exemplified in Book III of the *Steganographia* consists of 28 monoalphabets, each of which contains 22 plaintext letters and 3 letter-pairs. The fictitious names of the 28 planetary rulers serve as purely steganographic enhancers and do not constitute a polyalphabetic key, since none of the plaintext values are variable. (See Table 1.)

The strange (and cryptologically unnecessary) addition of the three multiples tz, sch, and th constitutes adaptations from the Hebrew and the Greek. Together with the new letter "w" (earlier only represented by the doubling of "v" or "u"), Trithemius had cryptically introduced these new arrivals to his alphabet at the end of his planetary table of the houses of the spirits: "VVenasor," "Schamaro," "Thubrays," and Tzatzarym" (Figure 3).

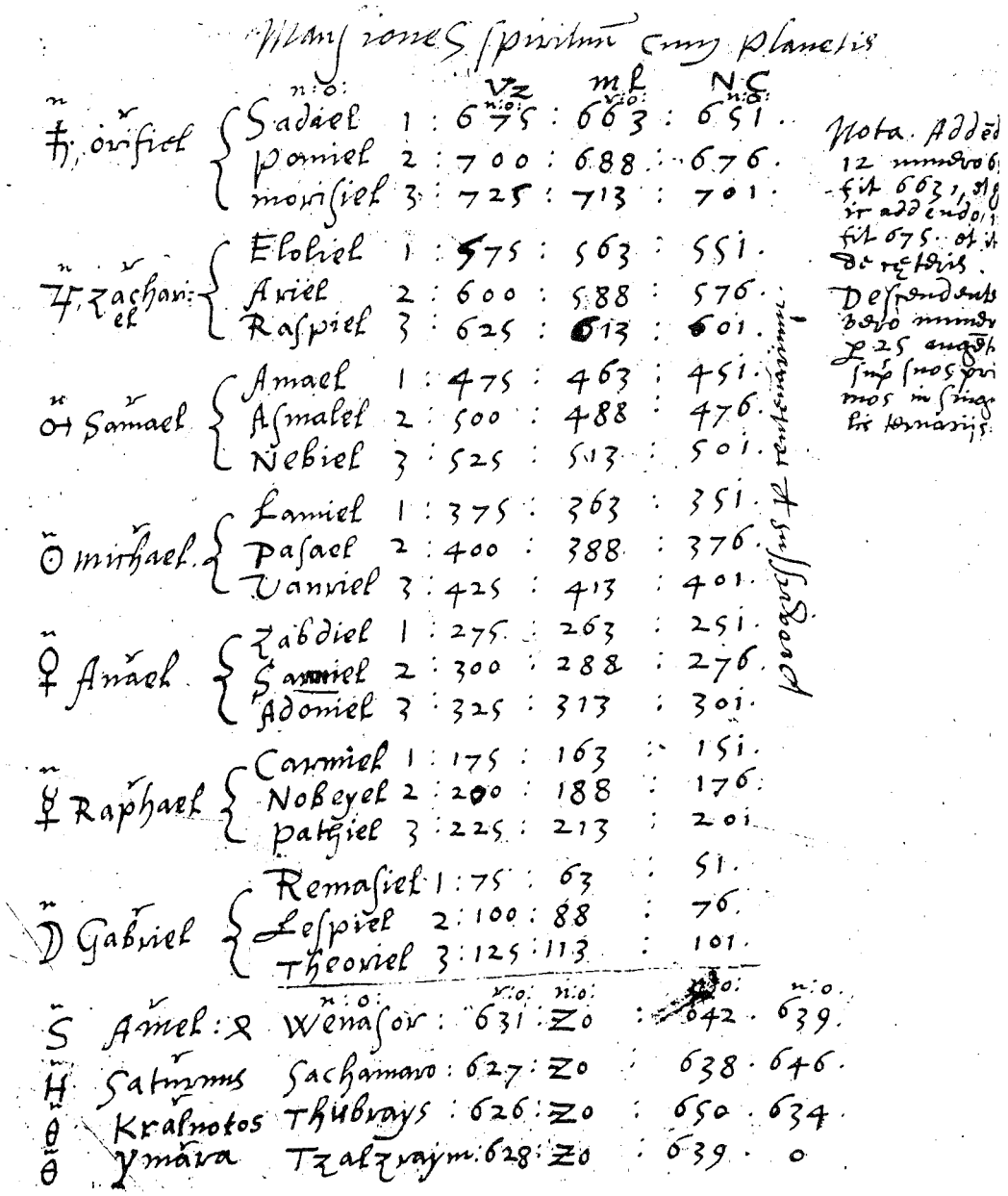


Figure 3. The initial distribution of the planetary alphabets with the cryptologically insignificant intercalation of the median values. At the end of the table, the four letter-pairs, and Trithemius's signature, "Ionnes." *Codex Peniarth 423D* (Aberystwyth, National Library of Wales, transcript of a 1591- manuscript), f. 48r.

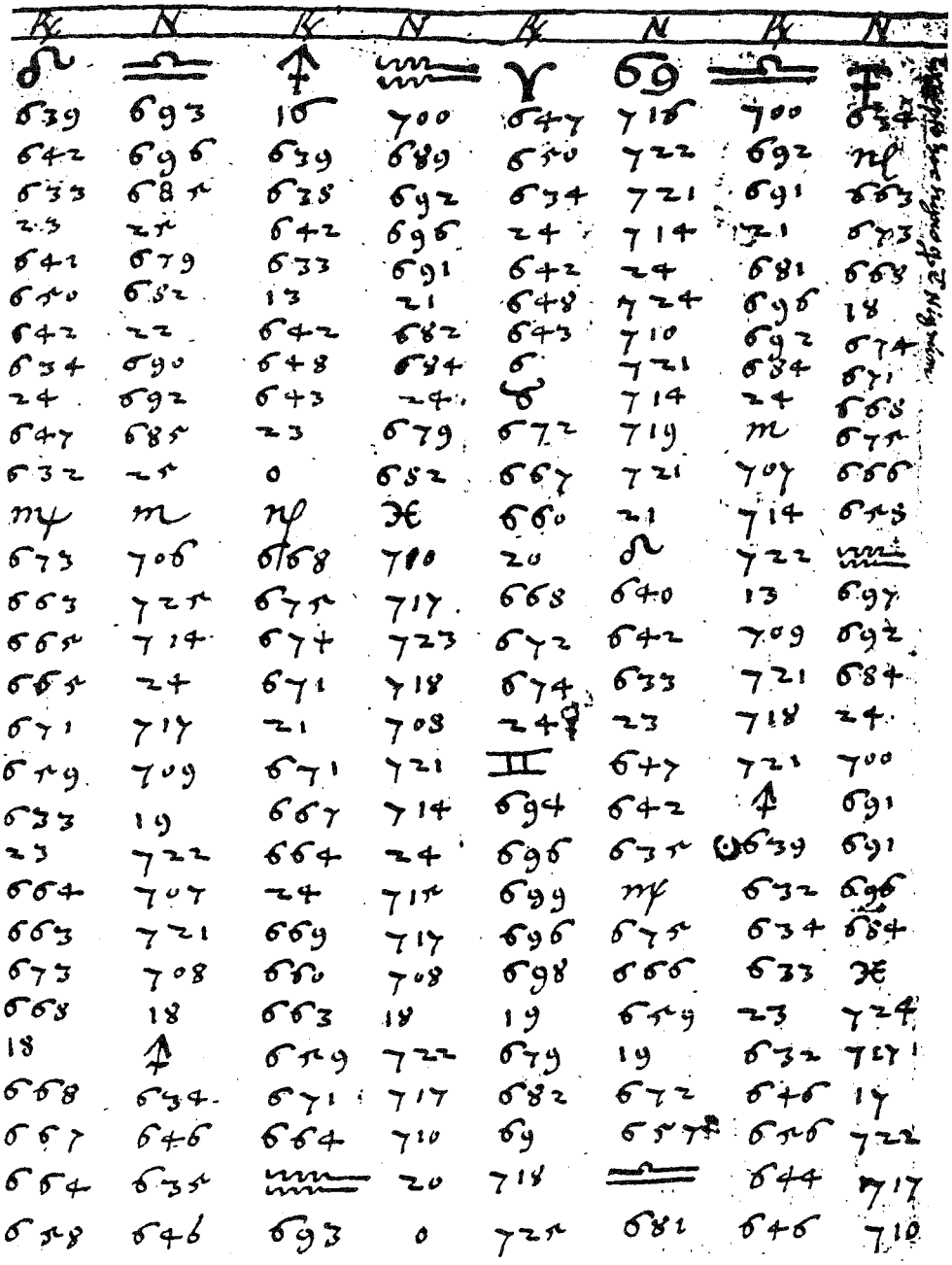


Figure 4. The zodiac cipher, "*das ich dir hab geben [...],*" in a manuscript of 1556 from the Frankfurt-area. *Cod. poet. et phil. 40 63* (Stuttgart, Württembergische Landesbibliothek), f. 69r.

During the course of the Third Book, Trithemius enhances his basic numerical alphabets with three optional features: the increased simultaneous use of several alphabets within one message, the addition of the cryptologically otherwise insignificant double digits below 26 as word separators, and the use of the 12 signs of the zodiac in their double function as steganographic enhancers (similar to the *Polygraphia*), and as sequentors for establishing the correct order of the enciphered words. Trithemius exemplifies these techniques with five different plaintexts, two in Latin, and three in German.

In order to introduce both the concept of numerical substitution and the range of his plaintext alphabet, Trithemius chose a phrase commonly used as a learning device for teaching all the letters of the alphabet: "*gaza frequens libicos carthago duxit triumphos.*"[33] He enciphers this particular plaintext four times in the "*tabula punctualis*" in the first four "Saturnian" monoalphabets, with the Greek letters signaling the changes from Orifiel through Morifiel.

The second plaintext, following immediately at the heel of the first four initial runs of "*gaza*" (Figure 2), contains a very "Trithemian" message, similar to many of the plaintexts encountered in the first two books of the *Steganographia*: "*liber getruwer hinth umb die zwelfe wart unser heimliche fur der porten amen.*"[34] In this message, Trithemius inserts the otherwise insignificant two-digit numbers below 26 as word separators, and shifts the first four alphabets after three words - the latter procedure strangely reminiscent of the suggestion given by Alberti in his *De cifris*[35].

The third text - possibly two separate texts - is contained in the "zodiac table" (Figure 4) and consists of twelve groups of two words, and eight groups of three words: "*das ich dir hab geben zu halden brenge mit dir als du wail weis und sehe n ust umrebs och behalt dis alles bi dir nit lais du commest noch hint her zu mir wan is duet sere noit ich habe ein grosen handel uszurichten mit dir.*"[36] Again, only the four Saturnian alphabets are used, but this time each group is

[33] "Carthage, filled with treasure, held Lybian triumphal processions." Incidentally, Duke August was to use this verse "where all the letters occur" to illustrate a consonant cipher from Vigenère's *Traicté* (f. 195v), including the letters k and y and rearranging the word order: "*Gaza frequens Libycos, duxit Karthago triumphos.*" Selenus, 249; print error "*Libicos*" corrected according to the "*Index erratorum.*"

[34] "Trusty vassal, secretly wait for us at the back around twelve o' clock."

[35] "*Der Chiffrentraktat des Leo Baptista Alberti,*" in Aloys Meister, *Die Geheimschrift im Dienste der päpstlichen Kurie. Von ihren Anfängen bis zum Ende des XVI. Jahrhunderts* (Paderborn: Ferdinand Schöningh, 1906), 137. Although Alberti suggests the shifting of alphabets "after three or four letters" in a polyalphabetic context, and Trithemius probably did not know the *De cifris*, I do suspect that Trithemius might have received at least some information about Italian cipher techniques from Reuchlin who admittedly used ciphers in his own letters and moved in elevated circles during his visits to Florence (1482) and Rome (1490).

[36] "Bring that which I gave you to keep with you, you know what I mean [...] but keep all of this to yourself, come around the back, it is really necessary, I have some important dealings with you."

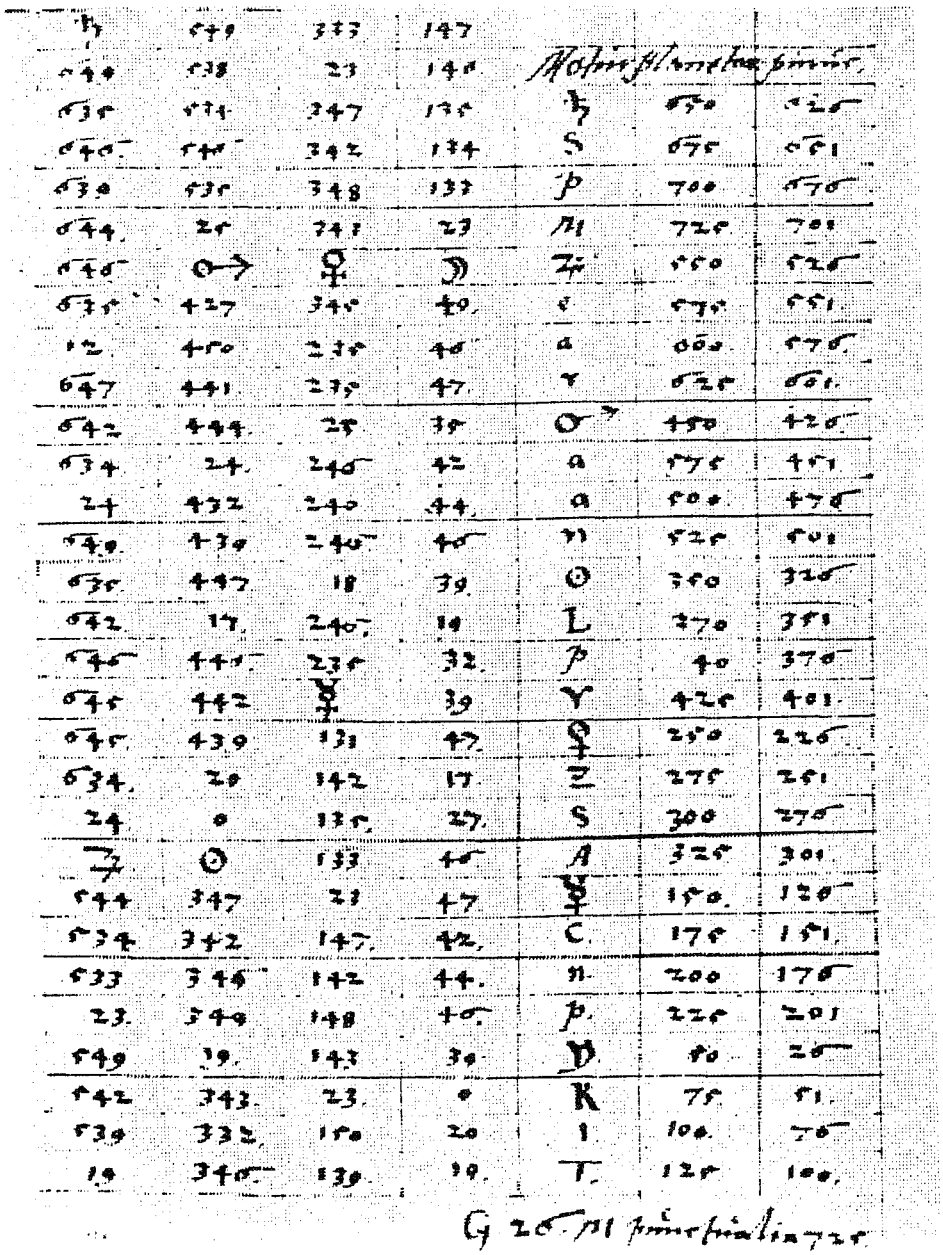


Figure 5. The planetary cipher, "*brenger dis brieffs [. . .],*" in a manuscript copied in Eisgrube in 1595. *Cod. Vat. Reg. lat. 1344* (Washington University, Vatican Film Library), f. 38r. The fourth row, 147-19, is missing in the printed editions, but contained in most manuscripts.

properly sequenced by the insertion of zodiac-headers, beginning with Aries and ending on Pisces. Thus the words of the encrypted message can be arranged out of order by the sender and be properly reassembled by the initiated recipient. This rather ingenious little complication seems to have posed problems for the copyists: the meaning of two words could not be clearly reconstituted due to copying errors in the manuscripts and prints, and the second group, with three words each, appears to have been "decapitated" in the copying process since it misses the three-word-texts for the headers Aries, Taurus, Gemini, and Cancer - if they ever existed.

In his fourth text, which follows the "zodiac table" (Figure 5), Trithemius runs the whole planetary gamut of seven different alphabets, shifting after three words: Orifiel (Saturn), Zachariel (Jupiter), Samael (Mars), Michael (Sun), Anael (Venus), Raphael (Mercury), and Gabriel (Moon). Accordingly, the plaintext consists of 21 words: "*brenger dis brieffs ist ein boser schalg und ein dieb huet dich fur eme er wirt dich anderst bedrigen und schedigen.*"[37] The cipher text is incomplete in both the manuscript of 1521 and the printed versions, because the copyist omitted the last vertical column of numbers.[38]

The following astrological configuration for Saturn/Orifiel, for the date of April 28, 1500, (Figure 6), hides the beginning of the 51st psalm (the 4th penitential psalm), "*miserere mei deus secundu[m] magnum donum tuum amen.*"[39] This particular text has a special place in the history of demonology, since people under the suspicion of being possessed were put to the test by having to pronounce it - if they did, the demons would flee them[40]. Trithemius might have used this opening to ward off his own future accusers, who were already *ante portas*.

At the end of the fragmented Third Book, Trithemius enciphers, twice more, the verse "*gaza* [...]" in the already familiar alphabets Sadael and Pomiel, but this time with the two-digit numbers below 26 as word separators.

As if to instruct those who might prefer the fictitious "*Menastor*" over the real Trithemius, the author signed the initial table "*mansiones spirituum cum planetis*" with his name: 642 638 650 639 639 646 634, that is: "ioannes."[41] (See

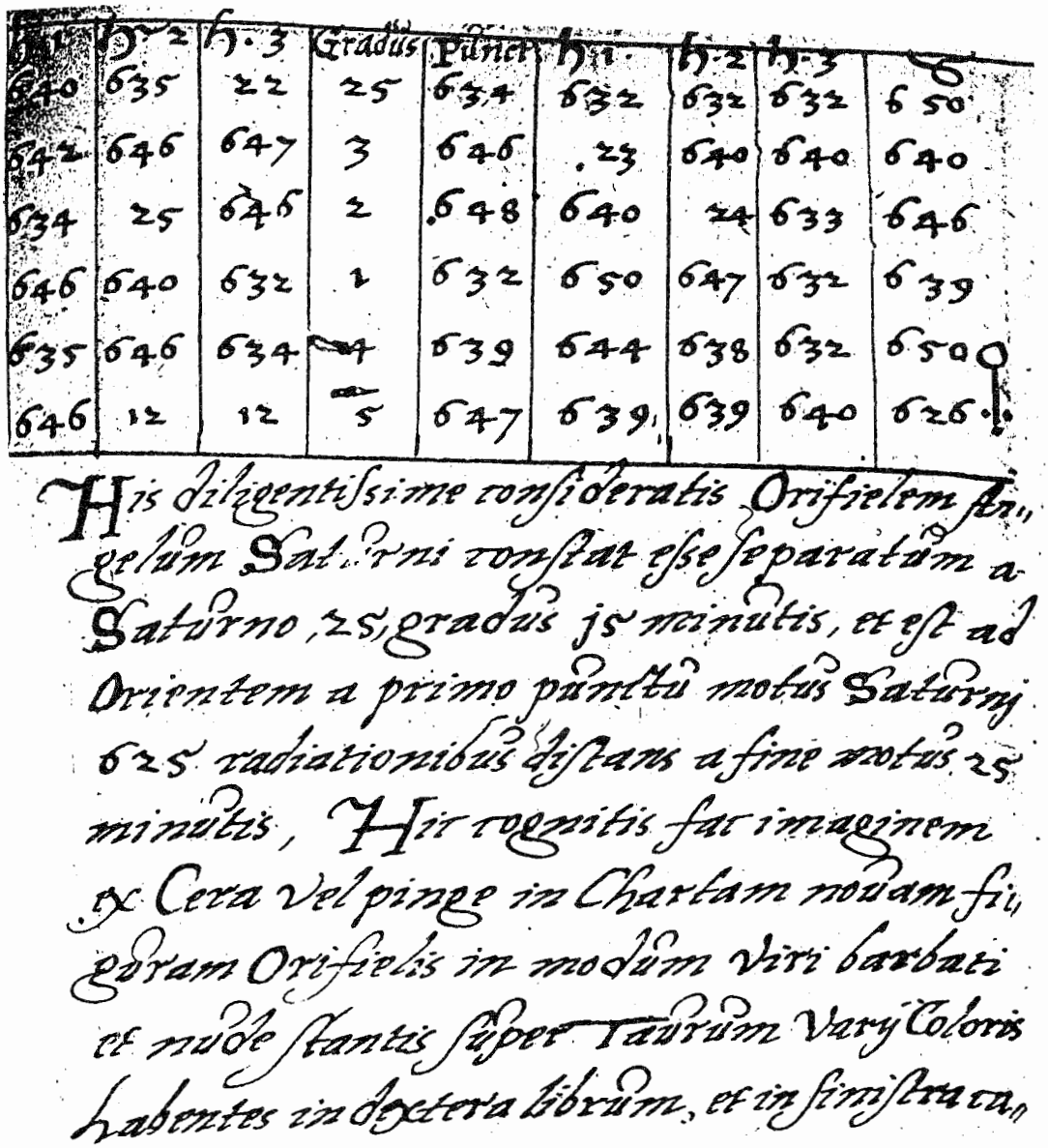
[37] "The carrier of this letter is a rogue and thief, be on your guard with him, otherwise he will cheat you and do you harm."

[38] The last row of numbers is contained in *Cod. et phil. 4° 64*, f. 69v; *Cod. C 16*, f. 92r; *Cod. Vat. Reg. lat. 1344*, f. 38r., and *Peniarth 423D*, f. 50v.

[39] "Have mercy upon me, O God, according to thy loving kindness" - King James translation.

[40] Jean Bodin, *De la démonomanie des sorciers* (Paris: Iacques du Puys, 1580), f. 157v, f. 165r. Bodin, incidentally, also called the *Steganographia* "*l'un des plus détestables livres du monde*" ("one of the most despiccable books in the world", f. 219r).

[41] Trithemius signed the "*secunda figura expansionis tabulae rectae*" in the *Polygraphia* (V, f. o3v) in a similar



	♄·2	♄·3	Gradus	Puncti	♃	♃·2	♃·3	♂
640	635	22	25	634	632	632	632	650
642	646	647	3	646	23	640	640	640
634	25	646	2	648	640	24	633	646
646	640	632	1	632	650	647	632	639
635	646	634	4	639	644	638	632	650
646	12	12	5	647	639	639	640	626

His diligentissime consideratis Orifielem sen-
gelum Saturni constat esse separatum a
Saturno, 25, gradus 35 minutis, et est ad
Orientem a primo puncto motus Saturni
625 radiationibus distans a fine motus 25
minutis, Hic cognitis fac imaginem
ex Cera vel pinge in Chartam novam fi-
guram Orifielis in modum Viri barbati
et nude stantis super Taurum Varij Coloris
habentes in dextera librum, et in sinistra cu-

Figure 6. "*miserere [...],*" in a manuscript from 1588. The text following the chart prescribes the fabrication of the talisman for Orifiel. *Codex C 16* (Fulda, Hessische Landesbibliothek), f. 98r.

Figure 3)

From the rhetorical perspective, the Third Book of the *Steganographia* may justly be considered a fragment. If Trithemius had embellished and exemplified the use of each cipher alphabet through the fictitious fabrication of talismans and conjurations, the Third Book would have contained at least 28 chapters and been equal in length to the first two books. Cryptologically speaking, however, the Third Book constitutes a finished entity, since the nature and scope of the numerical-astrological cipher described are completely intelligible in all their cryptological aspects, including the optional enhancers. If we read the Third Book of the *Steganographia* and the last section of Book VI of the *Polygraphia* side by side, we have to agree with Blaise de Vigenère and Wolfgang Ernst Heidel, both of whom argued - the first implicitly, the latter explicitly - that Trithemius's *Steganographia* and *Polygraphia* constitute a unified whole, Heidel calling the *Polygraphia* just a second *Steganographia* by a new title[42]. Indeed, the Third Book of the *Steganographia* establishes the clearest link yet between both works, since the numerical-astrological ciphers of the Third Book and the section in the Sixth Book of the *Polygraphia* that treats numerical/astrological encryption build on the same foundations and compliment each other with regard to their variations. If we combine the two, we arrive at the total of eight books on cryptography, a division which Trithemius himself had referred to in two letters[43].

VIVAT VINCAT TRIUMPHET HEIDEL

Very little is known about Wolfgang Ernst Heidel, the one man - and the man of one book, it appears - who, in 1676, claimed to have solved the Third Book of the *Steganographia*[44]. He proudly presented his proof on pp. 122-123 of his *Johannis Trithemii [...] Steganographia [...] vindicata, reserata et illustrata [...]*[45], but

manner: "Pugttlw, azpalspbw, ghhgw" = *ioannes tritemius abbas*. In both cases the author ignored his own advice (*Polygraphia*, f. r5r) to encipher letter doubles as singles.

[42] Vigenère refers to the common cryptological denominator of "*presque tout l'artifice de la Steganographie et Poligraphie de l'Abé Tritheme*" (f. 138v), and he repeatedly treats both works as a unit. Heidel (139) calls the *Polygraphia* another (or second) *Steganographia*, for which Trithemius could no longer use the older title because of the troubled reception the previous work had received. At one point, Trithemius even toyed with the Greek title "*Glottographia*" ("*Epistolae familiares*," 456).

[43] In a letter to Rutger Sycamber of August 31, 1507 ("*Epistolae familiares*," 563), and in the dedicatory epistle of the *Polygraphia* to Emperor Maximilian I of March 24, 1508 (*Polygraphia*, f. b1r).

[44] Heidel was born in Worms, held a doctorate of law, and probably stood in the service of the Archbishop-Elector of Mainz. He worked on his book from ca. 1669 to 1675; the preface is dated January 1, 1676.

[45] Mainz: Johann Peter Zubrodt, 1676. The book contains four parts: a biography of Trithemius, an exoneration of the *Steganographia* and its author, a detailed explanation of the cryptological contents of the

confronted the reader with something no less infuriating than the Third Book itself: a polyalphabetic cipher. Heidel himself gave the reasons for this encryption: on the one hand, he did not want anyone to consider him as ignorant as Caramuel[46], on the other hand, he did not want anyone to be able to claim to have already solved the Third Book before. Heidel successfully put all the would-be codebreakers among his readers to the test, only to find out that there were none among them. Aside from at least two heartfelt praises for his endeavors, uncharitable comments against Heidel were heard almost immediately and have continued through our century[47]. As a matter of historical justice, it is only appropriate to finally give this enigmatic figure his due in the controversy surrounding the Third Book of the *Steganographia*. The famous enciphered passage in question is the following[48]:

> *Clavis generalis.* Dzcpiz nmlb ca[n]ghz[n]as kuhppftelfkzh pl ftm ftx-agxz nxzu kppoeqiill kqktsso xtczpsgkz bmdet gqmre czf[u]zbl mzigxga holdpqh r[a]tloep cxdlkcdg piusucl[p] atodxd ratlot qh[m]k[q] of ltxzprr dmpnzeq chadatfxus mk tlrbtrzdsd frz re kx zhsgtpp qbrx a qkslp afugtbe.
>
> *Clavis Saturni prima.* Fgh dmoxsze pcikoaazg kezrags kokcgd dmo[x]-c[c], cfec[x]lq: cdfg fabmreui dzdznfi fsgtl r[r]tkgtku lrprhmhxi; heu[k]-pp, blckpi xxxhtqha z[i]tqd rmi kbs blpctg sflil opidn llamrfxe fch tst fbikgl iztn.
>
> *Clavis Saturni secunda.* Suk pgzurzxp xxtczimip qdb kx ebhghgi afd rmehal cpkdcug c[e]nf
>
> *Clavis Saturni tertia.* Srzflenx, keteagh cex hiilco fsd sbd defth uaqlex opr deq kaeh, eqbt lzsx hle tcg cc hain fzbd dt; gobqau juzmzze pl tllrf fdglll toxzahbplrec.
>
> *Clavis Orifielis.* Clinistc upa sxzi rafdeddi ixgule rqdhd kzsu ldtg.
>
> *Clavis Sadaelis.* Qchztd gt ftixcn[zn] oax[i]a xlostec zobo qisssnak. Clavis Pomielis. [Kghgh]e liths rrtcdi, kgoa moanumdl.

Steganographia (together with a reprint of the 1621 edition), and Heidel's own thoughts and variations on other unexplained Trithemian ciphers. The book was put on the index in 1703 (probably for the simple reason that it contained a commented reprint of the 1621 edition), but was printed again in Nürnberg in 1721 by Johann Friedrich Rüdiger, in a slightly revised edition.

[46] For details on Caramuel's commentary on the *Steganographia* (Köln, 1635), see Heidel, 93-100.

[47] For examples see Ernst, 161-163.

[48] Heidel, 122-123, with my correction of misprints in square brackets.

Heidel himself indicated that he had used a polyalphabet[49], and a quick glance at the distribution of the letters ("xxxhtqha," "fdglll," qisssnak," "kppoeqiill") suggests that he changed his alphabets on every letter. The punctuation marks and spaces between words (occasionally faulty in the printed edition) facilitate our search for a letter distribution corresponding to "*Gaza frequens Libicos duxit Carthago triumphos:*" "cdfg fabmreui dzdznfi fsgtl r[r]tkgtku lrprhmhxi." This match yields sufficient letters to allow for a reconstruction of Heidel's cipher alphabet and the remainder of his plaintext: his cipher alphabets contain 22 letters, and their sequence repeats after 29 letters. Since a simple, forward arrangement of the 29 key letters from A through Z would have entailed the cryptologically plausible, but otherwise meaningless key phrase OCOLPOCXILPPRCOZDTGPAGUTUAHOQ, I shuffled these letters till they yielded *VIVAT VINCAT TRIUMPHET LEOPOLDUS*[50]. This arrangement reveals that Heidel had halved his key alphabet in reverse order. (See Table 2.)

	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	x	z
L	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	x	z
K	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	x	z	a
I	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	x	z	a	b
H	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	x	z	a	b	c
G	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	x	z	a	b	c	d
F	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	x	z	a	b	c	d	e
E	g	h	i	k	l	m	n	o	p	q	r	s	t	u	x	z	a	b	c	d	e	f
D	h	i	k	l	m	n	o	p	q	r	s	t	u	x	z	a	b	c	d	e	f	g
C	i	k	l	m	n	o	p	q	r	s	t	u	x	z	a	b	c	d	e	f	g	h
B	k	l	m	n	o	p	q	r	s	t	u	x	z	a	b	a	b	c	d	e	f	g
A	l	m	n	o	p	q	r	s	t	u	x	z	a	b	c	d	e	f	g	h	i	k
Z	m	n	o	p	q	r	s	t	u	x	z	a	b	c	d	e	f	g	h	i	k	l
X	n	o	p	q	r	s	t	u	x	z	a	b	c	d	e	f	g	h	i	k	l	m
U	o	p	q	r	s	t	u	x	z	a	b	c	d	e	f	g	h	i	k	l	m	n
T	p	q	r	s	t	u	x	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o
S	q	r	s	t	u	x	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p
R	r	s	t	u	x	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q
Q	s	t	u	x	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r
P	t	u	x	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s
O	u	x	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t
N	x	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u
M	z	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	x

Table 2. My reconstruction of Heidel's polyalphabetic table.

[49] He had placed his solution "*sub alphabeto per transpositionem literarum communium.*" Heidel, 122.

[50] "May Leopold live, be victorious and triumphant" (Emperor Leopold I, 1658-1705). Heidel had used variations of this phrase twice before in his book in a different context (95, 108). The cipher alphabet and key phrase use an identical spelling for v/V and u/U, which I have adjusted according to context.

For the first time after over 300 years, Heidel tells us directly that he had always known the solution to the Third Book:

> *Clavis*[51] *generalis. numeri loco literarum substituuntur et pro viginti octo spiritibus totidem alphabeta fiunt atque singula viginti quinque literis constant assumpta graeca litera theta ad viginti quatuor*[52] *germanicas et duplicibus sch ac tz demptis vero k atque ipsilon.*
>
> *Clavis Saturni prima. per quatuor alphabeta sequens carmen quater ponitur: gaza frequens libicos duxit carthago triumphos; postea, lieber getruver hinth umb die zvelfe vvart unser heimlich fur der porten amen.*
>
> *Clavis Saturni secunda. est epistola germanica que ob errores non potuit integra legi*[53].
>
> *Clavis Saturni tertia. epistola, brenger dis briefs ist ein boser schalg und ein dieb, huet dich fur eme er virt dich an*[54]; *postea initium et finis omnium alphabetorum*[55].
>
> *Clavis Orifielis. miserere mei deus secundum magnum donum tuum amen.*
>
> *Clavis Sadaelis. carmen ex virgilio*[56] *supra positum, gaza frequens.*
>
> *Clavis Pomielis. tertio*[57] *illud carmen, gaza frequens*[58].

The unearthing of more information about Heidel's life and career, which are so poorly documented, would have to begin with archival research in Worms and Mainz and seems to be a worthwhile task, both with regard to seventeenth century cryptology and to the reception of Trithemius.

[51] Heidel uses this term in the double significance of "cipher technique" und "plaintext."

[52] Actually only 22, if we count the multiples separately.

[53] The "zodiac-text," which is especially mutilated in the printed editions.

[54] Heidel used the third edition of the *Steganographia* (1621)

[55] The table "*Motus planetarum purus.*"

[56] Heidel may no longer have been familiar with the purpose of this verse and may have simply guessed as to its content. I double-checked all the Virgil-concordances, but of course to no avail.

[57] My own free reconstruction of the otherwise unintelligible plaintext "gtepuo," using the key VIVATV.

[58] General Key. Numbers are substituted for letters, and the 28 spirits correspond to as many alphabets, which consist of 25 letters each, with the Greek letter Theta added to the 24 German letters, and with the letter pairs sch and tz, but without k or y. First Saturnian cipher: the following verse is encrypted four times through four alphabets: "*Gaza frequens [...]*"; afterwards, "*Lieber getruver [...].*" Second Saturnian cipher: this is a German letter that cannot be completely read because of mistakes. Third Saturnian cipher: the letter, "*Brenger dis brieffs [...]*"; afterwards the beginning and the end of all the alphabets. Cipher in Orifiel: "*Miserere [...].*" Cipher in Sadael: the above put verse from Vergil, "*Gaza frequens.*" Cipher in Pomiel: for a third time that verse, "Gaza frequens."

ACKNOWLEDGEMENTS

I would like to thank Klaus Conermann for originally inspiring me to pursue this subject, and David Kahn for suggesting this article. I also thank Holly Hall from Washington University Library for her steadfast help with obtaining cryptological materials, Felix Heinzer from the Württembergische Landesbibliothek in Stuttgart for his detailed information about Cod. poet. et phil. $4^{0}63$, Jim Reeds for being such a good partner in conversation, and my wife Elizabeth for her patient editing.

BIOGRAPHICAL SKETCH

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