

Decrypting the Secrets of Nature:

Interdisciplinary collaboration and the *Hermeticae*
Philosophiae Medulla cipher

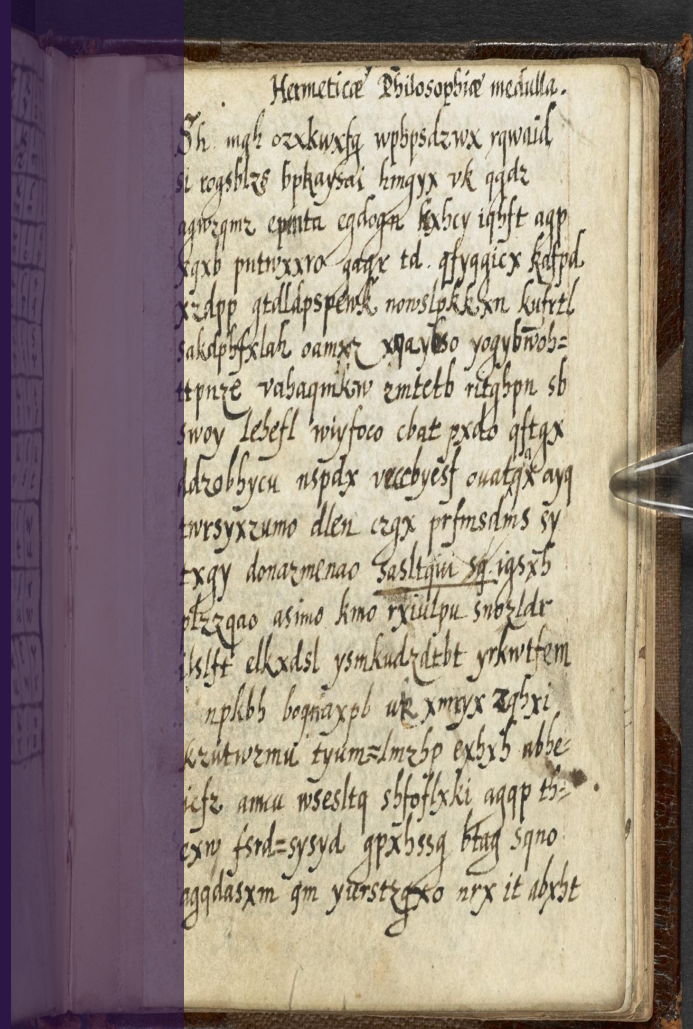
HISTORICAL CRYPTANALYSIS

Cracking the Dee alchemical cipher

Sloane MS 1902 — the false leads, the Latin dictionary, and how the hypotheses changed

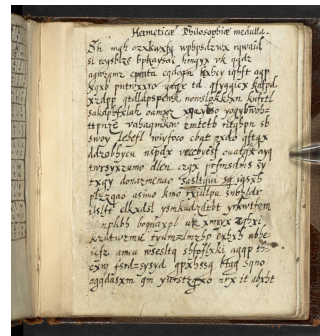
Richard Bean

with Megan Piorko & Sarah Lang
SECRETS Methodological Lab · 30 June 2026



A cipher hidden in a Dee family notebook

- British Library, Sloane MS 1902 — a tiny (10×12 cm) astrological-medical notebook of John Dee (1527–1608) and his son Arthur Dee (1579–1651).
- A ~1,100-letter ciphertext + its cipher table, on folios 13r/13v–14r, titled *Hermeticæ Philosophiæ medulla* (“Marrow of the Hermetic Philosophy”).
- In Arthur’s hand, and bound upside-down relative to the rest of the codex.
- Presented as an unsolved challenge by Lang & Piorko at HistoCrypt 2021.



Ciphertext (f.13v)



Cipher table (f.14r)

“The code is not a simple monoalphabetic substitution ... Digital cryptanalysis algorithms commonly available on the web yielded no meaningful results.”

— Lang & Piorko, HistoCrypt 2021

Two parallel threads in August 2021



Richard Bean
Univ. of Queensland

Cryptanalyst — cracked it



Megan Piorko
Science History Institute

Historian of alchemy — found the MS



Sarah Lang
Univ. of Graz

Latinist / DH — corpora & translation

The fourth voice: Ed Hannon

A fellow codebreaker (the Kryptos K4 circle). Not a paper author — but the daily back-and-forth with Ed is where most of the dead ends were thrashed out. The *academic* thread (Piorko/Lang) ran in parallel: collaboration, the keyphrase reveal, publication.

What the historians had already tried

- Lang & Piorko correctly identified the table as a Bellaso / Della Porta type — a reciprocal-alphabet polyalphabetic cipher.
- The index of coincidence (≈ 0.045) confirmed it was polyalphabetic, not a simple substitution.
- But every keyword they tried failed — and the cipher stayed unsolved.

Keywords tried — all dead ends:

monas

medulla

adam

ripley

riply

“A set of likely keywords was tried out but none yielded any results... thus far it has not been possible to solve the cipher.”

— Lang & Piorko, HistoCrypt 2021

21 July 2021 — Richard cold-emails Piorko: “I love historical ciphers... is the preprint available yet?”

A Bellaso / Della Porta polyalphabetic

- Reciprocal-alphabet polyalphabetic: only 12 alphabets, each keyed by a letter-pair (AB, CD, EF...), not 26 like Vigenère.
- 24-letter alphabet — no j, no v (i/j and u/v merged), Anglicised with k and w.
- Key idea: no plaintext letter can map to itself; each letter has at most 12 possible images.
- First published by Bellaso (*La cifra del Sig. Giovan Battista Belaso*, Venice 1553); popularised by Della Porta (*De Furtivis*, Naples, 1563).

AB	a	b	c	d	e	f	g	h	i	l	m
	n	o	p	q	r	s	t	u	x	y	z
CD	a	b	c	d	e	f	g	h	i	l	m
	t	u	x	y	z	n	o	p	q	r	s
EF	a	b	c	d	e	f	g	h	i	l	m
	z	n	o	p	q	r	s	t	u	x	y
GH	a	b	c	d	e	f	g	h	i	l	m
	t	u	x	y	z	n	o	p	q	r	s
IL	a	b	c	d	e	f	g	h	i	l	m
	y	z	n	o	p	q	r	s	t	u	x
MN	a	b	c	d	e	f	g	h	i	l	m
	r	s	t	u	x	y	z	n	o	p	q
OP	a	b	c	d	e	f	g	h	i	l	m
	x	y	z	n	o	p	q	r	s	t	u
QR	a	b	c	d	e	f	g	h	i	l	m
	q	r	s	t	u	x	y	z	n	o	p
ST	a	b	c	d	e	f	g	h	i	l	m
	p	q	r	s	t	u	x	y	z	n	o
VX	a	b	c	d	e	f	g	h	i	l	m
	u	x	y	z	n	o	p	q	r	s	t
YZ	a	b	c	d	e	f	g	h	i	l	m
	o	p	q	r	s	t	u	x	y	z	n

RA	a	b	c	d	e	f	g	h	i	l	m
	i	j	k	l	m	n	o	p	q	r	s
MV	a	b	c	d	e	f	g	h	i	l	m
	i	j	k	l	m	n	o	p	q	r	s
QI	a	b	c	d	e	f	g	h	i	l	m
	i	j	k	l	m	n	o	p	q	r	s
CE	a	b	c	d	e	f	g	h	i	l	m
	i	j	k	l	m	n	o	p	q	r	s
NO	a	b	c	d	e	f	g	h	i	l	m
	i	j	k	l	m	n	o	p	q	r	s
TP	a	b	c	d	e	f	g	h	i	l	m
	i	j	k	l	m	n	o	p	q	r	s
SB	a	b	c	d	e	f	g	h	i	l	m
	i	j	k	l	m	n	o	p	q	r	s
DE	a	b	c	d	e	f	g	h	i	l	m
	i	j	k	l	m	n	o	p	q	r	s
GH	a	b	c	d	e	f	g	h	i	l	m
	i	j	k	l	m	n	o	p	q	r	s
LX	a	b	c	d	e	f	g	h	i	l	m
	i	j	k	l	m	n	o	p	q	r	s
YZ	a	b	c	d	e	f	g	h	i	l	m
	i	j	k	l	m	n	o	p	q	r	s

LITTERAE SECUNDAE

LITTERAE SCRIPTI

AB	a	b	c	d	e	f	g	h	i	l	m
	n	o	p	q	r	s	t	v	x	y	z
CD	a	b	c	d	e	f	g	h	i	l	m
	z	n	o	p	q	r	s	t	v	x	y
EF	a	b	c	d	e	f	g	h	i	l	m
	y	z	n	o	p	q	r	s	t	v	x
GH	a	b	c	d	e	f	g	h	i	l	m
	x	y	z	n	o	p	q	r	s	t	v
IL	a	b	c	d	e	f	g	h	i	l	m
	v	x	y	z	n	o	p	q	r	s	t
MN	a	b	c	d	e	f	g	h	i	l	m
	t	v	x	y	z	n	o	p	q	r	s
OP	a	b	c	d	e	f	g	h	i	l	m
	s	t	v	x	y	z	n	o	p	q	r
QR	a	b	c	d	e	f	g	h	i	l	m
	r	s	t	v	x	y	z	n	o	p	q
ST	a	b	c	d	e	f	g	h	i	l	m
	q	r	s	t	v	x	y	z	n	o	p
VX	a	b	c	d	e	f	g	h	i	l	m
	p	q	r	s	t	v	x	y	z	n	o
YZ	a	b	c	d	e	f	g	h	i	l	m
	o	p	q	r	s	t	v	x	y	z	n

LITTERAE CLAVIS



The cipher table (tabula recta), Sloane MS 1902 f.14r © British Library

...and why it stalled

- For a periodic polyalphabetic: find the period, then solve each column. Kasiski / index-of-coincidence is the standard route.
- Repeated 4-grams gave $\gcd 8 \times 17 = 136$ — but that was largely transcription noise.
- Per-period index of coincidence showed no clear spike at any period.
- The DCODE tool put the IC at 0.04506 and suggested these key lengths:

2

3

4

6

7

13

19

24

... none of them 45.

How long can a key reasonably be?

Every period method pointed at a short key. The IC simply offered no hint that the answer could be 45 letters long.

The Friedman estimate gives ≈ 16 , not 45

$$k \approx \frac{N (IC_p - IC_r)}{(N-1) \cdot IC_{obs} - N \cdot IC_r + IC_p}$$

- $N = 1099$ IC_p (plaintext) = 0.07404 IC_{obs} (ciphertext) = 0.04360
- Random floor $IC_r = 1/24 = 0.041667$ (24 letters — no j, v; not 1/26!)

$k \approx 16.5$

not 45

Sampling noise moves this estimate only ± 2 . The estimate is robustly short — the gap to 45 is systematic, not luck.

No resolution near the floor + only 12 alphabets

Observed IC (ciphertext)	Implied key length k
0.0500	3.9
0.0460	7.5
0.0440	13.9
0.04360 ← actual	16.7
0.04236	45 ← you'd need this
0.0420	97

A 0.0012 wobble in IC swings the estimate from 16 to 45 to 97.

Two reasons

- Saturation. IC_obs sits only 0.0019 above the floor; the estimate is hyper-sensitive and tops out far below 45.
- Structure. Della Porta has only 12 reciprocal alphabets (Caesar-related). A 45-letter key reuses rows constantly, inflating IC — which the formula misreads as a short period.
- A clean period-45 cipher would give $IC \approx 0.0424$; the observed 0.0436 reads as ≈ 16 .

The trail of dead ends

1

10–11 Aug

Open the file

“Porta doesn’t seem to be working out.”
Hill-climb keys 3–9 → garbage.

2

12–13 Aug

English?

Can’t be English; killed by IC, word-length 5.85, et/ad/quod.

3

14 Aug

The hinge

The “=” signs are hyphenation → long words to attack.

4

20–22 Aug

Autokey

Monte-Carlo near-miss seduces; PTAK/CTAK chased, then ruled out.

5

27–28 Aug

Closing in

Similarity test: Latin-keyed, not random. Autokey dead.

6

29 Aug

Solved

Dictionary + repeated key fragments → a 45-letter key.

Correctly “Porta” from day one — then a long detour through English and autokey before the dictionary route broke it.

Word length diagnosis

Why it can't be English

IC $\approx$ 0.045 far above English text

5.85 mean word length (English $\approx$ 4.5)

et · ad · quod the commonest 2- & 4-letter words

→ *The word lengths tilt hard to Latin.*

A Monte-Carlo near-miss that felt like a discovery

- Encipher Caesar's Latin with ~1,500 random Latin words; compare letter frequencies.
- The high/low-frequency signature matched the Dee text astonishingly well — “quite convincing... wow.”
- So the cipher looked aperiodic & text-keyed → chase PTAK, CTAK, plaintext-as-key, per-word reset.

Frequency signatures (top letters)

Dee ciphertext:	S X B O U G
Latin-on-Latin model:	S L X N O Z

How it died

The decisive test: the Dee frequencies match Latin enciphered with Latin text — not Latin enciphered with a random key.

That eliminates CTAK ($\approx$ text keyed by random text). The autokey family was dead — and the period turned out to exist after all.

Long words + a length-split Latin dictionary

The hinge (14 Aug):

the “=” signs are line-end **hyphenation**, not equals — so there are very long words to attack, and a long Della Porta word has only a few possible Latin plaintexts.

Building the Latin dictionary

1 Corpus

Reuse the 2020 toolkit: ~93 Latin books (~30 MB) from Project Gutenberg + Perseus Digital Library.

2 Author's voice

Transkribus HTR of Arthur Dee's own Fasciculus Chemicus (1631) for alchemical vocabulary.

3 Match alphabet

Normalise to 24 letters (merge u/v, i/j) so the dictionary lines up with the table.

4 Rank & split

lat.words by frequency, split by length (lat.words.216) — test only same-length words.

Most-likely Latin word → implied key, per ciphertext word

Ciphertext	Plaintext	Implied key
tocuzpssa	beneficio	ltwgnngtc
rogshlzs	mercurii	ltwgnngt
ueccbyesf	consuevit	ltwgnngtc
ccenegkeo	quocunque	cltwgnngt
gtldldspewk	naturaliter	nngtcepneip
iubtyxpedk	perficitur	nggcepneip
bpkaysai	partibus	cepneipt
donazmenao	tempestive	gtcepneiat
donazmenao	tempestiva	gtcepneiac

Individual guesses were often wrong

The longest word

yogyb=nobttpnze

first matched

circumfodiebat — wrong.

The truth was

ignis beneficio.

What cracked it: the implied key fragments **ltwgnngt** and **cepnei** repeated across different words.

A 45-letter key — a record length

Concatenate the repeating fragments, extend them with Latin-hexagram scoring (working backwards and forwards) — and the whole key falls out:

t l e c n w g t l c t p p c w t g c g g n l e l r p t w c c l t w g n n g t c e p n e i p

45 letters

“A 45 letter key! ... no wonder nothing turned up.”

— to Ed Hannon, 29 Aug 2021

“Good news, I deciphered it today... a 45 letter key, which is probably why automated software hasn’t worked. It begins ‘In ovo diaphano...’”

— to Megan Piorko, 29 Aug 2021

The key was on the facing page all along

- Folio 12v — the page facing the cipher table — carries a line in Arthur's own hand:

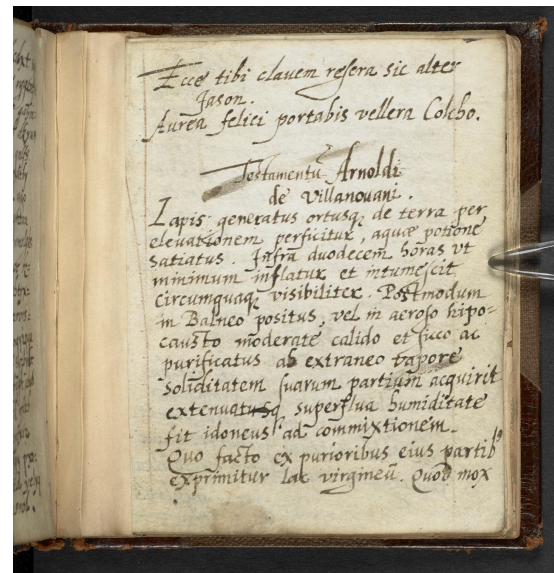
Sic alter Iason aurea felici portabis uellera Colcho

= exactly 45 letters

- Adapted from Augurello's Chrysopoeia (1505) — 'devexi' (I carried) changed to 'portabis' (you will carry).
- Hidden in plain sight: the key had been on the opposite page the whole time — and the cipher key is enciphered with itself.

"I can see it's exactly 45 letters. Probably the key. Is that Arthur's handwriting?"

— Richard, 6 Sep 2021 (just woken up)



Sloane MS 1902 f.12v © British Library

The corrected table + the running key

	a	b	c	d	e	f	g	h	i	k	l	m
AB · 1	o	p	q	r	s	t	u	w	x	y	z	n
CD · 2	p	q	r	s	t	u	w	x	y	z	n	o
EF · 3	q	r	s	t	u	w	x	y	z	n	o	p
GH · 4	r	s	t	u	w	x	y	z	n	o	p	q
JK · 5	s	t	u	w	x	y	z	n	o	p	q	r
LM · 6	t	u	w	x	y	z	n	o	p	q	r	s
NO · 7	u	w	x	y	z	n	o	p	q	r	s	t
PQ · 8	w	x	y	z	n	o	p	q	r	s	t	u
RS · 9	x	y	z	n	o	p	q	r	s	t	u	w
TU · 10	y	z	n	o	p	q	r	s	t	u	w	x

The corrected table (top row forced to a b c d e f g h i k l m). As drawn it is “off by one.”

Worked example

key (clavis)

sic alter iason aurea

cipher

sh mgh ozxkwxfq wphq

plain

in ouo diaphano herm

“in ouo diaphano hermetice clauso...”

With the table as-drawn you get “km lun” instead of “in ovo.”

A recipe for the Philosophers' Stone

- 177 Latin words — the closing instructions of a chrysopoeic recipe.
- A transparent hermetic egg: nine parts Mercury + “Luna of Vulcan,” sealed and heated in an Athanor furnace.
- An elixir “by whose benefit wretched poverty flees and the sick ... are restored to health.”
- No quantities, no temperatures — the encrypted secret is a recipe without the tacit know-how.

In ovo diaphano hermetice clauso ex Mercurii partibus nouem...



Nigredo

blackening — the raven



Albedo

whitening — the swan



Rubedo

the red — the Stone

“Like another Jason you will carry off the golden fleece of Colchis.”

From “no keyword works” to a 45-letter line of poetry

Hypothesis / lead	Why it was tried	How it resolved
Keyword Porta (monas, medulla, ripley...)	Looks like a tabula recta	No keyword worked (2021)
English plaintext	Text ‘sounded’ readable	IC 0.045, word-len 5.85, et/ad/quod → Latin
Short period (Kasiski, 8×17)	Standard polyalphabetic drill	Noise; no IC spike; DCODE ≤ 24
Autokey (PTAK / CTAK / PT-key)	Monte-Carlo Latin-on-Latin near-miss	Similarity test: Latin-keyed, not random
“There must be a twist”	Long words resisted plain Porta	No twist — just a long key
Is the cipher TABLE wrong?	Manual decrypt gave ‘km lun’	Yes — off by one; corrected works
Probable-word + Latin dictionary	Long words → few Latin fits	✓ This won (repeated key fragments)

Correctly “Porta” from the start → stuck because the period seemed not to exist → detour through English & autokey → rescued by the dictionary, a corrected table, and a record key.

Confirmation, collaboration, and the wider story

Sister manuscripts (plaintext en clair)

- Bodleian MS Ashmole 1423 — the recipe, with lab notes showing someone tried it.
- Edinburgh MS Dc.1.30 & a Leiden copy — confirming the solve independently.

Telling the world

13 Oct 2021	The Conversation — “Deciphering the Philosophers’ Stone”
26 Oct 2021	Jargonium — “A secret key hidden in plain sight”
11 Nov 2021	Atlas Obscura
Feb 2022	Science & Vie — “on a enfin décrypté la recette!”
20 Jun 2022	HistoCrypt 2022, Amsterdam — the solution paper

From cold email to cracked in 5½ weeks

21 Jul	first contact with Piorko
29 Aug	deciphered
6 Sep	keyphrase found on f.12v
45	letters — a record key length

The HistoCrypt Community

International Conference on Historical Cryptology

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An alchemical cipher in a shared notebook of John and Arthur Dee (Sloane MS 1902) [Work In Progress]

Sarah Lang

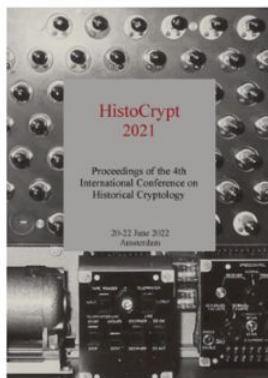
Megan Piorko

DOI: <https://doi.org/10.3384/ecp183161>

Keywords: alchemy, Arthur Dee, John Dee, cipher

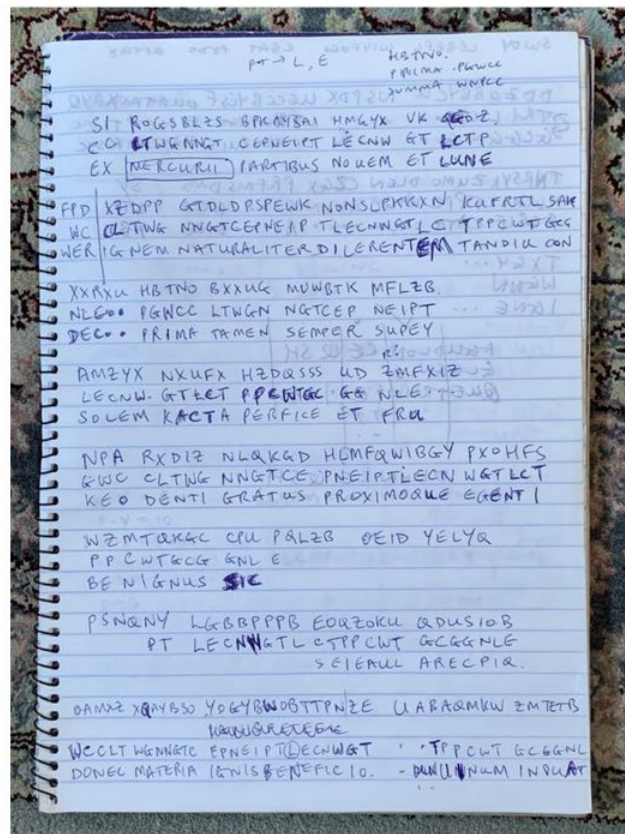
Abstract

Alchemy, while being known for its secrecy, cryptographical and stylistic devices, isn't known for its ciphers in particular. However, ciphers can sometimes be found in alchemists' and chymists' (laboratory) notebooks. This paper discusses a ciphertext and cipher table found in a shared notebook by John and Arthur Dee (Sloane MS 1902). It presents a bibliographical description as well as context for interpretation. However, thus far it has not been possible to solve the cipher.



Published

2021-08-09



Personal notebook of Richard Bean,
Research Fellow, UQ Centre for Energy Data Innovation

Cracking the Code

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Solving an Alchemical Cipher in a Shared Notebook of John and Arthur Dee

Richard Bean
Sarah Lang
Megan Piorko

DOI: <https://doi.org/10.3384/ecp188388>

Keywords: cryptanalysis, Porta cipher, Latin, alchemy, Decknamen

Abstract

This paper builds on a work in progress by Lang and Piorko published in HistoCrypt 2021, which presented a seventeenth-century ciphertext and cipher table discovered in a shared notebook of John and Arthur Dee (Sloane MS 1902). Using Latin statistical models we have successfully deciphered the encrypted text. Our results found the plaintext to consist of 177 Latin words describing a practical experiment for the creation of the alchemical Philosophers' Stone, presented as a chrysopoeic recipe. The encryption method is a variant of a Bellaso/Della Porta style-cipher, agreeing with the paper by Lang and Piorko. After correcting some errors in the seventeenth-century ciphertext and table it was noted that the cipherkey, 45 letters in length, forms part of the original plaintext and is also derived from an alchemical context. This article presents the



PDF

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Deciphering the Philosophers' Stone: how we cracked a 400-year-old alchemical cipher

Published: October 12, 2021 8:06pm EDT

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What secret alchemical knowledge could be so important it required sophisticated encryption?

The setting was Amsterdam, 2019. A conference organised by the [Society for the History of Alchemy and Chemistry](#) had just concluded at the [Embassy of the Free Mind](#), in a lecture hall opened by historical-fiction author Dan Brown.

At the conference, Science History Institute Postdoctoral Researcher Megan Piorko presented a curious manuscript belonging to English alchemists John Dee (1527–1608) and his son Arthur Dee (1579–1651). In the pre-modern world, alchemy was a means to understand nature through ancient secret knowledge and [chemical experiment](#).

Authors

 **Richard Bean**
Research Fellow, The University of Queensland

 **Megan Piorko**
Arlington Postdoctoral Fellow, Science History Institute, Georgia State University

 **Sarah Lang**
PostDoc in Digital Humanities at Centre of Information Modeling (University of Graz), University of Graz

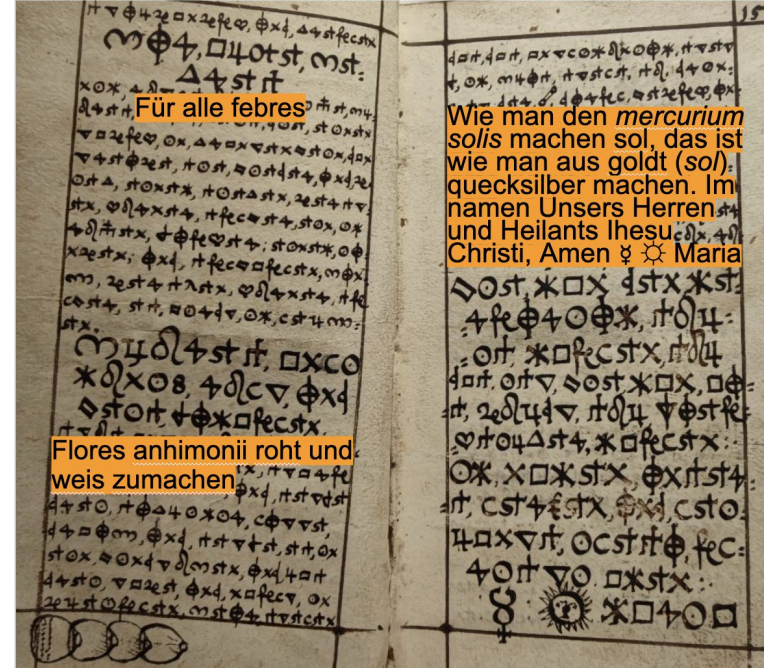
Disclosure statement

Megan Piorko receives funding from the Science History Institute.

Dr. Sarah Lang
(Max-Planck-Institut) Institute for the History of Science
slang@mpiwg-berlin.mpg.de

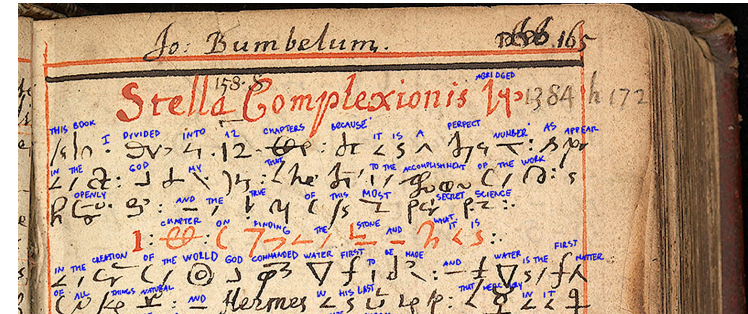
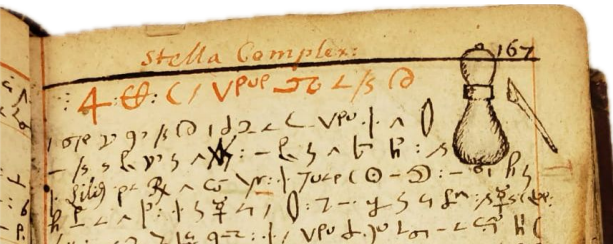
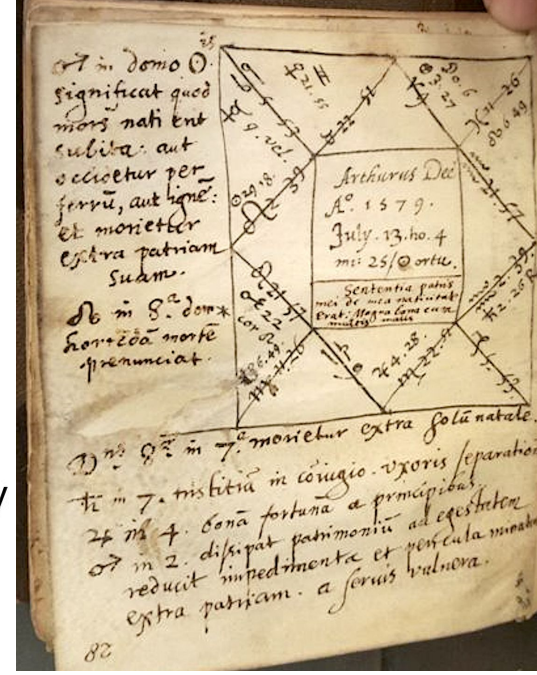
(Al-)Chymical Secrecy and Ciphers

- 1: Alchemical ciphers haven't been a focus of
- 2: cryptographic research
- 3: cryptological contextualization in strictly



Textual Devices of Alchemical Secrecy

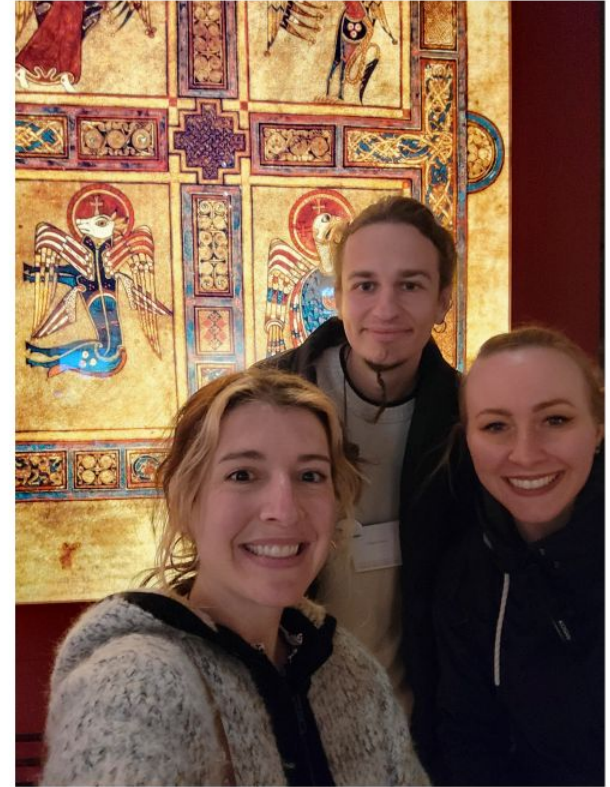
- *Decknamen* and specialist terminology
- Word/name substitution
- Dispersion of knowledge (*dispersio*) across multiple sources
- Monoalphabetic ciphers
- Polyalphabetic ciphers
- Trade symbols & codes
- Alphanumeric knowledge charts
- Astrological horoscopes
- Cabbalistic mysticism
- Lullian letter diagrams
- Emblems
- Mythoalchemical allegory
- Omitted or enciphered publication information
- Pseudonomia
- The use of multiple languages



HistoCrypt 2024: *Sources of Alchemical Cryptography*

Abstract

This article summarizes the current state of the field of alchemical cryptography and examines the roadblocks preventing scholars from a comprehensive understanding of early modern encryption practices and scribal knowledge-production among natural philosophers. The authors address the need for scholarly collaboration by contributing over one hundred instances of alchemical ciphering found in manuscripts across twenty-seven international institutions, with the intention of future scholars utilizing and adding to the examples put forth in this article.



Meg, Sarah & Sergei Zotov, Warwick, Art History
Book of Kells, Dublin

6 Italy

6.1 Brescia Library

- LIV31:** Cipher alphabet in multiple lines (starting with the plaintext letters in the first row), some symbols for specific terms. In *Secreta secretorum philosophorum*, a manual of alchemy from the late 16th or early 17th century, featuring various recipes for metal transmutation and herb distillation.
- ms.L. V.13:** Contains a symbol code, potentially a form of shorthand, interspersed with alchemical symbols (1 page) from the second half of the 17th century. In what is described as one of the oldest and most complete examples of the *ABRAHELIN*, a famous esoteric grimoire attributed to a legendary Egyptian mage Abraham Melin, or to Abraham of Worms or Würzburg, a German Talmudic Jew from the 12th or 13th century; likely composed during the 14th century in the Balkan region, only a few known copies.

6.2 Marciana Library

- Italian II. 152 [5046]:** 1 page containing hard to read text (not ciphered), combined with symbols (potential cipher). Line drawings accompanied by 4-letter combinations each, labelled 'littera egittica' and 'Numeri Egiptij Hieroglyphici', however, they are definitely not hieroglyphic numerals (2 pages). Paper, quarto, 16th century. *Opusculum alchimie auri et argenti*.

7 Netherlands

7.1 Allard Pierson

- PH344:** 5 pages of partially enciphered text, all with the same alphabet. One page contains a table called 'Die erste Tabelle des Königs Xophor' ('The first table of King Xophor') Basilus Valentinus' *Das große Geheimniß der Egyptischen Könige*, dated to the 1700s.

7.2 Leiden UL

- Cod. Voss. Chym. Q. 51:** *This Liber de magna alchymia* lists several alphabets, existing and fictional, ranging from Greek and Egyptian to Chaldean and even angel symbols. Foreign scripts are heavily adapted through scribal modifications or transmission errors (Gannon, 2019).¹⁴
- VCO17:** Cipher alphabet for monoalphabetic substitution with symbols often found in the context of alchemical ciphers. A 16th-century manuscript from 1588–95, 337 folios on paper, dimensions 212x164mm, featuring various works on alchemy including poems, operations, and dialogues in both Latin and German, including *Rosarium philosophorum sive Donum Dei*, *Splendor solis*, Pseudo Roger Bacon, Pseudo Thomas Aquinas, Bernard Trevisan, Johannes Aurelius Augurellus, Pseudo Alexander von Suedten, Pseudo Raimon Lull, Paracelsus and Pseudo-Paracelsus.

8 Norway

8.1 National Library Oslo

- Ms.8° 32321 1702:** A manuscript (*Libellus singularis*) that includes a substitution cipher, in which letters seem

to be substituted for numbers, on the back side of the title page, 1702.¹⁵

9 Russia

9.1 State Library Moscow

- 183.1082:** Cipher alphabet table within masonic manuscript, written in French from the mid-18th century.¹⁶
- 183.1426:** French 18th-century manuscript with a cipher table and a partially enciphered passage about Roger Bacon (where ingredients would follow: 'il faut prendre...'), 281 folios. *Recueil de divers traits de la Philosophie Hermetique, composees par divers maitres dans cette science*. Contains Arnald of Villanova, Paracelsus (on *Electrum*, see Gannon (2023)) and P.-J. Fabre.
- 183.943:** Page mentioning 'Theophrastus' with symbol-encoded text in a manuscript titled *Tinctura universalis* in German Gothic script from the 18th century, 78 fol.
- 183.998:** German text (*Tabula Smaragdina*, 2 pages total) with a portrait of Hermes Trismegistus holding a ciphered table. In *Reichversammlung und Stimmen der berühmtesten Philosophen von der Schöpfung an bis auf unsere Zeit über die höchste Geheimnis der Natur, sonderlich ihres großen Steins*, 1663.

10 Sweden

10.1 National Library Stockholm

- Fa. 14:** 5 pages of plaintext containing runes, some aligned in a way that makes them look like potential substitution alphabets. Different alphabets arranged in table formats (5 pages), the page heading mentions Johannes Trithemius. In a manuscript related to the idea of Goths as keepers of ancient wisdom with runes having 'double' meanings and sacred significance, similar to the Hebrew Cabala and Egyptian hieroglyphs.¹⁷
- Fa. 2:** Titled *Azotica Astronomia*, the text contains a few enciphered words. Beside it there is a cipher table, potentially for polyalphabetic substitution but also containing many symbols familiar to other ciphers in alchemical contexts. Reflects Bures' interest in alchemy from early 1604, noting key ideas from medieval classics and works of Paracelsus, Gerhard Dorn, and Andreas Libavius.¹⁸
- Huseby 78:** An Old English manuscript from 1550 with various recipes includes an alphabet for simple substitution cipher and a few enciphered words.
- Rål. 9:** A text titled 'mysteries of the alphabet', appears to contain cipher instructions within Swedish text. In Johannes Bures, *Adalruna Rediviva seu Sapientia Sveorum Veterum*.¹⁹

¹⁵Ms.8° 32321 1702 https://beta.nb.no/dhlab/privatarkiv_navn/

¹⁶183.1082: <https://viewer.rsl.ru/ru/rsl0100047213107?page=1&rs=0&theme=white>

¹⁷Fa. 14: <https://lucris.lub.lu.se/ws/portalfiles/portal/2285913/3809108.pdf>

¹⁸Fa. 2: <https://lucris.lub.lu.se/ws/portalfiles/portal/2285913/3809108.pdf>

¹⁹Rål. 9: <https://lucris.lub.lu.se/ws/portalfiles/portal/2285913/3809108.pdf>

¹¹X113: List and table of syllables (2 pages), could be just a writing exercise. From a late 15th-century German medical book.²⁰

11 UK

11.1 Edinburgh Royal College of Physicians

- DEP ERG 5 1-5-1-23:** Potential cipher table below text in Italian. Alchemical manuscripts of George Erskine, titled *Arbatel – The magick of the ancients Philosophers*, dated 13 Feb 1602, with aphorisms and possibly in Erskine's own writing.²¹

11.2 Edinburgh University Library

- MS. Dc.1.30:** *Medulla* cipher discussed in Piorko et al. (2023) containing the Bellas/Vigenère/Della Porta cipher table, enciphered text, key and plaintext; plus one number wheel to calculate the days of the alchemical work.

11.3 Glasgow University Library, Ferguson Collection

- Ferguson Ms. 114:** Brief note in cipher or shorthand on one page. 18th-century alchemical manuscript with various traces including *The Praxis of Mercurius and Sir George Ripley's Epistle to King Edward unfolded*.²²
- Ferguson Ms. 130:** Cipherhex text on alchemical symbols (two pages with each one paragraph, one line on another), cipher table with one symbol per letter. 18th-century French manuscript, *Oeuvre du philosophe Solidarius*, featuring colored hermetic figures and sections in code, 55 folios, 205x156cm.
- Ferguson Ms. 19:** Nomenclature alphabet encoding alchemical processes. 17th-century Spanish manuscript with Italian section headings, including *Cedula ritrovata* and *Elucidarius Christophori Parisiensis*, 52 folios, 215x142mm.

- Ferguson Ms. 191:** One coded block in the margin of one page. 17th-century English manuscript with Latin verses, including Thomas Norton's *The Ordinal of Alchimy*, 207x147mm, 52 folios.

- Ferguson Ms. 262:** French text contains a cipher alphabet under the heading 'Alphabet cryptographique'. The two pages seem to refer to another text (mentioning Nicolas Flamel) in which this cipher seems to have been used. 17th-century French manuscript, a copy of (Pseudo-)Nicolas Flamel's writings, featuring horoscopes and planetary arrangements. ii folios + 36 pages + 4 folios on vellum. 159x108mm.

- Ferguson Ms. 323:** One page contains what seems to be a nomenclature. 16th-century English manuscript with alchemical receipts, diagrams, Raymond Lull's *Alphabeta*. 12 folios, 294x198mm.

²⁰X113: <https://kortkataloger.kb.se/hanominal/20647/>

²¹DEP ERG 5 1-5-1-23: <http://archives.rcpe.ac.uk/CalnView/Record.aspx?src=CalnView.Catalog&id=DEP%2F2HEG%2F1%2F25%2F23>

²²Ferguson Ms. 114: <https://www.gla.ac.uk/collections/#/details?irn=26540&catType=C&referr=results&q=GB+114+MS+Ferguson>

Ferguson Ms. 6: Familiar circular drawing typical of *Buch der Heiligen Dreifaltigkeit*.

- Ferguson Ms. 77:** Cabalistic table, relating letters to numbers. The heading contains the symbol for Mercury. 18th-century French manuscript with various alchemical treatises, including a depiction of Copernican cosmology and writings by Bernard Trevisan, Isaac Hollandus, Raymond Lull, Nicolas Flamel and *Traité de l'Or Potable*. 132 folios, 210x168mm.

- Ferguson Ms. 94:** Cipher table (1–2 symbols per letter), about 20 pages with partially or entirely enciphered text amongst French plaintext. 17th-century French alchemical and astrological notebook of A. Mercau, including sections in code, pen portraits, and drawings of alchemical apparatus. 190 folios (of which 54 are blank). 201x145mm. The manuscript features sections in code, with the key affixed to the inside front and rear covers. An astrology-focused section presents several horoscope charts. The cover bears coded words, followed by the inscription: 'Elvoh a servez a la gloire de Dieu et au salut de | J ame A.M.'

- MS Hunter 10 (T.5.12):** Number and letter tables on one page. Alchemy compendium, late 14th century, in English hand, illuminated initials, pen and ink drawings, diagrams, and numerous marginalia. Includes works such as *Synonyma Alchemiae* and *Mappae Clavicula* (unknown authors) and Albertus Magnus.²³

11.4 London British Library

- Sloane MS 1902:** Astrological medical manuscript produced by John and Arthur Dee (Lang and Piorko, 2021; Bean et al. 2022; Piorko et al., 2023), containing the cipherhex *Hermetica Philosophiae Medulla*, adjacent *tabula recta*, and cipher key (ff. 12–14).

- Harley Ms. 2407:** 110011101010101 code on the left of one page. 15th and 16th century manuscript including various alchemical texts, poems, and treatises in Latin and English including Arnald of Villanova, and numerous alchemical drawings and preparations.

- Sloane MS 3189:** *The Book of Enoch* contains the fortune telling tables of John Dee, as scribed by Edward Kelley, later owned by Elias Ashmole. The angelic conversations (Harkness, 1999) were communicated via encrypted angelic languages unique to each angel. Dee and Kelley used alpha-numeric tabula recta containing Enochian language symbols, which are also recorded in the codes.

- Sloane 3604:** 4 pages containing cipher wheels and multiple cipher tables. 16th century manuscript in the hand of Robert Frelove, containing various alchemical treatises such as by Raymond Lull. 293 folios.

- Sloane Ms 1118:** One page with different cipher alphabets, including rectangles. End of the 15th Century manuscript with 33 items: paper, small quarto, 154 folios.

- Cotton MS Vespasian A II (ff. 2–10, 27–40 1):** Numeric/alphabetical cipher tables corresponding to the months of the year; geometric computational charts, and letter ciphers are all present in this Arabic astrological manuscript owned and annotated by John Dee.

²³<https://www.gla.ac.uk/collections/#/details?irn=26640&catType=C&referr=results&q=MS+Hunter+110>

Sloane MS 3687: Contains the alchemical processes of George Marrowe and others mentioned in Sloane MS 1902 related to the *Medulla* cipher (Piorko et al., 2023). After Villanova is referenced, the rest of the MS contains laboratory notes that include numeric ciphers referencing encrypted days of the week.

11.5 London Wellcome

- Ms. 164:** Circular drawing in which words are linked in mysterious ways in this copy of *Buch der Heiligen Dreifaltigkeit*.

- Ms. 259:** Text in Latin and Ancient Greek with religious contents, a two-line code of alchemical ciphers, marginalia with what could be Ashmolean shorthand; mapping of letters to numbers. 1649 manuscript by Petrus Almerugus Encherch, written in a cipher of semi-Greek characters, with content focused on the secret chemica and the importance of discretion in alchemical pursuits. 1649 manuscript containing semi-Greek cipher recommending secrecy in the Work.²⁴ Further names follow in an unresolved cipher (pointing to members of an order).

- Ms. 309:** Several pages encoded by a monoalphabetic cipher consisting of 51 symbols (most letters are replaced by more than one symbol). The cipherhex spans the following pages: 7–10, pages 11–12 are missing, 13–20, 21, 26, 27, 28, 29. The rest of the text is in German. The cipher key is included. Some of the cipher-text pages contain drawings of alchemical vessels and furnaces. In Johann Gerlach's *Occlusa scripta chemica* written in German at Göttersdorf in 1572 and Naumburg in 1575–1576. The 18th-century manuscript includes secret alchemical scripts, prayers, lists of ingredients, and alchemical and medicinal receipts. It is illustrated with water-color symbolic alchemical drawings, some heightened with gold, and is written partly in cipher. The relevant section is pp. 7–178 *Secreta alchemica* in cipher and German. There follows an ingredients list (called *Elixir vitae*) and another partly coded section pp. 179–209. A manuscript key for the 51-symbol code by Julius Köhn is included.²⁵

- Ms. 424:** French text (seemingly an alchemical recipe) broken up by musical notes, which seem to be used as symbols for encoding words (2 pages). *LIBVRE accompany de secrets chimiques pour distillations*, [...], a mid-17th century manuscript, 20 x 15 cm, containing

²⁴<https://wellcomecollection.org/works/m4k7d4g> Fol 1 (In a cipher made up of semi-Greek characters): Jesvs Et Maria Et Ioseph. (/red) Uerba propria philosophorum auree curis super secretis chemica De gratia / a fidelis et dilectissimo amico mihi huius [?] / ter dargita pro cutus amico semper Dum / rogare teneat quoniam mihi testantur. Deum ideo Precor ut mihi concedat gratiam eadem / robora cognoscere pro eius laude et gloria / pro salute anime mee, pro auxilio pauper / rum et pro commoditate me familie pau / per [sic] Amen. Translation: Jesus, Mary and Joseph. The peculiar words of the Wise of the Golden Cross about the secret alchemy of God's grace were donated to me in a humanistic manner by a faithful and highly esteemed friend, for whose soul my God always care, as he has testified to me, which is why I adhere. Therefore, I pray to God to bestow the grace to understand these words for His praise and glory and for the salvation of my soul, to aid the poor and for the benefit of my poor family. Amen.

²⁵<https://wellcomecollection.org/works/qb3carav>

¹⁴The Viennese ÖNB Cod. 11133 also contains comparable alchemical alphabets.

Sources of Alchemical Cryptography

- Our understanding of alchemical practices related to cryptography remains insufficient
- This is likely due to a lack of sufficient studies on relevant sources
- We thus present an overview of over 110 manuscript sources related to alchemy and cryptography, most of which remain unstudied and not digitised
- What trends did we identify?

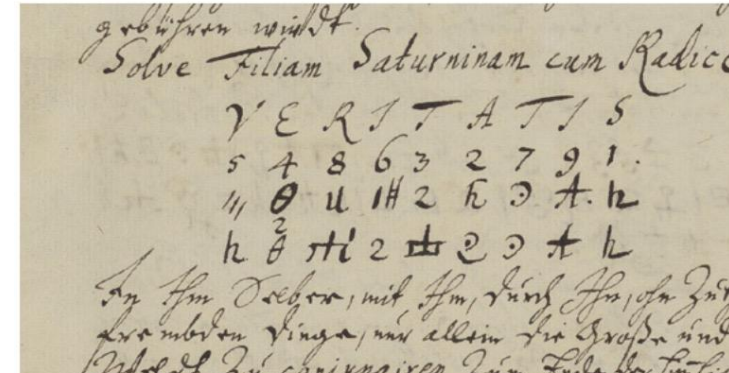
Alchemists and chymists frequently:

- encrypted short passages related to recipes and experiments
- obscured content using exotic foreign languages
- employed custom shorthand
- created unique symbol codes

Sarah Lang, Sergei Zotov, and Megan Piorko, “Sources of Alchemical Cryptography,” in *Proceedings of the 7th International Conference on Historical Cryptology (HistoCrypt) 2024*



FIGURE 4 Cod. alchim. 651, p. 51 (courtesy of Staats- und Universitätsbibliothek Hamburg).



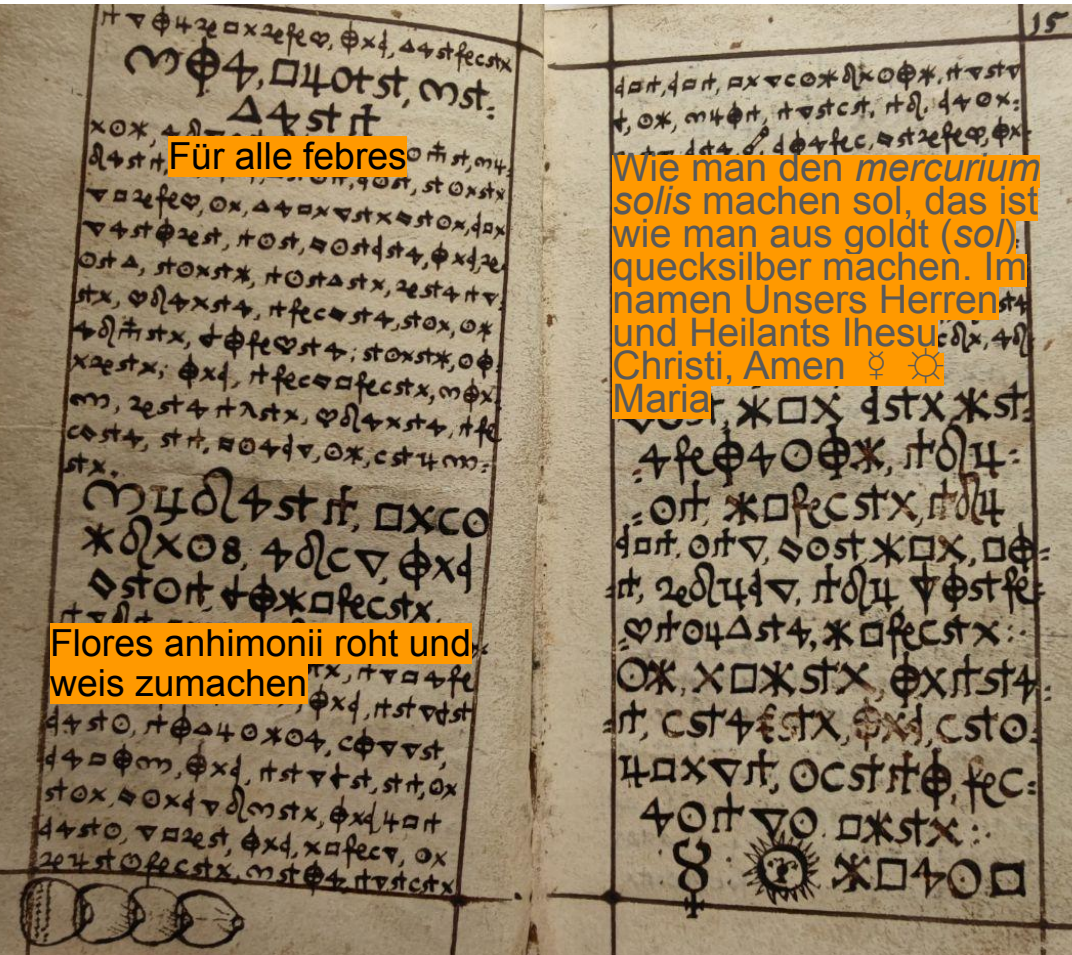
London, Wellcome Ms. 309

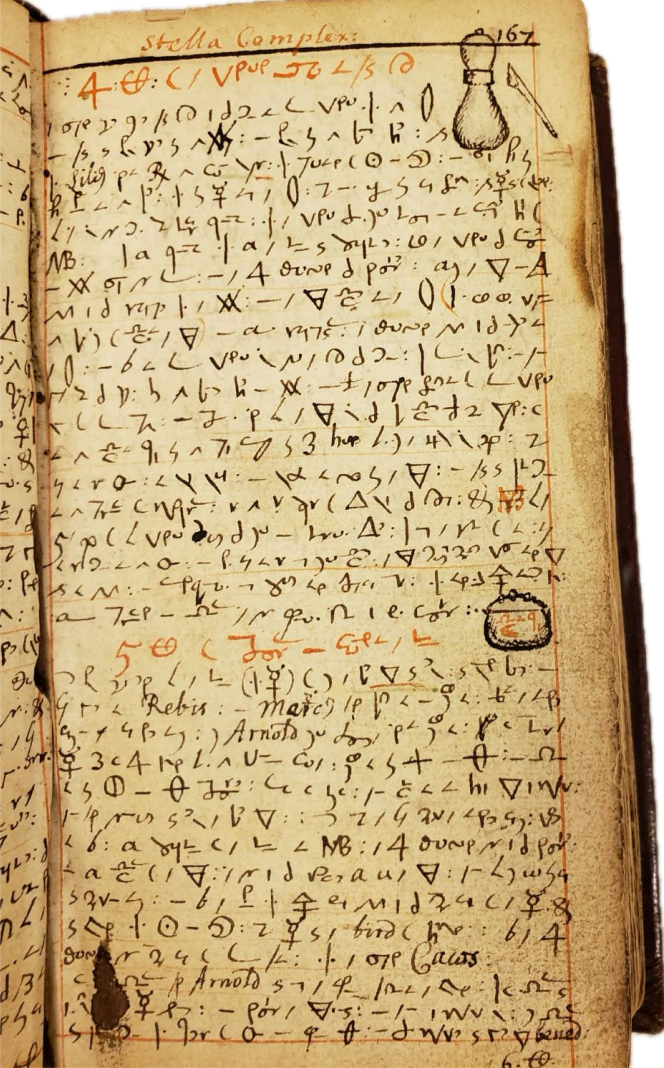
Für alle febres

Flores anhimonii roht und
weis zumachen

Wie man den mercurium
solis machen sol, das ist
wie man aus goldt (sol)
quecksilber machen. Im
namen Unsers Herren
und Heilants Ihesu
Christi, Amen ☿ ☼
Maria

- Johann Gerlach's
Occulta scripta chymica, 18 c.
- Several pages with German text
encoded by a monoalphabetic
cipher consisting of 51 symbols
(key included)
- Drawings of alchemical vials
and furnaces



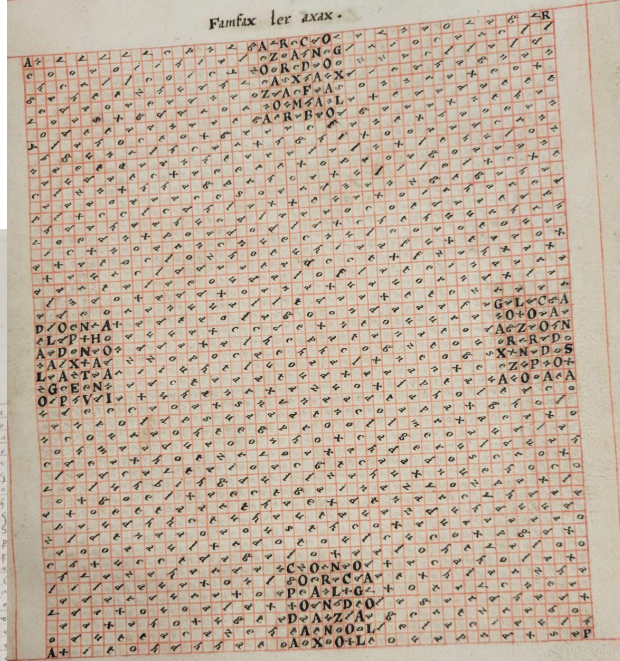
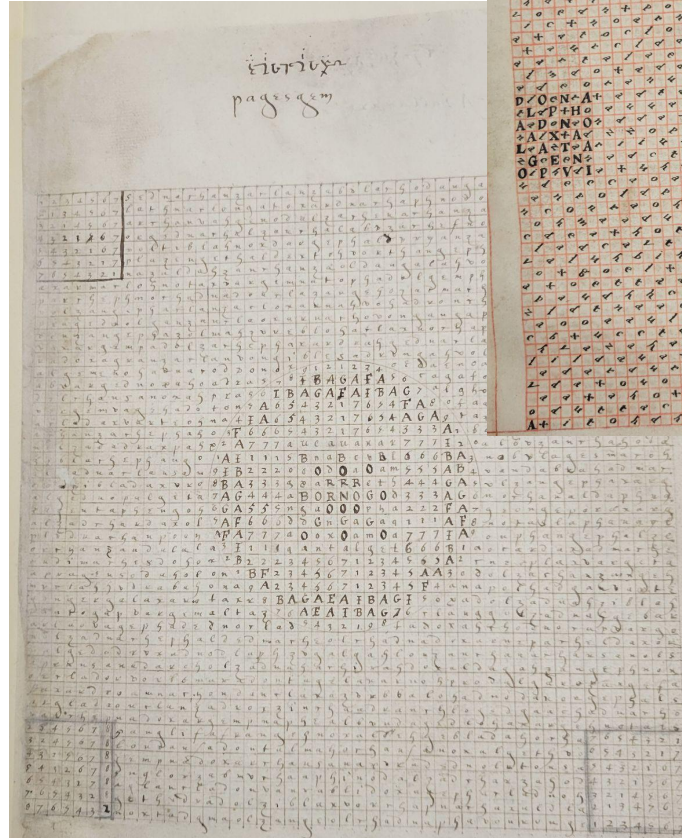


London, Wellcome Ms. 3563

- *Miscellanea Alchemica*, 1746
- Composite manuscript written in personalised alchemical shorthand
- contains alchemical and astrological symbols to be used for practical experimentation

London, British Library Ms. Sloane 3189

- The *Book of Enoch* with the fortune telling tables of John Dee, as scribed by Edward Kelley, later owned by Elias Ashmole
- Angelic conversations were communicated via encrypted angelic languages unique to each angel



Hamburg, UB
Cod. alchim. 651

- German poem entitled *Thorough Summary of All Celestial Influence*, making intriguing claims about alchemists at the court of Emperor Rudolf II (1552–1612)
- The supposed author, Martinus de Delle, a fictional court poet and adept, is likely a result of textual corruption
- Both the prose introduction and the verse contains ciphpered passages
- Prinke and Zuber 2020, esp. 418

[illegible]

Gott ewig Lob, Ehr und Sanct
 Tag Sey von Sorgen Mein Leben lang.
 ♄ □ □ □ □ □
 ♄ ♄
 ♄
 744 ♄ ♄ ♄
 40400
 412040
 4204
 0444




Umb den 5. Dingem Australischen Platanen der
 Dingem, Zeit lufon, mit Vorigen lufon Welt, Mit.
 Caly Zeit und Tugend
 Auf der Kanna und Gollin von,
 Laß Was haben 5. Dingem

Solve Filiam Saturninam cum Radice.

V E R I T A T I S

5 4 8 6 3 2 7 9 1.

11 0 u 1 H 2 K 3 A. h

h 3 H' 2 d e o t h

An Ihm Treuen, mit Ihm, durch Ihn, der Ist Ihm alle
zu werden Vinga, nur allein zu Groden und Klein
Nobeld zu conjugiren zum Ende der fünfzig Perse

Rudolf II's hand bell

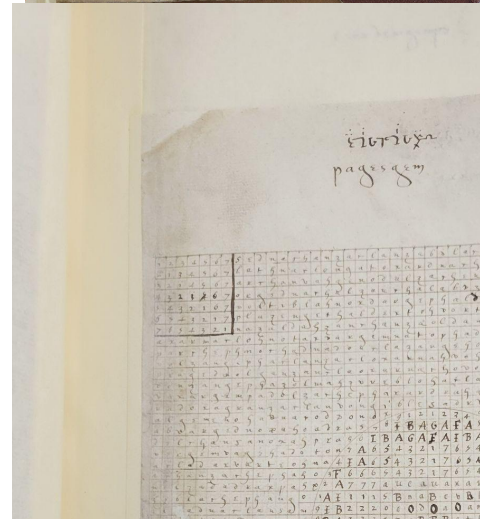
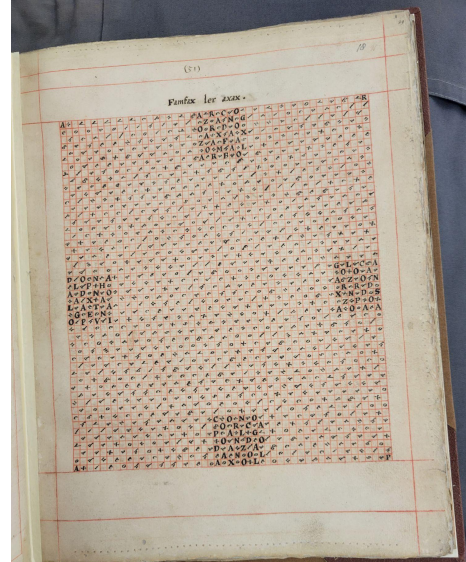
- Cipher:
θιδαγΗ θιβ κιδιγ ιιαθδεγι ια-
εθιθ δαιΗ κδειθειζ Ηθιγκδεγι
δαΗι ιΗεθδθιζ θιδαγ Ηθιβ κγκ
βκειΗ ζειΗιει ζιδγΗειγ θιβ ιγαι-
βειγ ζιδιθειΗ καιθειζιΗ κιγδ δει-
Η ιΗιδιγιΗ κιγδ δειΗ Ηεθιαθζειγ
ζεθιΗθιΗ
- Still unsolved
- Richard Bean, Corinna Gannon, and Sarah Lang: The cipher of Emperor Rudolf II's "Alchemical Hand Bell." In *Proceedings of the 6th International Conference on Historical Cryptology (HistoCrypt) 2023*.



First hypotheses in the HistoCrypt 2021 work-in-progress

An alchemical cipher in a shared notebook of John and Arthur Dee (Sloane MS 1902)

1. Ciphers in alchemy exist but aren't particularly well researched
2. Cryptology research often is only interested in solving ciphers, not such much the historical context
3. approximate dating = 1610
4. Cipher is likely Arthur's
5. Somewhat similar tables from Book of Soyga (Aldaraia sive Soyga vocor), a 16th century Latin treatise owned by John Dee.
6. so-called Magic Tables from the Christian Cabalistic tradition: connection unlikely
7. René Zandbergen & Rafał T. Prinke demonstrated that Dee probably never owned the Voynich MS
8. not a simple Caesar cipher nor other monoalphabetic substitution cipher
9. frequency analysis shows no spikes for vowels and shows an overall too uniform distribution for a simple substitution cipher



Ciphertext and Table: "Hermeticae Philosophiae medulla."

AB	a	b	c	d	e	f	g	h	i	k	l	m	n
CD	a	b	c	d	e	f	g	h	i	k	l	m	n
EF	a	b	c	d	e	f	g	h	i	k	l	m	n
GH	a	b	c	d	e	f	g	h	i	k	l	m	n
IK	a	b	c	d	e	f	g	h	i	k	l	m	n
LM	a	b	c	d	e	f	g	h	i	k	l	m	n
NO	a	b	c	d	e	f	g	h	i	k	l	m	n
PE	a	b	c	d	e	f	g	h	i	k	l	m	n
RS	a	b	c	d	e	f	g	h	i	k	l	m	n
TV	a	b	c	d	e	f	g	h	i	k	l	m	n
WX	a	b	c	d	e	f	g	h	i	k	l	m	n
YZ	a	b	c	d	e	f	g	h	i	k	l	m	n

Hermeticae Philosophiae medulla.
Sh. mch ozxkuxfy wppstewx nquail
si roshlas bphayai hmgx vk qadr
agwgmz epmta eqdoga hahcy iqst aqp
haxb putnaxxo qagx td. qfyggicx kafful
x-adpp qullapspenk. nomspkexn kutetl
sakapfexlah oamxer xqaybo yaybnoob
ttprre vabagmkav emtett ntebpn sb
swoy lebefl wiyfoco cbat xado qftgx
hadrobhyca nspdx veebyest onatgx aya
twrsyxzumo dien exyx pfmsdmis sy
txqy donarmentao Sasltqm sq iqsxb
ptzqao asimo kmo xultpu snbzldr
ilstte elxatd ymkudatdt ynknttem
nphbs bogaxpb uk xmyx zpxi
kntwrmu tydmzmbp exbx abbe
isfr amu msesltq shoflxki aqap th
exw fsmzsyssyd qpxbssq kmg sqno
agdasxm gm ymstexxo nrx it abxt

mpqum xobddrhd fpeckext sqco
h. woruod. any fsebxu kyise nqgchls
exhea ikrofxyolp elopa ditqle qahm
uqxubs tm tnsznoixm tonogi qf dkyur
zkye riewogexidpp iluefnstetn qalls
aqzyce fseckdaqu dlomceqsh sqxdtby
mluse za edfr nppyb uuoisk asgo
caozzorca xltge zocuzpsa oqmtau
erlxm qegsflk haktuddqm xnmrlges
ceenegkeo unkcom puyiz ogiz yce he
lftbodek aphrmxh qie pph iubtyx
pedk oisspsdm nqya xlofemrons
lab. exeo qhix mluxd sirdt ogytqu
ua iabbwobs tuuxpa nre lege sybydr
xmbas unuk keappskon Lfagh ichub
xxrxu hbtuo bxxug muretk mftb
amryx nrxufx hzlagss ad emfziz
npa radiz nlaqkd hlmfjwibgy pzo
kfs wmtqkge epu pqlzb reed yelyq
et pinqny lgbppps eapzoku alarob.

Cryptological discussion of Dee's cipher table and text

- Numerical substitution (instead of word substitution in *Decknamen*)
- Cipher table looks like a *tabula recta*
- Vigenère-type cipher but not actually a Vigenère
- Bellaso / Della Porta cipher ?
 - while Vigenère ciphers use 26 alphabets
 - Bellaso/Della Porta ciphers only use 13 reversible alphabets,
 - each being associated with two letters from the alphabet (like the row indices 'AB', 'CD', etc.
- Reference to "*Medulla*" → Ripley / Lull connection?
- Father John Dee was a mathematician; Arthur not so much
- Early modern ciphers weren't usually up to the mathematical state of the art of their time

Decrypting the cipher (with Richard Bean/Queensland)

- Bellaso / Della Porta Cipher
- cipher text, plain text, cipher table (*tabula recta*) and key (phrase, *clavis*)

key		a	b	c	d	e	f	g	h	i	k	l	m
AB	1	o	p	q	r	s	t	u	w	x	y	z	n
CD	2	p	q	r	s	t	u	w	x	y	z	n	o
EF	3	q	r	s	t	u	w	x	y	z	n	o	p
GH	4	r	s	t	u	w	x	y	z	n	o	p	q
IK	5	s	t	u	w	x	y	z	n	o	p	q	r
LM	6	t	u	w	x	y	z	n	o	p	q	r	s
NO	7	u	w	x	y	z	n	o	p	q	r	s	t
PQ	8	w	x	y	z	n	o	p	q	r	s	t	u
RS	9	x	y	z	n	o	p	q	r	s	t	u	w
TU	10	y	z	n	o	p	q	r	s	t	u	w	x

Keyphrase

sic alter iason aurea felici
portabis uellera colcho

Ciphertext: Hermeticae Philosophiae medulla.

sh mg h ozxkwxf g wphpsdzw x rqwa id
si rogsblzs bpkaysai hmg yx vk qqdz
[...]

Solution = plain text

in ouo diaphano hermetice
clauso ex mercurii partibus
nouem

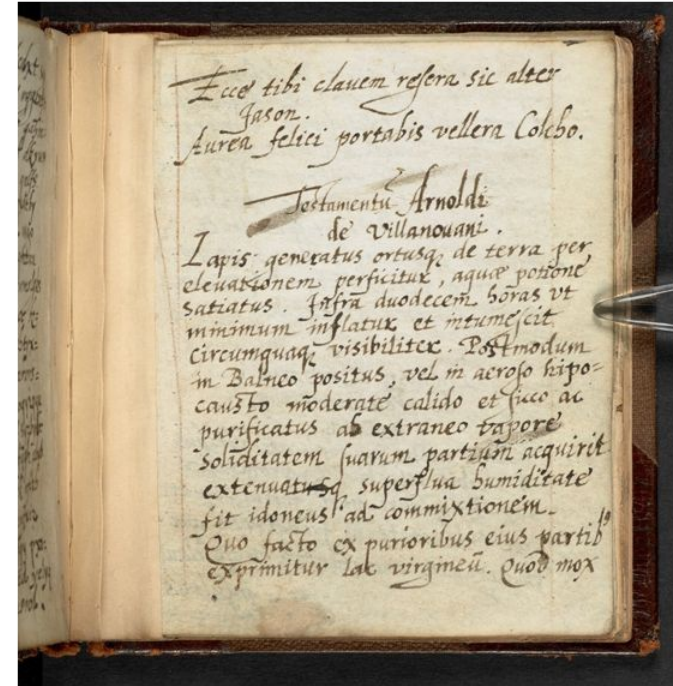
Decrypting a polyalphabetic substitution cipher

key		a	b	c	d	e	f	g	h	i	k	l	m
AB	1	o	p	q	r	s	t	u	w	x	y	z	n
CD	2	p	q	r	s	t	u	w	x	y	z	n	o
EF	3	q	r	s	t	u	w	x	y	z	n	o	p
GH	4	r	s	t	u	w	x	y	z	n	o	p	q
IK	5	s	t	u	w	x	y	z	n	o	p	q	r
LM	6	t	u	w	x	y	z	n	o	p	q	r	s
NO	7	u	w	x	y	z	n	o	p	q	r	s	t
PQ	8	w	x	y	z	n	o	p	q	r	s	t	u
RS	9	x	y	z	n	o	p	q	r	s	t	u	w
TU	10	y	z	n	o	p	q	r	s	t	u	w	x

Keyphrase: **sic** alter iason aurea felici portabis uellera colcho

Ciphertext: **sh** **m** **g** **h** ozxkwxfg wphpsdzw x rqwaid si rogsblzs bpkaysai hmgys uk qgdz [...]

Plaintext Latin **in** **o** **u**o diaphano hermetice clauso ex mercurii partibus nouem



Cipher key in Sloane MS 1902

Irregularities in the *tabulae rectae*

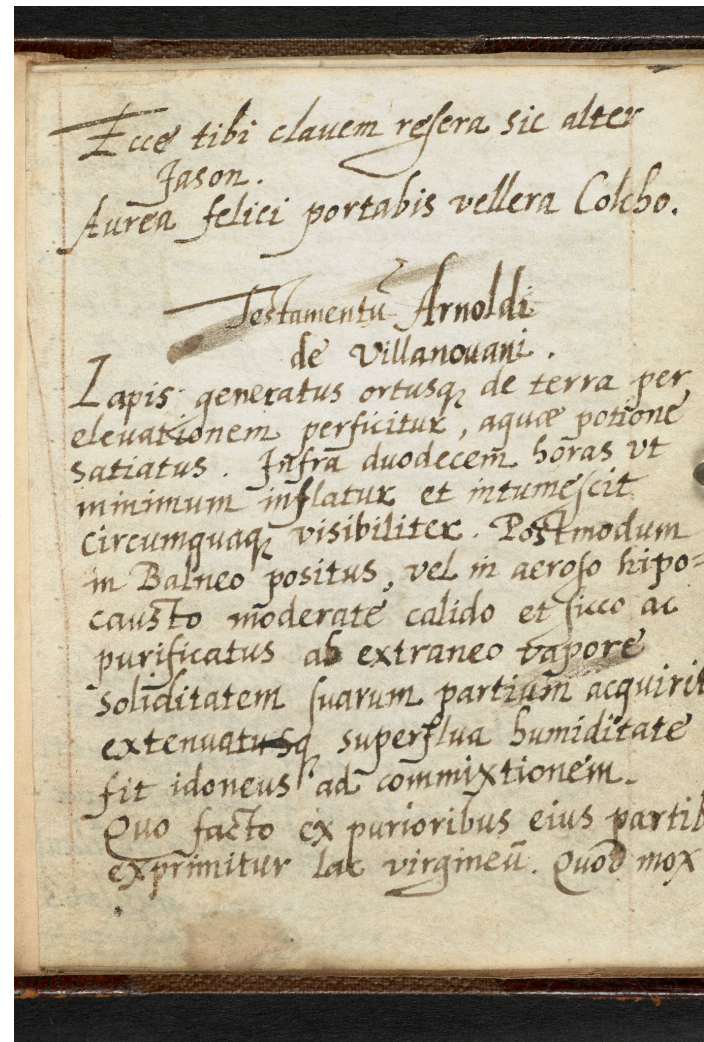
AB	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
CD	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
EF	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
GH	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
IK	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
LM	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
NO	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
PE	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
RS	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
TV	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
WX	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
YZ	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

key		a	b	c	d	e	f	g	h	i	k	l	m
AB	1	o	p	q	r	s	t	u	w	x	y	z	n
CD	2	p	q	r	s	t	u	w	x	y	z	n	o
EF	3	q	r	s	t	u	w	x	y	z	n	o	p
GH	4	r	s	t	u	w	x	y	z	n	o	p	q
IK	5	s	t	u	w	x	y	z	n	o	p	q	r
LM	6	t	u	w	x	y	z	n	o	p	q	r	s
NO	7	u	w	x	y	z	n	o	p	q	r	s	t
PQ	8	w	x	y	z	n	o	p	q	r	s	t	u
RS	9	x	y	z	n	o	p	q	r	s	t	u	w
TU	10	y	z	n	o	p	q	r	s	t	u	w	x

AB	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
CD	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
EF	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
GH	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
IK	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
LM	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
NO	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
PE	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
RS	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
TV	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
WX	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
YZ	a	b	c	d	e	f	g	h	i	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z

The recipe translated

- 177-word passage, 45-letter password
- Instructions seemingly from towards the end of a recipe for making the philosopher's stone
- Followed by the key (adapted from Augurelli's *Chrysopoeia*)
- In a different MS, the plaintext was found followed by more practical instructions
- With it came lab notes indicating somebody tried it out
- Is it a practical recipe?
Where's the beginning?
- Potential connection to the *Processus Universalis* recipe group?



Translating the Decrypted Recipe

Marrow of Hermetic Philosophy

English Translation by Sarah Lang & Meg Piorko

In the hermetically sealed translucent egg, make an amalgam of nine parts Mercury and Luna which has not yet suffered the forces of Vulcan, one part.

If one continues digesting it in the Athanor over natural fire for so long until the material takes on the colour of the raven thanks to the fire, and in turn the colour of the swan, which usually happens after around a little less than a *trilunium*.

Once the matter is thus whitened, you shall open up the egg at the proper time without removing it from the fire.

And after one part of the matter is immersed in gold foil, with as much dexterity as you can, close it again and let it cook in the same manner until the whole *materia* becomes more intensely black than before, but this blackness goes over into whiteness.

If you end the work here, you will have Tincture of Luna, but it is better to climb up to the shiny throne of Sol by continuing the work and to await the conversion of its whiteness into redness.

And this usually occurs in three *trilunia* in most cases and then you will have a truly gold-making elixir with the help of which the miserable poverty is driven out and the sick who labour under whichever illness are restored to health.

In the same way, truly, that it is perfected, it is multiplied unless you have to replace some gold for the used Elixir. To shorten the work, the projection shall be done one over ten, but the first time it is always done over gold.

Perfect it and enjoy, thanking God, be kind to your neighbour in need.

Like a new Jason you will carry the Golden Fleece to the lucky Colchian.

Publication list

Lang, Sarah, Sergei Zotov, and Megan Piorko. 2024. *Sources of Alchemical Cryptography*. Tartu: Tartu University Library. <https://hdl.handle.net/10062/98480>. <https://doi.org/10.58009/aere-perennius0105>.

Bean, Richard, Corinna Gannon, and Sarah Lang. 2023. "The Cipher of Emperor Rudolf II's 'Alchemical Hand Bell'." In *Proceedings of the 6th International Conference on Historical Cryptology (HistoCrypt 2023)*, edited by Carola Dahlke and Matthias Göggerle, 13–17. *Linköping Electronic Conference Proceedings* 195. <https://doi.org/10.3384/ecp195690>.

Lang, Sarah. 2023. "Situating Ciphers among Alchemical Techniques of Secrecy." In *Proceedings of the 6th International Conference on Historical Cryptology (HistoCrypt 2023)*, edited by Carola Dahlke and Matthias Göggerle, 93–104. *Linköping Electronic Conference Proceedings* 195. <https://doi.org/10.3384/ecp195698>.

Piorko, Megan, Sarah Lang, and Richard Bean. 2023. "Deciphering the *Hermeticae Philosophiae Medulla*: Textual Cultures of Alchemical Secrecy." *Ambix* 70 (2): 150–83. Doi: <https://doi.org/10.1080/00026980.2023.2201744>.

Bean, Richard, Sarah Lang, and Megan Piorko. 2022. "Solving an Alchemical Cipher in a Shared Notebook of John and Arthur Dee." In *Proceedings of the 5th International Conference on Historical Cryptology (HistoCrypt 2022)*, edited by Carola Dahlke and Beáta Megyesi, 12–21. *Linköping Electronic Conference Proceedings* 188. <https://doi.org/10.3384/ecp188388>. <https://ecp.ep.liu.se/index.php/histocrypt/article/view/388>.

Bean, Richard, Megan Piorko, and Sarah Lang. 2021. "Deciphering the Philosophers' Stone: How We Cracked a 400-Year-Old Alchemical Cipher." *The Conversation*, October 13. <https://theconversation.com/deciphering-the-philosophers-stone-how-we-cracked-a-400-year-old-alchemical-cipher-167900>.

Lang, Sarah, and Megan Piorko. 2021. "An Alchemical Cipher in a Shared Notebook of John and Arthur Dee [Work In Progress]." In *Proceedings of the 4th International Conference on Historical Cryptology (HistoCrypt 2021)*, edited by Carola Dahlke, 90–93. *Linköping Electronic Conference Proceedings* 183. <https://doi.org/10.3384/ecp183>. <https://ecp.ep.liu.se/index.php/histocrypt/article/view/161>.

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Text and Commentary

Deciphering the *Hermeticae Philosophiae Medulla*: Textual Cultures of Alchemical Secrecy

Megan Piorko, Sarah Lang & Richard Bean

Pages 150-183 | Published online: 10 May 2023

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Abstract

This article presents the decryption, historical analysis, and alchemical interpretation of an alchemical cipher found in a shared notebook of John and Arthur Dee (British Library MS Sloane 1902). The cipher is an early example of a Bellaso/Della Porta/Vigenère type, a strong encryption method which was historically deemed indecipherable. The essay explores the medical and alchemical context for the manuscript into which the cipher was copied and provides the transcription, plaintext solution (in Latin), and English translation of the encrypted text. Further, it interprets the enciphered text through the lens of alchemical

THE CONVERSATION

Academic rigour, journalistic flair



Deciphering the Philosophers' Stone: how we cracked a 400-year-old alchemical cipher

Published: October 13, 2021 2:06am CEST

© British Library Sloane MS 1902 f.10v. Author provided (no reuse)

What secret alchemical knowledge could be so important it required sophisticated encryption?

The setting was Amsterdam, 2019. A conference organised by the Society for the History of Alchemy and Chemistry had just concluded at the Embassy of the Frenc

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SCIENCE & VIE

COMMENT LE CERVEAU EST DEVENU HUMAIN

7 MILLIONS D'ANNÉES D'ÉVOLUTION VERS TOUJOURS PLUS D'INTELLIGENCE

NOUVEAUX DÉCHETS ÉNERGETIQUES L'AUTRE PÉRIL ÉCOLOGIQUE

XENOBOTS L'ÈRE DES ROBOTS VIVANTS EST ARRIVÉE...

NOTRE SÉRIE

PIERRE PHILOSOPHALE ON A DÉCHIFFRÉ LA RECHETTE ?

CANCER UN VACCIN PROMETTEUR COMME LES RÉCÉPTEURS

MISSION 11 : DÉVULGER L'ASTÉROÏDE

100% SÉRIE

Meg Piorko, PhD

Special Collections Librarian, Villanova University

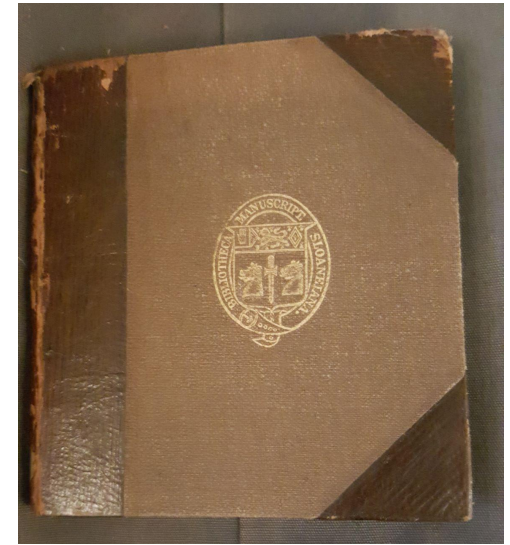
megan.piorko@villanova.edu

Sloane 1902: A shared notebook by John Dee (d. 1608) and Arthur Dee (d. 1651)

Paper and parchment, small manuscript bound in leather, 10cm x 12

31 folios numbered with Arabic numerals throughout

Folios 11v-14r, 27v, 28r, 29v are oriented upside-down from the rest of the codex



A father/son notebook: *iatromathematics* + *iatrochemistry*

ATION BOOKMATE

h.	Ecus.	h.	Ventrem.	3
h.	Cor.	h.	Inguina.	
o.	Caput.	o.	Spatulas, et manus.	
o.	Testiculos.	o.	Crua.	
o.	Pedes.	o.	Collum.	
o.	Tibias.	o.	Caput.	
o.	Genua.	o.	Pedes.	
h.	Cor.	h.	Inguina.	
h.	Ventrem.	h.	Verenda.	
o.	Collum.	o.	Ecus.	
o.	Genua.	o.	Pedes.	
o.	Caput.	o.	Manus et humeros.	
o.	Pedes.	o.	Collum.	
o.	Tibias.	o.	Caput.	

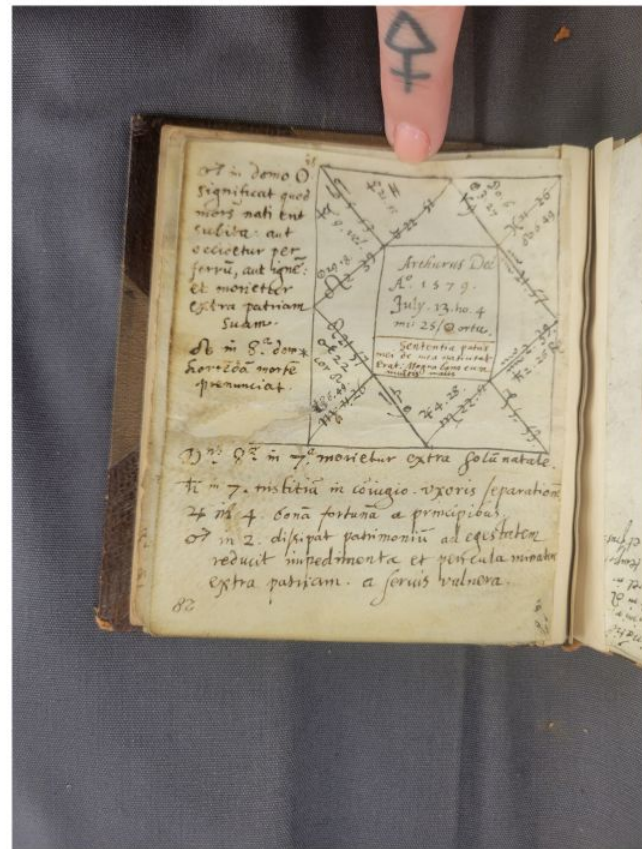
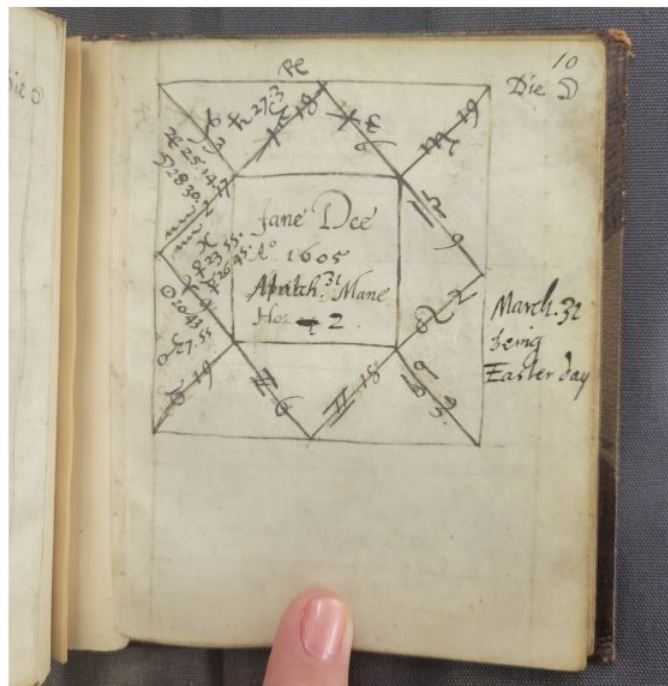


Sloane MS 1902, a collection of Paracelsian remedies

John Dee (d. 1527-1608)

Arthur Dee (son) (d. 1571-1651)

Nativities & *Decumbitures*



MS. Sloane 1902.

Paper. Quarto. 31 folios. 17th Century.

Written by the hand of Arthur Dee (?).

1-9. [Astrological nativities, including John Dee.]

Reversing the Volume:

10. 'Schema of the nativities of Arthur Dee and Isabel Dee.' f.28.

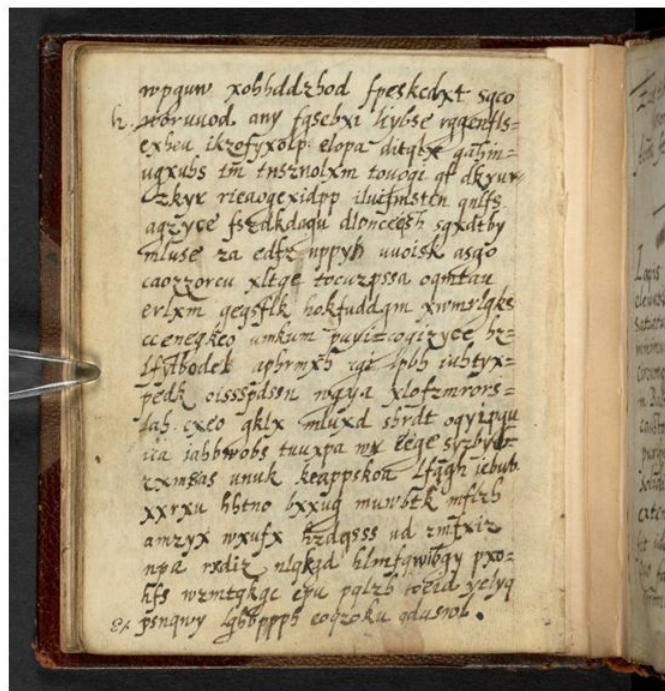
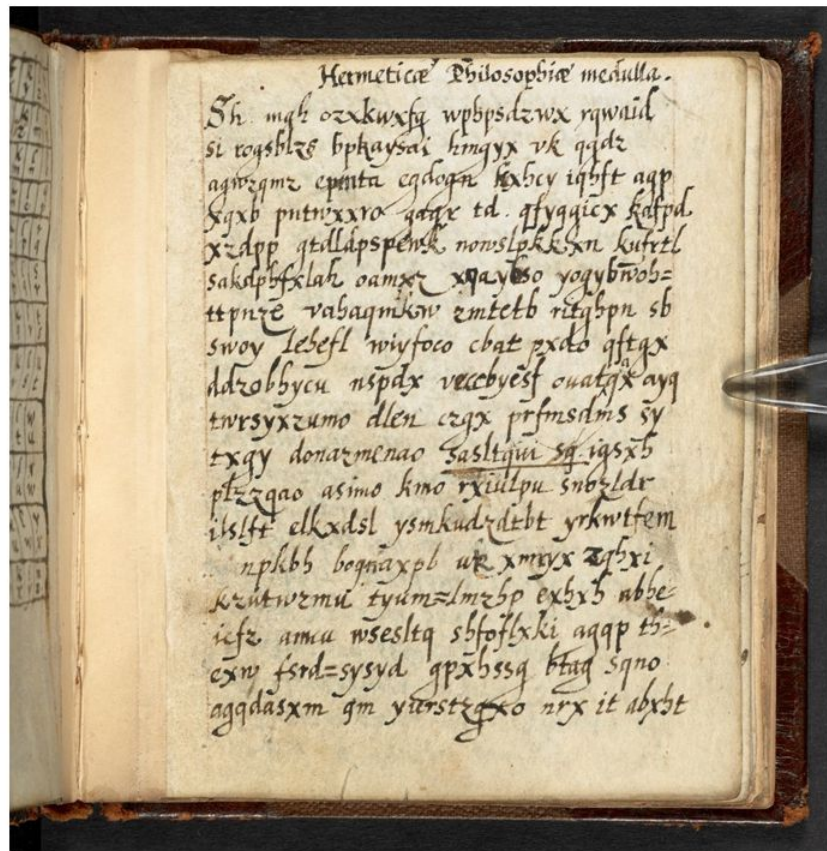
11. 'Hermetiae Philosophiae medulla' Tractatus litteris mysticis scriptus: cum clave. f.14.

12. 'Testamentum Arnoldi de Villanovani.' f.12b.

13. 'Dionysii Zachariae de projectione super metalla.' f.12-11.

Decumbiture of Jane Dee and nativity of Arthur Dee with prognostication in Sloane MS 1902

A Della-Porta Cipher upside down



Poly-alphabetic substitution ciphers & keys

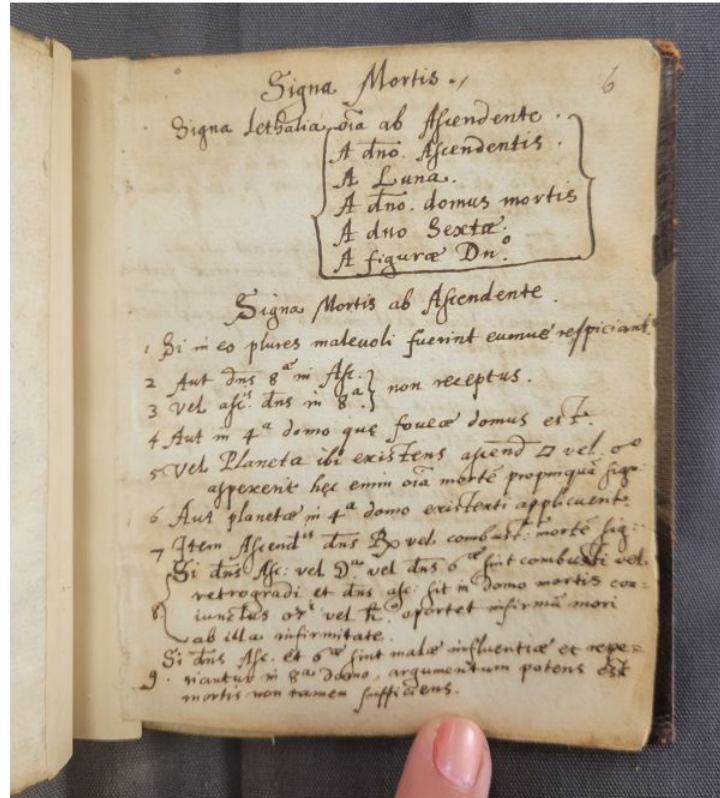
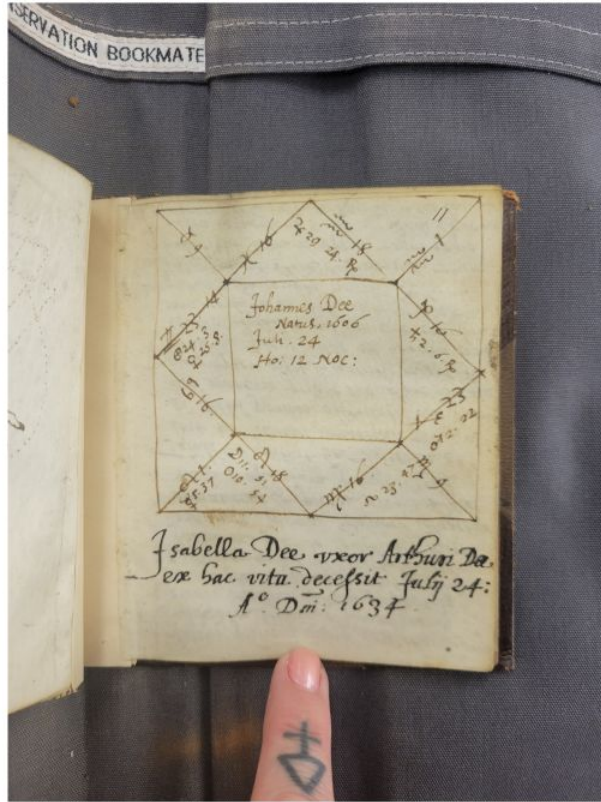
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CD	a	b	c	d	e	f	g	h	i	k	l	m
EF	a	b	c	d	e	f	g	h	i	k	l	m
GH	a	b	c	d	e	f	g	h	i	k	l	m
JK	a	b	c	d	e	f	g	h	i	k	l	m
LM	a	b	c	d	e	f	g	h	i	k	l	m
NO	a	b	c	d	e	f	g	h	i	k	l	m
PQ	a	b	c	d	e	f	g	h	i	k	l	m
RS	a	b	c	d	e	f	g	h	i	k	l	m
TV	a	b	c	d	e	f	g	h	i	k	l	m
WX	a	b	c	d	e	f	g	h	i	k	l	m
YZ	a	b	c	d	e	f	g	h	i	k	l	m

*Ecco tibi clauem resera sic alter
Jason.
Aurea felici portabis vellera Colebo.*

*Testamentu Arnoldi
de Villanouani.*

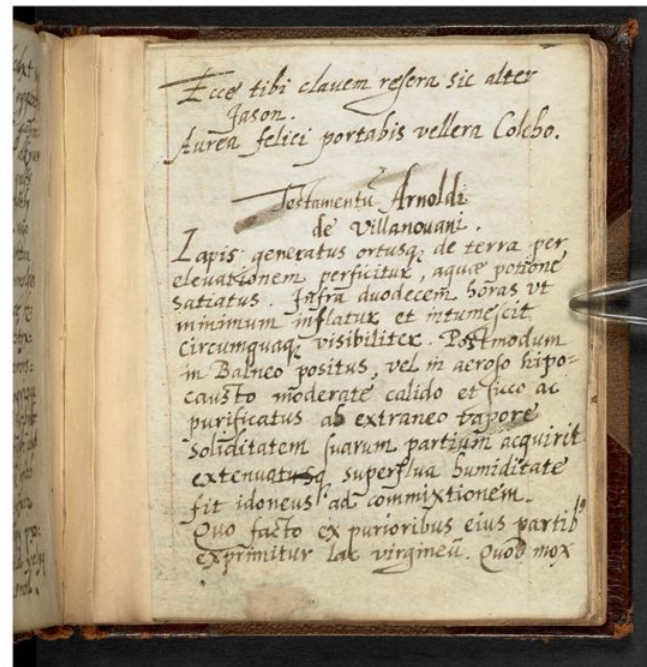
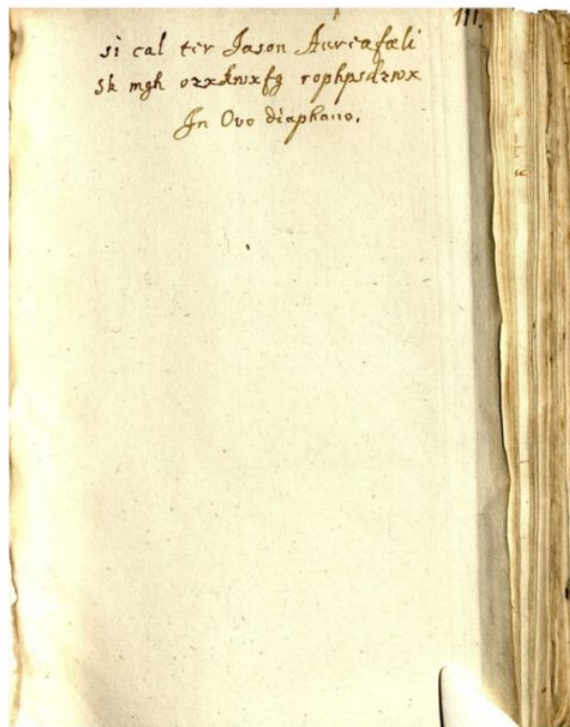
*Lapis generatus ortusq; de terra per
elevationem perficitur, aquae portione
satiatus. Infra duodecem horas ut
minimum inflatur et intumescit
circumquaq; visibiliter. Postmodum
in Balneo positus, vel in aereo hipo-
causto moderate calido et siccato ac
purificatus ab extraneo sapore
soliditatem suam partem acquirit
extenuatusq; superflua humiditate
fit idoneus ad commixtionem.
Quo facto ex purioribus eius partib;
exprimitur lac virgineu. Quod mox*

A Death Prognostication Book?



Death of Isabella Dee recorded by Arthur Dee and Signa Mortis by John Dee in Sloane MS 1902

Finding the *Hermeticae Philosophiae Medulla* at the Bodleian



MS Ashmole 1423, *Treatise on the Philosophers' Stone* by George Marrow O.S.A. (scribed in 1596)
Previously owned by John Dee with keyphrase, incorrect Latin phrase, and the first line of the recipe

Year 1612

May 23rd: I made a conjunction in the three glass vessels

May 30th after noon: I put three vessels in the Athanor

June 7th colours appeared, yellow and dark blue mixed.

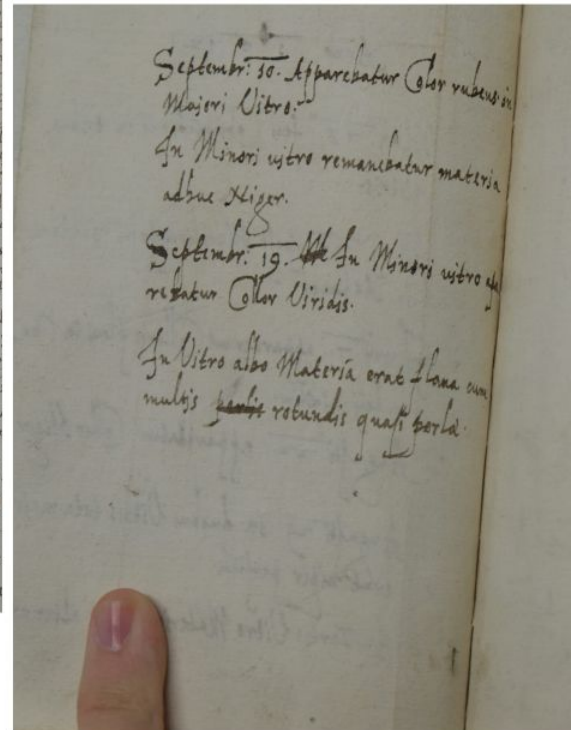
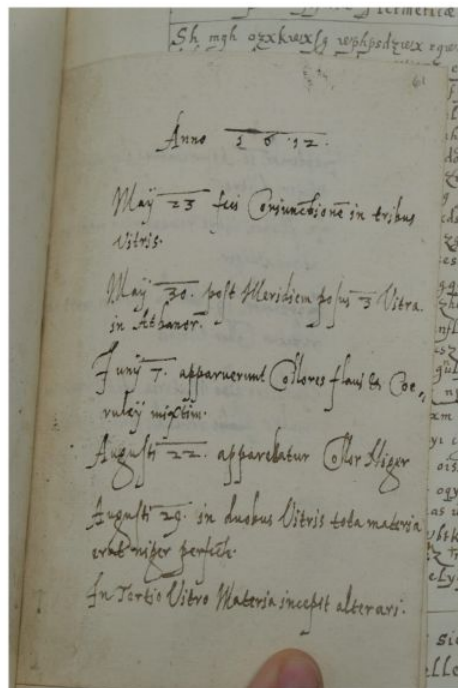
August 22nd: black colour appeared

August 29th: in two vessels all matter was completely black. In the third vessel, the matter has started to change.

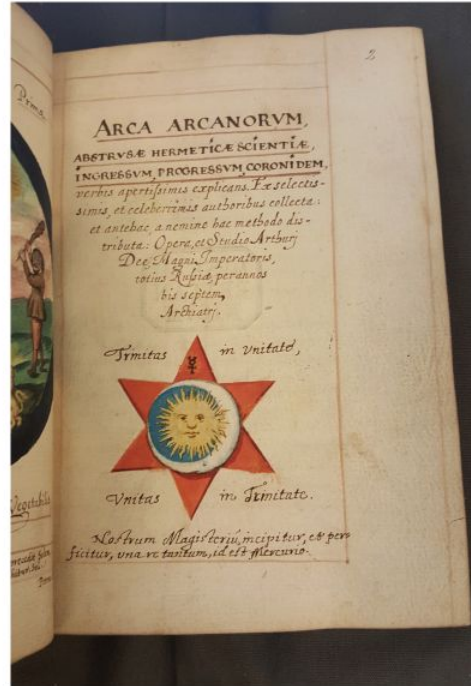
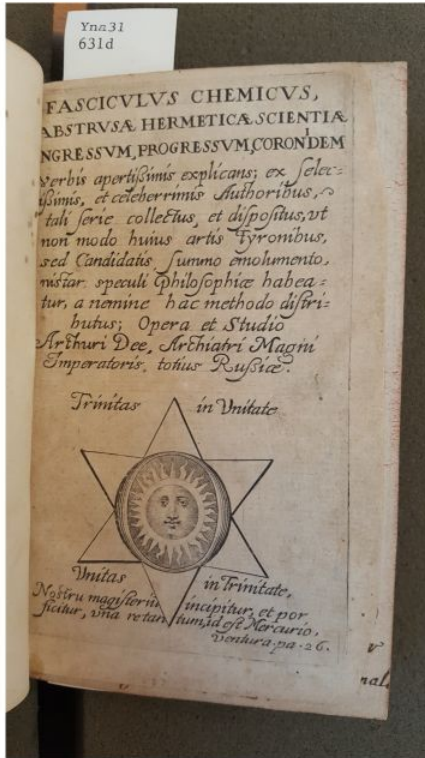
September 10th: Red colour appeared in the larger vessel. In the smaller vessel, thus far the matter remained black.

September 19th: In the smaller vessel, green colour appeared. In the white vessel, the matter was yellow with many pearl-like spheres

An Alchemist's Lab Notes



Arca Arcanorum– dating Arthur Dee's success



Thank you!

Publications:

- [HistoCrypt proceedings](#)
(International Conference on Historical Cryptology)
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Media mentions:

Science et Vie, Atlas Obscura
(translated into French), Jargonium
blog about Chemistry, The
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In this article

Introduction

Production and description of Sloane MS 1902

The Marrow of

Abstract

This article presents the decryption, historical analysis, and alchemical interpretation of an alchemical cipher found in a shared notebook of John and Arthur Dee (British Library MS Sloane 1902). The cipher is an early example of a Bellaso/Della Porta/Vigenère type, a strong encryption method which was historically deemed indecipherable. The essay explores the medical and alchemical context for the manuscript into which the cipher was copied and provides the transcription, plaintext solution (in Latin), and English translation of the encrypted text. Further, it interprets the enciphered text through the lens of alchemical

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Academic rigour. Journalism flair.



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What secret alchemical knowledge could be so important it required sophisticated encryption?

The setting was Amsterdam, 2019. A conference organised by the Society for the History of Alchemy and Chemistry had just concluded at the Embassy of the Free

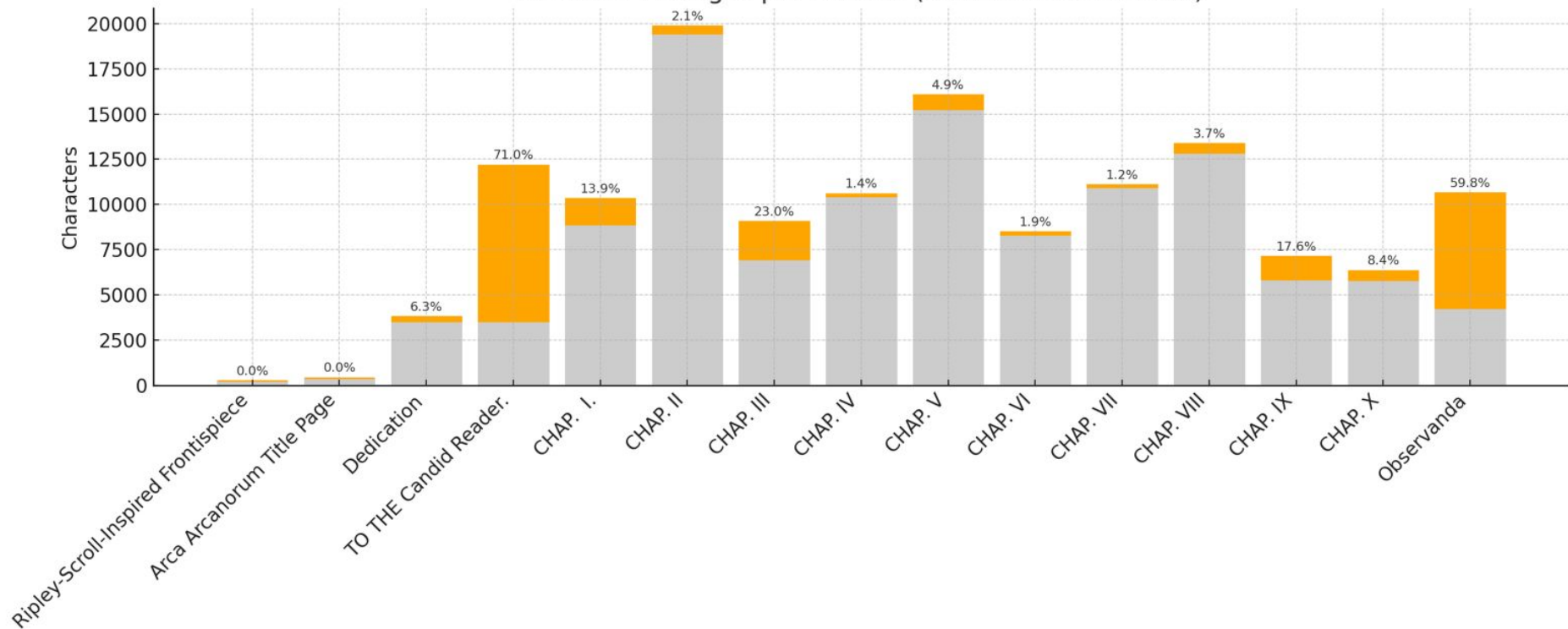


Extra Slides

Tracking the Changes

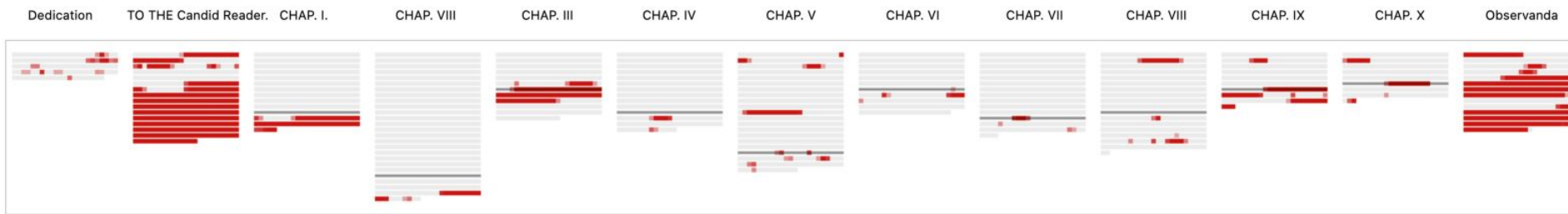
Between the printed *Fasciculus Chemicus* (1631) and the manuscript *Arca Arcanorum* (1634)

Extent of Changes per Section (absolute and relative)



Arthur Dee: Changes between *Fasciculus Chemicus* and *Arca Arcanorum*

Each block corresponds to one section (Dedication, Candid Reader, chapters, Observanda). Within a block, segments of the text are laid out left-to-right in lines, similar to written text. Light squares indicate unchanged segments, darker squares indicate segments with more changes (insertions in the manuscript). Horizontal lines mark the start of corollaries within chapters.



TO THE Candid Reader. CHAP. I.

CHAP. VIII

CHAP. III

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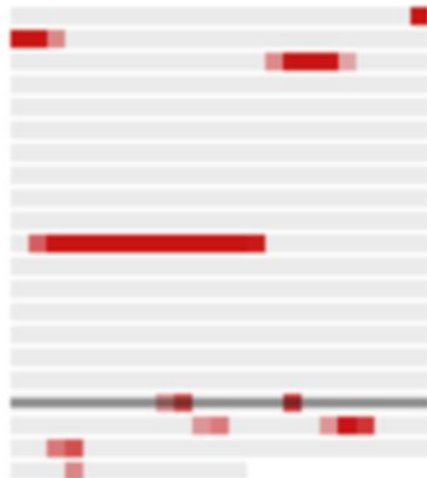
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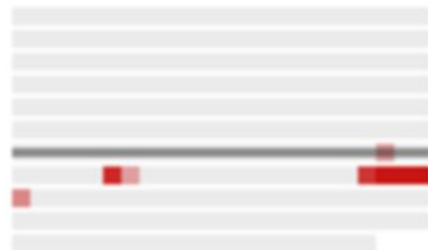
CHAP. IV



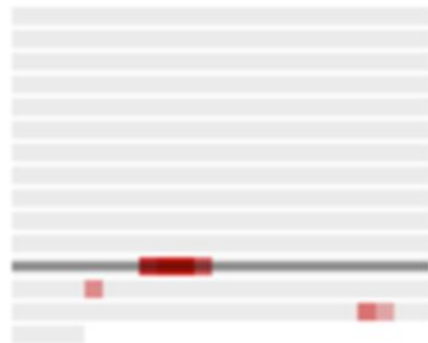
CHAP. V



CHAP. VI



CHAP. VII

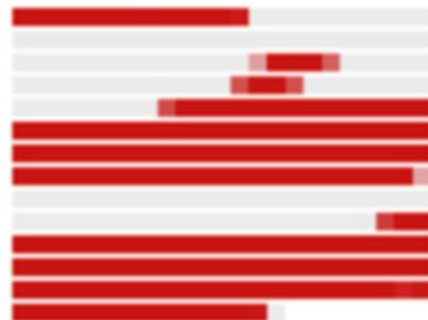
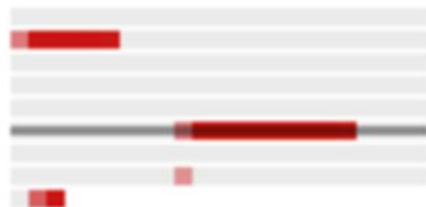
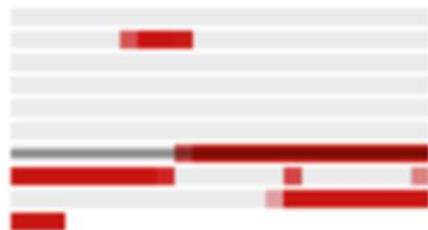
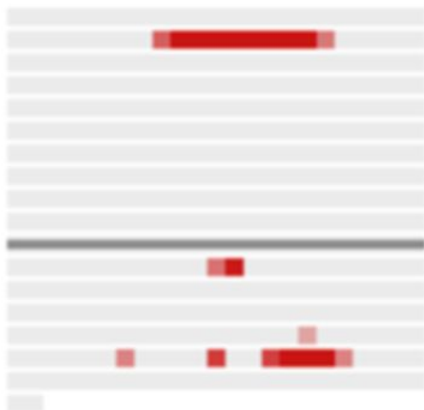


CHAP. VIII

CHAP. IX

CHAP. X

Observanda

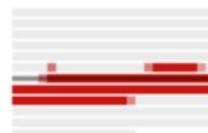
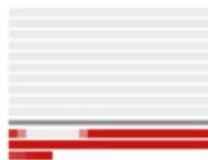
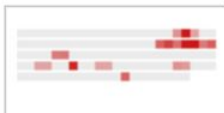


Dedication

TO THE Candid Reader. CHAP. I.

CHAP. VIII

CHAP. III

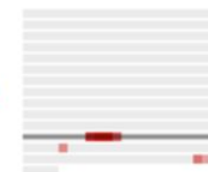
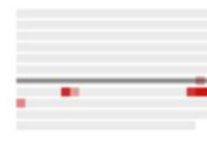
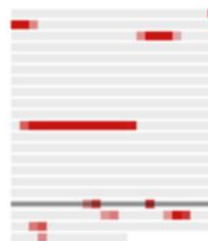
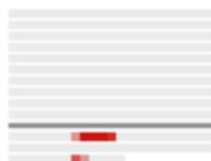


CHAP. IV

CHAP. V

CHAP. VI

CHAP. VII



CHAP. VIII

CHAP. IX

CHAP. X

Observanda

