Beinecke MS 408

A Transcription Based on a Revised Version of Takeshi Takahashi's Transliteration

Alexander Max Bauer

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1 Introduction

In Section 2, mainly to promote easier readability and comparability, a transcription of Beinecke MS 408 is currently being developed, based on a transliteration by Takahashi (1999). To achieve this, Takahashi's transliteration is obtained in an automatically capitalized version of the European or Extensible Voynich Alphabet (EVA), using the Interlinear Transcription Archive Extractor by Schwerdtfeger (2004). It is then converted back into glyphs using a font by Bettencourt (2019).

Using the manuscript's reproduction in Clemens (2016) and the scans provided by Yale University's Beinecke Rare Book and Manuscript Library (2004), Takahashi's transliteration is compared with what I am able to make out of the manuscript on a best guess basis. In total, I made changes in 394 places of Takahashi's transliteration. Changes to Takahashi's reading are highlighted in orange:

- Glyphs that I interpret in another way than Takahashi or that I add to the corpus are printed in orange, showing my interpretation.
- When a glyph has been deleted by me without replacement, this is indicated by \varkappa .
- Removed spaces are marked with \frown and added spaces are indicated by \smile .
- Added paragraphs are represented by ¶.

Especially the recognition of spaces in running text is, as Takahashi has already noted, sometimes very difficult. Therefore, my adjustments in this—just as in any other—regard should be taken with a certain amount of caution. Note that places where the writing is interrupted by illustrations are marked by em dashes (—).

Each line of the transcription is preceded by a locator in square brackets, informing about the element a line is part of (i. e., paragraph, title, or label) and assigning the line a number. For example, a line located at [P2, 9] is part of the page's second paragraph (P2) and is counted as the overall ninth line (9) on this page.

Additionally, in Section 3, some basic analyses are presented. First, in Section 3.1, glyph frequencies are counted. In Section 3.2, then, entropy is calculated.

¹ Hence, changes that Takahashi made to his transliteration in subsequent versions are not included. Further note that Schwerdtfeger (2004) builds on an online archive of Voynich transcriptions maintained by Jorge Stolfi (1998). For a general overview of transcription efforts, see Zandbergen (2023).

2 Transcription

Folio 1, Recto

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[P3, 11]
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Folio 1, Verso

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[P2, 5]
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Folio 2, Recto

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Folio 2, Verso

Folio 3, Recto

[P3, 15]

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[P4, 18]

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[P4, 19]

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[P4, 20]

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Folio 3, Verso

[P2, 7]

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Folio 4, Recto

Folio 4, Verso

[P2, 7]

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Folio 5, Recto

[P1, 1]

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[P1, 2]

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[P1, 3]

toarro otlar ero sarro otles eros otles otles otles so
[P1, 4]

Folio 5, Verso

[P1, 1]

Notice of the of the

Folio 6, Recto

Folio 6, Verso

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[P1, 1]

Noa? 9 2a? accila? toa? co? attag 2 aca? aa? offag

[P1, 2]

occ2 aco? actteg toclaa? aca2 obarro lace aco? acar.

[P1, 3]

toar? attg acox ooacoattg aclasog attg offox ?gaco?

[P1, 4]

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garb da cobay bay offor offg boxboy
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[P2, 6] 1 cost coeffice coeffice octo2 gotog 8a\\V ctrog 80g 9000 000 01000 tolog occo 809 cto7 cto8 S 10 (cc. 20)

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[P2, 11]

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Folio 7, Recto

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[P2, 0]

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Folio 7, Verso

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[P1, 1]
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[P1, 2]
crocro ctro sann tollo cretico sann ctros ctro ctros
[P1, 3]
tollos sollos critico licto lo so creco os crecos so
[P1, 4]
croffeced occar crocro sand cho licto chos secce sos
[P1, 5]
secosann tolloso creco ficeo
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Folio 8, Recto

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[P1, 1]
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 [P3, 14]
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Scrop Sars
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Folio 8, Verso

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       7089 \text{ creas } 7089 \text{ creas} 
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       G1B90S
[P2, 12]
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Folio 9, Recto

[P2, 6]
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Folio 9, Verso

[P2, 5]

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[P2, 6]

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[P2, 7]

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[P2, 8]

2011 danny totter rolled — sard

[P2, 9]

danny crop thore croft sard — ottore

sanny

[P2, 10]

off theore crop crop thoth

[P2, 11]

octor credito off thanny

critanny ether crop

Folio 10, Recto

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[P1, 1]

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[P2, 6]
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[P2, 7]
8ccg tollewog glecarry offg 8arry effe — 8arry 8arr ag
[P2, 8]
tollewor coo? offog crog crogo? — crog 8arry 8ar
[P2, 9]
oglicror coo? croq crogo? — crog 8arry 8ar
[P2, 10]
offofor offor ceteg effeor ocarry offorry
[P2, 11]
Poollewo croo? tollo tollor effeg 8 — offar
[P2, 12]
Poolarry 8arry tollor
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Folio 10, Verso

[P1, 1]

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[P2, 4]

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[P2, 5]

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con office sand totage

con office sand totage

con office con con totage

Folio 11, Recto

[P1, 1]

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[P1, 2]

2 octhoosy toso? 9 thicy sann offers offerolly through sann

[P1, 3]

totag crog ctog so? 9 those crotag sann crand sann ses

serog crog through so sann

[P2, 5]

There is the start of the start of

Folio 11, Verso

[P1, 1]
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[P1, 2]
choop dy cicting cicting danny day — glicing danny derg

cooperate diction death of the day tolled — olly crop dy dy

tolled cooperate cicling day tolled — olly crop dy dy

tolled cooperate cooperate cooperate day

[P1, 4]
tolled cooperate cooperate day day — office the diction of day

[P1, 5]
Cooperate cooperate cooperate day day — office day are

percor licing door office day day

Folio 12

Folio 12 is missing from the manuscript.

Folio 13, Recto

Folio 13, Verso

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[P1, 1]

floar? citlored offices offices offices offices

[P1, 2]

offices to floar crosses offices cities crosses

toffices to flos crosses offices cities

[P1, 4]

oge crosses offices offices

[P1, 5]

toffices darred
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Folio 14, Recto

Folio 14, Verso

[P1, 1]

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oliano? Sang that only and attention offano?

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offano offano?

offano offano offano offano offano offano?

(P1, 6)

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Folio 15, Recto

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[P1, 1]

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Folio 15, Verso

[P1, 1]
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**cor or oro or annothing than offer or so [P1, 3]
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[P1, 4]
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[P1, 8]
offer or cor or or only off cor sand
[P1, 9]
offer or cor cor cor cor cor offand
[P1, 10]
Cor cor cftond cftor tolland
[P1, 11]
Corond cftor cor cor sand find
[P1, 12]
sand cftor cor cor cor

Folio 16, Recto

[P2, 5]

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[P3, 10]

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Folio 16, Verso

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[P1, 1]

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[P1, 2]

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p1, 3]

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[P1, 4]

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[P1, 5]

offero enoting enor enox offero san

[P1, 6]

Zor entor other enterox sancy
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Folio 17, Recto

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[P1, 1]

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[P1, 2]

gda.? ccolly ollety toda? effects do? office todeffeg od?

[P2, 4]

**Theos dog tollog to? oga... ofgdg — Zos gferg gfa.s

[P2, 5]

gocelleg effeg co? do? effec? effects og da.? effect tode

[P3, 7]

If de to tollec to corder ferg — de.

[P3, 8]

decey dogera? Zera? gferg

Ba? cca? deco? da... ofgg.

[P3, 10]

da? cca? deco? da... ofgg.

[P3, 11]

offices effect? offices da...

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ground offices delices d
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Folio 17, Verso

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Folio 18, Recto

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[P1, 1]

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Folio 18, Verso

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[P1, 1]

**Thogo coop office office of office offi
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Folio 19, Recto

Folio 19, Verso

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[P1, 1]
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[P1, 2]
follow flow 20\ follow \\
[P1, 3]
office coop sa\\\\ follow office sa\\\\\
[P1, 4]
office coeffe follow sa\\\\\
[P1, 5]
follow follow sa\\\\\\
[P1, 6]
occop loco\ coeffe coeffe \\
[P1, 7]
occo\ coeffe \\
[P1, 7]
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Folio 20, Recto

[P1, 1]

Notice of the control of th

[P2, 5]

Throoffing molloanny off mechy offers docanny?

[P2, 6]

mocco offero? follog mechy sanny may monny sanny

per, 7]

omogened sanny molleog mog sog etog offanny

[P2, 8]

Comosany moc ? mecoso

[P3, 9]

Toodeco dody tottong tottong toothy orothogogo

[P3, 10]

ootoall oroof dody toodall orothogogo orothy dog too

[P3, 11]

dool tottondy offers tottong domall orogody

[P3, 12]

doll oroody offers offers they tottong dall dark

[P3, 13]

ootall oroof oroof orony they

Folio 20, Verso

Folio 21, Recto

[P1, 1]
Theor occoeffics objects offered to the code offered o

[P2, 4]

Toology dann offern offern forces for the force of the force

[P3, 8]

The older offor the operation of the objective of the objective ofform office office

Folio 21, Verso

[P1, 1]

Those of a color of the control of the con

Folio 22, Recto

[P1, 1]

Top open fecosy took offers offs offs offs sann offers 2 octos
[P1, 2]

or on the tollers sann offs tollers sann offs offs sand effects
[P1, 3]

tollog softs no lot tollers sann offs offs sand offs offs softs.

[P3, 7]

Moros dos socos ello cesoso offarro of — offero etas

Boros offo sarro theoso tollo confarro confero — sorro secos

Boros offo sarro effecos ofarro

[P4, 10]
| Kocog ceof dann officent decof cecof tollog do — ofceog ogdang
| P4, 11]
| donn officed tollog olf offogdo off dog of — deceg dann
| P4, 12]
| odceann office olf ceof decog dann — oddann
| P4, 13]
| decof dogdan tollog olf ogolfan

Folio 22, Verso

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[P1, 1]

**ToZarrior office of
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[P2, 6]

Thoo to the following the proof of the proof of
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Folio 23, Recto

[P2. 4]

tollogog ollariz ollariz ollariz ollariz ollariz ollariz ollariz ollariz

getor tollariz ollariz ollariz ollariz ollariz ollariz

getor tollariz ollariz ollariz

[P3, 6]

Thereographically offs and offs series sand offers seas?

[P3, 7]

offar operar tanno tollerog sar tollerog santo r og sanno agg

[P3, 8]

tolleroge car sanno tolland ogog toand offers 2 — sing offers

[P3, 9]

offog off to tollog so — sog stee tolleres og ogo — sanno sag

[P3, 10]

toll offand elleroge - offers osag erag so — sar offand

[P3, 11]

offollo sagoro

Folio 23, Verso

Folio 24, Recto

[P1, 1]

107079 cco7 ofca7 &c cco9 8a110 o7 totally of obard offartheas offartheas offartheas 9 cttca? cttcax olfox tottar cttcg of cectleago ettea? coo? cecce 8a 1807 cro 7 crcg cttg cttc 1608 occco2 ctlco7 otlag toctlcog tollg *162 cc162 ccc02 cttog todog octo7 2 08 toca7 8a110 tollcog 08a110 clicar toda1 the soc dag 7. 07 cta? co? 2 a8 ccotla/10 89
[P1, 11]
[P1, 11]
[P1, 12]
[P1, 1 tollers tollers flog flos effes Socos of S coco coche Sas too ceces too cear offeas S 208 20 Sosso Sosostao ट्टंबर जीटबर ठवर ठवर ठवर ollo posto pato pollo estis ${\displaystyle \mathop{\mathsf{o}}_{\scriptscriptstyle{[P1,\,19]}}}^{}$ cros cros 8a11) cros 8 909 for crop tog offarteg Sagczoggo

Folio 24, Verso

```
Horosar crockes ofor those crokes of those of the solution of the second of the secon
 ossilo sossilo Sossil
 octtog oscocco occarco ollas coctto
 98ag & olfog olfarry 08arry 890S
                   090 900 110 Accas 090
  [P2, 6]
                  Mocros coo characo
 .
gczcog da\d da? ogog
[P2, 8]
                    Poclo cotto cos Savo
 9009 cros of crofos
offoco? cffcco8 cco9 ffcog
 98a110 ccco? todog oloda110 [P2, 12]
                   lico toa? etto do tolle ollege
 occes acor as odo? To do offorodag _{[P2, \ 14]}
 80117 ccco8a8 to to 89
offcog 08a118
```

Folio 25, Recto

[PI, 1]

Tooges cooks sand office toos sand occors ofters of conformation office toos of compassion office office

Folio 25, Verso

[P1, 1]

Toccarry follo do sarry folloco offeco folloco? CoC

[P1, 2]

Seco? effeo? ero? sarry 2 offecarry sarry effeco? Soc

[P1, 3]

oreco feco? erox sarry effeco? sarry secret sarry

folloring folloco dos sarry effecar effecox sarry effecar

[P1, 4]

folloring follocox secox sarry effecar effecox sarry sarry

sar eroffecox secox secret focox sox ero sarry sarry

follocox ocox follocox follorax — erox erary secarry 2

odo erfecy sarrox sarry deeth — orecarry

Folio 26, Recto

```
[P1, 1]

The colly obanged from the collection of the collection o
```

Folio 26, Verso

Folio 27, Recto

```
[P1, 1]

[P0, 2]

89 coard tog sard sare togard togs— tos care
[P1, 3]

cos tog theorem tog tog tog tog tog theog sare
[P1, 4]

†olleg too tog tog theory
[P1, 5]

80? telee theo tog theory
[P1, 6]

cos theory
[P1, 6]

cos theory
[P2, 7]

fletog tog theory
[P2, 8]

9fletog tog theory
go theory
go
```

Folio 27, Verso

```
[P1, 1]
Tocol col co do 2009 dos offico? ofco? fleoreo?
[P1, 2]
8cg colla? offico do sca sca? cosa officos do sca sca?
[P1, 3]
Ifaco fleo scollag scol sca? cosa officos do sca fleo soccos
[P1, 4]
offico co flecos cos cos flos — o offico soccos
[P1, 5]
tollo defico 2cosa? defos — coffico soccos
[P1, 6]
sho fleo to 2cosa? defos — cofficos
[P1, 7]
do do offico deso — sca cos — cofficos
[P1, 7]
do do offico deso — sca — collas
officos officos fleos
```

Folio 28, Recto

[P1, 1]
Toosar dos coctos ofcos sanno — officos costo segente officor officor

Folio 28, Verso

```
[P1, 1]

| ltdog toolly do? ttdolly detter tolly 89 do?9

[P1, 2]

olicogy tolly as 89 tolicog aco? ttag tolicos9 aco? o

[P1, 3]

co? acog acy acolly
```

[P2, 4]

11/2011 - The control of th

[P3, 7]

Toog ond ond the dand of the sand of the sand

Folio 29, Recto

```
[P1, 1]

To2a11 & call off and total off and total off according [P1, 2]

8 of graph of and off and according and for any form total off and for all off according and for all off according and form of according to for according to for according to for according to according to
```

Folio 29, Verso

Folio 30, Recto

```
offectop acq dotacq tacosq deq they act so deq per 29 offectoq acq affectoq theorem according act so decq offectoq act offettoq act off
```

```
[P2, 8]
of trop of circles decree decree of trage — series decree of trage of trage — series decree decree
```

Folio 30, Verso

[P1, 1]

cftc2cftcavd &co2avvd crocftce of or ctfce of decavvd

[P1, 2]

tottcoof ce of de tecof crof bloof of ce of davvd cftcoff

cooftcoof davvd cftcoff dove dovvd davvd crotfcoff dag cettorfte

[P1, 4]

oftce of davvd croff crocfte of tottcooff day cettorfte

[P1, 6]

tottcooff crotfoff cettoff

[P1, 7]

crotfce of crotfoff cettoff

[P1, 8]

ogde crotfoff cfcoavvd cftco

[P1, 8]

tottcooff croff croff davvd cftcoff

[P1, 10]

cooffce offce offce davvd

cooffce croffce davvd

[P1, 11]

Folio 31, Recto

offco? arrefteg

```
Probable to the South following the followin
         80000 January Collect S and collect total
tolleg ecco sand tolleg fant eccles sand seg
total ccg 8al so \leq al cccc llccox ccc80 tollcg [P1, 5]
         90010t 0800055 (111B
         Theolicoso tolicos tolicos ecctar ecoso ? and sag
per, 7]
glice da? Zarri cocofficos cocos folicos glicedo cocos gos
[P2, 8]
cocos folicos cocos cocos folicos cocos cocofficos
[P2, 9]
         80117 Ecco Ecttog offcog
[P3, 10]
        Those and offices tolless tolless tolless sar acording
oxéccox tollers dax ency decy lety lees offarrid splecy _{[P3,\ 12]}
†οαινθ 9σες ο Μεδο δες σες σεςδαινθ δα?
obsolo Gilbe obsos so Silos
octobar choog collo ollobar
```

Folio 31, Verso

[P1, 1]
Toda \ ? &ccess offices offices toffogetee 2 a ? a? offices offices age
[P1, 2]
officeo octives officeo eccoss offices focoss sand eccoss focoss
[P1, 3]
officeo sand &csos offices offices offices offices offices
[P1, 4]
san? effices toffoss offices eccoss offices ag octives offices
[P1, 5]
office eccoss a? and

P2, 6]

Toccoso tot occos occition of occitions of occit again of a theo offar

[P2, 7]

og ficeday occi occi ficeog occition offag offag offa occided offar

[P2, 8]

off and occided offaces occided offaces occided offag

[P2, 9]

officecog occided offaces and antificed occided occided offaces

[P2, 10]

sar occided offaces occided offaces offaces offaces offaces

[P2, 10]

sar occided offaces occided offaces offaces offaces offaces

[P2, 11]

Zand offaces occided offaces offaces offaces

Folio 32, Recto

```
[PI, I]

Toolid deglicos salvos salv — do too off too
             .2020 Potor Cocord clip sas — 8ctobar fothcos
   tollcrof crof ettrog crog sog — scrcosand sand
  toffers toffers sand
[P2, 6]

Laco Hace aces
   offor sox ox sar?
  †oa? 8a\\V 8a8
   8011cco2 8a29
[P2, 10]
8cto? cffco 8a\\\\
[P2, 11]

cto2 cccffcox \(\bar{V}\)

[P2, 12]
           ट्टें08a110 ट्रीं08
             office of sand sand cttog
 [P2, 14]

Cocco toll occo sand offer
 tollary tollog 80117 og [P2, 16]

Tollarog acco 2019
   [P2, 17]
  حدهالاده الادمال المراقع المر
los scros sas
```

Folio 32, Verso

```
[P1, 1]

| The cosann cos | The cos follows of the same of the sam
```

[P2, 7]

Ilito cto? to tecanno officeo dan — tetto 2 odal

[P2, 8]

officeo danno danno effeo danno toffano — officeo de tea

[P2, 9]

tofficeo effeo effeo effeo danno effeano — danno

[P2, 10]

to lleo ero? ero danno effeo effeo da — a?

[P2, 11]

og to ero

Folio 33, Recto

[P1, 1]

The sar also actes of the so of order of offered offered offered sand

[P1, 1]

offered to the action of a sand offered offered offered offered offered

sond of action of the so action offered offe

Folio 33, Verso

```
[P2, 7]

**Thicks of the solution of the solut
```

Folio 34, Recto

```
[P1, 1]

**Tercoefferg oga? gg — gfo3g offe803g et03 ogog3g 3a? gffeg
911a7 &cco89 08a8 — octtcc89 offc89 cc8a10 081c9 ffc9 ffc9
toticog crotig crosses — 8a7 cros oticog totig olicog 8089 obg llag _{\mathrm{[P1,4]}}
      9tc89 8a11 cc9 a11 — co cctto 9
      folicoso coso coso og — olico a2 — oglicoco olicos sag cocilio
offeds welled welled ors — weld — offeeds well offed offed of 0
tollodg dag codg — ogcog — gllcoxg — dann collg tad and agg
      Lotterg tollg — ogli — ercetteg — glicog tollerog 2 at ogoan
9/10089 108 — a7 — ccott — atto — 92a 17 a 17 cco8a7 flag
      obsecto flosago offarro sarso
      There of cells of market and cells of the same of the 
†olicco & lagoarro — ceclo ctesago oticeso cetto 2011
.

cca? a\\dolon olfo? a? Hog — folfa? ccolfcg cc8ag lfc8 folfa? a? 8a\\dd 8a\\
gho sof occo oso — ollaso flocoso tolloso coof af a1110 8aso _{[P3,15]}
\stackrel{\cdot}{\circ} of at 9 lat og ag off — cross to lag cross crefteds creft satas
      2a17 acla? aclfo chell — acosaceso tolleso of accosacetto
```

Folio 34, Verso

[P1, 1]
[Pacoso coso culturo deso totales desoso cuesares oftes cultus 2tanol [P1, 2]
Those tollows socies ollows cultus cultus custos cultus cultus could societ and order oftes cultus cultus

[P2, 6]
There da? Lea? to the day to the edge of the day of the da

Folio 35, Recto

```
[P1, 1]

cffroo? crops cffrs croffs cra? 39

[P1, 2]

tollicann crollann tollicas anno

scanno cffrcs tollicus flann cffro?

[P1, 4]

tollicus chilicus cffros crocs sanno sanno

[P1, 5]

offro? cho flacces crocs sanno sanno

[P1, 6]

cranno cra? crad sanno

[P1, 7]

chollicus flanno sanno

[P2, 9]

tanno cranno cffro cracs cracs sanno

[P2, 10]

o anno cranno cffro cracs cracs sanno

[P2, 11]

chaccanno cros cffranno scanno scan san san san asso o

[P2, 12]

oso? cra cranno cra flanno flanno flanno

[P2, 13]

tollono cranno tollicus offro? sanno cffranno

[P2, 14]

cffros cros anno tollicus offro? sanno chos tollanno

[P2, 15]

ocro? 2 crnno sanno offano? sanno chos tollanno

pre, 15]

ocro? 2 crnno sanno offano
```

Folio 35, Verso

fa? cco? ccocffcg ?oa\\dagger a? totlarg offaceg llaco? offa Boro For collo sally [P1, 4]
offce folice for offe Scroller croeffed creffed? Los flaces affecces actesive The golf os cos for Sarry 00110 Hero? to to the strong 8 9905 9aSon وعدماً †offceccann ceosann 8000110 80110 80110 809 8 . og cta? oð a? ctca? Mercan 29 Mar 3and olfog croog offerg ffer 98axid offcc9 8axid Barry gard cellago ceogo 8 000 Polices Possibot Pinas Scrolleg gloss cros sarry 80110 CO2 CO2

Folio 36, Recto

```
[P2, 4] To 3a \ \? cft 9 to 9 fcc 0 x \frac{2}{9} cc 9 sc 9 fcc 8 a ? [P2, 5] 3a \ \) to ? cc 9 cft 0 x 9 ? \frac{2}{9} cc 9 sc 9 fcc 8 a ? \frac{2}{9} cc 9 sc 9 \frac{2}{9} cc 9 sa \frac{2}{9} cc 9 sa \frac{2}{9} cc 9 fa \frac{2}{9} cc 9 fa
```

Folio 36, Verso

```
[P1, 1]
Tocalaly totology coannil therey exetting offannil efteal sannil
total engress sannil offannil totology offan octol exetty efteal son
[P1, 3]
sergificing offor 2 — offannil totology offan offerannil
[P1, 4]
totherol off to so — sannil efteal
```

```
[P2, 5]

Thereof effeon dann effecta?

[P2, 6]

Sann effeor sann sag sg2

[P2, 7]

Tolly leog offeror of ero can

[P2, 8]

offer goffer sog offes goff of goff of goffer goffer goff ero ero ero effect goff of ero effect gof
```

Folio 37, Recto

```
[P1, 1]

1 foctog cannot tollor of cor off coro sanno offos or [P1, 2]

9 flonn cftcor offanno tollor offos tolland co offanno foctog tolland cftcor offanno
```

[P2, 4]

Toollog sann oftog sar ong sann — 98

[P2, 5]

9/19 tollog tollog offog

[P2, 6]

ctor ctog tollog tollogos — song sann

[P2, 7]

207 ong 1/07 tollor sann

[P3, 8]

No.10 ccorosg tollarid ctorg offag — ctor ctcor sar

[P3, 9]

gliccosg tollarg gliarid ccg tollor—sg — office gog sarid

tollo ollacoccor sacor ccg ctg sarid — gaccg llog sarir

ollacor sarid cffcg sard sarid

Folio 37, Verso

```
[P1, 1]

| fictody toothey tothogogy croffsand cog [P1, 2]
| 80? crog ctro? o?cro cro? dann)
| folicrod cty crod dann dy decor defined decor decor dann)
| 8ctor defined decor dann
| P1, 6]
| golfor other offcand dann
| p1, 6]
| golfor other cannot offg
| p1, 7]
| tothcor dann
```

[P3, 14]

Thosand ctann ctropose

[P3, 15]

20110 ccollog sand sand

[P3, 16]

Tothor sand ccothand

[P3, 17]

201100 tothon dand sand osg

[P3, 18]

office sand sand osg

[P3, 19]

sand thond tothog sand

[P3, 20]

occothacy offor sand ctrope

[P3, 21]

occothacy offor sand ctrope

[P3, 22]

Tothog offord coothacy

[P3, 23]

Folio 38, Recto

```
[P1, 1]

Thoso? crocifics — olly crown ollicos ogg olly

[P1, 2]

ollicos crosso? — ofform offarm offarm offarm

tollo? ollarm — offarm tollicos crollollo?

[P1, 4]

garoll cros crotit — cro cello? osam dann ogg

[P1, 5]

ollo? cros llard — cro? offo sand offogs

[P1, 6]

garo coo llos — sand ollog crocro? sand
```

Folio 38, Verso

```
[P1, 1]
  office of crop chotog offices offices of crop & and & and & [P1, 2]
  ctonn chotog fice cho on on offices and control offices for the crop offices fices and offices fices and offices fices and offices and offices and the control offices and the control offices and and and files fices fices fices and and and files for the control offices and and and files for the control offices and and and files for the control of the control o
```

Folio 39, Recto

[P1, 1]

The so are a cheer of as and each term of or and are than of other soft of the so

[P2, 6]

**Tecology of the state of the stat

[P3, 10]

**Tecolor decolor are anterested and anterested anterest

Folio 39, Verso

[P1, 1]

#8a\? cc89 #8911a\D o? a\? &c911a\\\D o#c09 11a? o? a\\D &ox 119 o&&9

[P1, 2]

20? &g 110? cc0x totto 11cc89 ox 119 80? cc89 of 1a? ox 11c8a\\D o&9 89

8a\\D cc0? of 1a\D of 1a\\T cc089 2a\\D o? a\\D to 1a\\D of 1a\\D of 168a\\D of 168

9 of 1cc9 cc089 ccc0? a\\D of 1689 cc08ax of 1c89 to 1c89 8ax o? a\\D &f 1689

of 1c89 110? o? &c19 11a\D of 1a? o? a\\D of 1a\\D of 1a\\D of 1689

x 11c89 of 1cc9 &o? \tag{10} 1a\ \D of 1689 cc0 cf 1689

x 11c89 of 1cc9 &c0? \tag{10} 1a\ \D of 1689 cc0 cf 1689

x 11c89 of 1cc9 &c0? \tag{10} 1a\ \D of 1689 cc0 cf 1689

x 11c89 of 1cc9 &c0? \tag{10} 1a\ \D of 1689 cc0 cf 1689

x 11c89 of 1cc9 &c0? \tag{10} 1a\ \D of 1689 cc0 cf 1689

x 11c89 of 1cc9 &c0? \tag{10} 1a\ \D of 1689 cc0 cf 1689

x 11c89 of 1cc9 &c0? \tag{10} 1a\ \D of 1689 cc0 cf 1689

x 11c89 of 1cc9 &c0? \tag{10} 100 \ta

Folio 40, Recto

```
[P1, 1]

Taco Ilcosar agsgsg — tollg ollag 289 oglicsg offace ar orsanni

tollar ollar ollar sar — glaco Ilanni ollor aces ollar aragor

[P1, 3]

29 tollag as gar — glar ollor and ollogar tollar ollar

[P1, 4]

or and acellos sar — tollog ollanni ollar ollg ollogsg og

[P1, 5]

gollar tollar ollar — ollog og aces tollar ar ar or sag

[P1, 6]

Thor or ar and ollor of — ogaces tollar area Ilar oranni

gand acelland oll — gaces
```

[P2, 8]

| face | face & are are marked of and are face & are face

Folio 40, Verso

```
[P1, 1]

Tocosand occtanno ogso
[P1, 2]

Thosa? tolland og aras
[P1, 3]

Z anr and olland otlas

[P1, 4]

Tharand olland occtar

[P1, 5]

Zogand ollar ogg occtar
[P1, 6]

tocos and og occso sand
[P1, 7]

chosy tollog occso ar
[P1, 7]

chosy tollog occso ar
[P1, 8]

chosy tollog occso ollag
[P1, 9]

Thocosand occlar ollar og
[P1, 10]

Thocosand focso folland
[P1, 11]

Zoccso tollog occso sagor antico
[P1, 12]

goccclicco sand olland

[P2, 13]
```

[P2, 13]

Thocc? σε εθρ leebρ ορ terebρ tollebρ — δαινί σε εταιί
[P2, 14]

Zαινί ο ρσε ερ leecbρ οβα? tollebρ δρ — tollec? αξ σε δρ

tollec ερ tollec ροδρ ορ αιννί οβαινί ο εθε ρ — σε εσδ tarδρ

[P2, 16]

σε ορ leebρ ρορ αρ οβαρ το βρ leebρ ρ — σθε ερ το βαχ ξ

[P2, 17]

Thocc ερ το leebρ το lar το βρ leeρρ το βαχ σο ερ οβαρ το βαν οβαρ σε αρ οβαρ οβαρ — το βαρ οβαρ οβαρ σε ερ σε ερ οβαρ οβαρ σε ερ σε ερ

Folio 41, Recto

```
[P1, 1]

Taco licoarco olico acilica — otaco otaco talalicos polico araco olico technologia polico araco olico licoarco — otaco otaco otaco araco olico ilcoarco otaco o
```

[P2, 6]

checked formed folices melicos office — milimos offices for checks

[P2, 7]

farmes firmes offices folicos — offices milimos offices folices

farmes firmes offices folicos — offices milimos folices meets

and milimos folices melicos melicos — folicos melicos melicos folicos offices melicos melicos melicos melicos melicos melicos melicos melicos folicos folicos folicos folicos folicos folicos melicos melicos melicos melicos melicos melicos folicos folicos folicos melicos me

Folio 41, Verso

```
[TI, 1]
| Mcc2odag
| [PI, 2]
| Taccodo totaccito otado atechado — otacedo acetacito adacedo totas da?
| [PI, 3]
| Sacedo taceo 2 and acetaco otado otago — sand otago oficeo oficeo sas
| [PI, 4]
| totado otago totacodo oraceo electro otago — eleccodo totaceo otago acede
| [PI, 5]
| oaceo oraceo sand or aced otago oraceo oraceo oraceo oraceo otago otago oraceo otago otago
```

```
Folio 42, Recto
 Costa to otalia patracetto offices forca?
 Osymbarry Cells offcarry carres
Tocto celleta ceollar cears &ag
 Fire Fab Siallow Fallow Fois
toldar croctly crotlor toldar
 807a17 cca?
 र्रिट० ८९ १८४० १० २०१४ १० ५००
octog crec2 ettog cto7 ctog ettog cra79
+ offceo? offceog cffco fceo8al cellceo?9
colfs dog lícico efferd offog efferg crog — crog da \sqrt{0} [P2, 11]
. Screeg crop chor crollann croelly scffg — sand sage _{[P2,\ 13]}
to like colf colary crosarry barry — 8ag _{[T2, \, 15]}
 Tocoso offices sosarry
```

Folio 42, Verso

```
8chcg flowg g llowg colleg ctg 8al - 8al offog 8all
                  cio حماله وعلام من عمور من والم عماله وهواره وماله من المرادة من المرادة من المرددة ا
 †offceg celloeg 2a2 8g — o8arrs — glloeg ollog 83
 collector coco collar - of - of - of - or collar collar - of - of - or - of - or - of - or - or - of - or 
 offcollear creotlerar — 29 — Zarri ctrar 8ag
colf decolfeg flees \mathbf{8} — are fleezedg _{[P1,\,8]}
                  GIIDS RDBOS
                 Total of the state of the state
                  \mathcal{S} cos offers \mathcal{S} of \mathcal{S} or \mathcal{S} or \mathcal{S} or \mathcal{S} or \mathcal{S}
to all tolless less energy offcos -8 — they feall 8 _{[P2,\ 12]}
 coffeecy cox ox early officered — either flaxly 9 _{\rm [P2,\ 13]}^{\rm [P2,\ 13]}
to acq floof they accounting savid — acolling savid
 tother one they offer choose — 2a^2a^2 are a^2a^2
                  حزهاادع حرمع ماادع
                  02280 Follo
```

Folio 43, Recto

[P1, 1]

The rose in the rose of the restrict of the restrict of the rose of t

Folio 43, Verso

[P1, 1]

**T82a\?9 &ax11cocc9 &a x9 ccc11 o? a?osx x11co ? a?a\\\) ottcs9 o toxs9

[P1, 2]

**Ccc89 octto ottcs9 ccc89 &a? ccc2 to ottcs9 ott9 ottax89 toxs9 otta?

[P1, 3]

**Toss9 toxs9 tott coctto cclf0 ott9 ccs9 ottcs9 ottax\\)

**Toss9 ottos9 ccc2 a\\\)

**Ccc11 o? a?osy x11cocs9 ottos9 ottax\\

**Ccc12 ottos9 ottos9 ottax\\

**Ccc13 o? axoss9 ottos9 cct11cocs9

**Toss9 ottos9 ottos9 ccc11cocs9

**Toss9 ottos9 ottos9 ccc11cocs9

**Toss9 ottos9 ottos9 ottos9

**Toss9 ottos9 ottos9

**Toss9 ottos9 ottos9 ottos9

**Toss9 ottos9 ottos9

**Toss9 ottos9 ottos9

**Toss9 ottos9 ottos9

**Toss9 ottos9

*

[P2, 6]
Thoselicido olicoso tolicosos cicoso olicosos cicoso ticos os ticos os olicosos olicosos cicosos olicosos cicosos cicos cicosos cicosos cicosos cicosos cicosos cicos cicos

[P3, 10]

That coop at assat cos sassat colf offices coffees forces office offices off

Folio 44, Recto

[P2, 5]

100 dopto toticog cood ciclo decog office 8a\\0\
[P2, 6]

8dood office dop o occultary toticog office 8a\\0\
[P2, 7]

totico ot8 door toticog ooffe coog

[P3, 8]

They offered to free offered offered

Folio 44, Verso

[P1, 1]

There to the control of the

[P2, 4]
golfagos canno cor coroso cello co offico oficos ofo
[P2, 5]
oand cog ctto ctanno officor officor officor ctand
[P2, 6]
flog sand offano sog officand offolicos officor offano sog
[P2, 7]
offo ficanno cttos so coop

[P3, 8]

The coop effect of ode to the coop effo — of ode — og [P3, 9]

8 ho of effect of ode the coop effo effect of ode of [P3, 10]

get o follow the often of offer o

Folio 45, Recto

[P1, 1]

Tollosas cartes offs cas tot car ofcas ofcar ofcar

[P1, 2]

cor offs tollos tollarry cas cos slarry sar of

[P1, 3]

to cattes lacos sarry toarry offs carry slarry

gor of larry slarry

gor of larry slarry

gor of larry slarry

Folio 45, Verso

```
[P1, 1]

Notato culto Nox accop theory to the of offers so of the offers of the offers and offers a
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Folio 46, Recto

[P1, 1]

Toccofteg totless octly so octloss of octloss ocanno dece totless sand dece so sags
[P1, 2]

Posanno decess took decotloss ocethes sanno decilident decs xor and decethes
sanno deor star octloss ocethes
sanno deor star octloss ocethes
totless density decilis dec

[P2, 6]

The soft of the soft

Folio 46, Verso

Folio 47, Recto

[P2, 6]

Tog? acg 20 acg cog and cog and cog asg agg agg

[P2, 7]

2acc2g Maco? attand acg acg acg acg acg attag

[P2, 8]

colleg ag Maco8 acg ac attag acg attag

[P2, 9]

Tollo Mo? and ollag acg sand ollag acg

[P2, 10]

ag ollag acg sand sag

[P2, 11]

sto atg sand sand

Folio 47, Verso

```
[P1, 1]

The coll accor acordo at tag 2ag — 2arg

[P1, 2]

8th cop at a offico offico offico of acord — 8arro

[P1, 3]

Atop arar officos 8or officos at tag — 8arro

[P1, 4]

tothor according at tag — 6th officos at tag — 6th officos according at tag — 6th officos according at the first officos according acco
```

Folio 48, Recto

[P1, 1]

The dann of the good of good

Folio 48, Verso

[P1, 1]

The coders deceds the edge of and spleeceds the state of the edge of and spleeceds the edge of the edge o

[P2, 7]

Tools are considered to the constant of the constant

Folio 49, Recto

3 Analysis

3.1 Glyph Frequencies

Based on a transliteration by Takahashi (see Section 1), a first basic analysis of frequencies can be performed, by simply counting each Latin letter of the transliteration. This results in Table 1, listing all letters that are used.

Letter	Glyph	Count		
		Takahashi Takahashi/Baue		
0	0	25,468		
е	С	20,070		
h	5	17,856		
У	9	17,655		
a	а	$14,\!281$		
С	c	13,314		
d	8	12,973		
i	\	11,660		
1	9	10,518		
k	ľ	9,996		
r	5	$7,\!456$		
n	J	6,141		
t	11	5,968		
q	1	$5,\!423$		
S	උ	$4,\!501$		
S	ተ 2 2	2,886		
p	₹	1,406		
m	В	1,116		
T	Ħ	976		
K	ff	938		
f	₽*	425		
P	ť	224		
g	අ	96		
F	₽*	80		
I	τ	72		
x	ᆽ	35		
v	٨	9		
Z	Н	2		

Table 1: Letter frequencies in Takahashi's transliteration.

Determining what counts as one glyph, though, is in some cases an interpretative act. It seems straightforward to assume that σ and τ are one glyph (i.e., σ). Likewise, \mathcal{C} and τ could be interpreted as another glyph (i.e., \mathcal{C}). Additionally, one might interpret instances of \mathcal{C} , \mathcal{C} , \mathcal{C} , or \mathcal{C} as representing σ (or \mathcal{C}), on the one hand, and \mathcal{C} , or \mathcal{C} , or the other. Concerning those "gallows" characters, as they have come to be called, it is not clear whether \mathcal{C} and \mathcal{C} and \mathcal{C} are variations of the same glyphs, only diverging in one small loop (as Tiltman 1967 seems to have interpreted them). In the following, the four gallows will be treated as distinct glyphs, as has become customary. Accordingly, Table 2 gives frequencies for several σ combinations, taking into account four forms of "pedestalled gallows". The table also includes three instances that bear some resemblance to Latin abbreviations (also see D'Imperio 1978, p. 95).

Furthermore, while there are instances of a single ι , it is not clear whether instances like $\iota\iota$ and $\iota\iota\iota$ or combinations with ϑ like $\iota\vartheta$ or $\iota\iota\vartheta$ represent separate glyphs. Table 3

Letter(s)	Glyph	Count		
		Takahashi	Takahashi/Bauer	
ch	CC	11,008		
Sh	ત્ત	4,501		
cTh	c ¶c	950		
cKh	clfc	906		
cPh	ct° c	216		
cFh	ctc	74		
С	C	143		
СО	CO	9		
су	c 9	7		

Table 2: Glyph frequencies in Takahashi's transliteration for several σ combinations.

gives frequencies for several of those χ combinations. Assuming there are three glyphs χ , $\chi \partial_{\lambda}$, and $\chi \chi \partial_{\lambda}$, it is of course difficult to determine when there actually is a $\chi \partial_{\lambda}$ or a $\chi \chi \partial_{\lambda}$.

Letter(s)	Glyph	Count		
		Takahashi	Takahashi/Bauer	
i	١	590		
ii	\\	195		
iii	111	10		
n	J	148		
in	٧)	1,752		
iin	611	4,076		
iiin	1119	154		
iiiin	61111	2		

Table 3: Glyph frequencies in Takahashi's transliteration for several v combinations.

This being said, I tentatively stipulate a set of 22 glyphs. Table 4 gives frequencies for those glyphs. They are counted according to the following rules:

- The glyphs a, δ , c, δ , τ , φ , ϑ , o, \uparrow , \uparrow , \uparrow , \uparrow , and φ are simply counted as before. Hence, frequencies are identical with Table 1.
- The glyph \mathcal{L} is counted every time \mathcal{L} and \mathfrak{c} appear consecutively.
- The glyph σc is counted every time σ and c appear consecutively, as well as in cases where there is #, #, #, or # between them.
- The glyph ff is counted every time ff or ff appears.
- The glyph If is counted every time If, If, or If appears.
- The glyph f is counted every time f or f appears.
- The glyph f is counted every time f or f appears.
- The glyph $\sqrt{3}$ is counted every time $\sqrt{3}$ appear consecutively without there being a preceding second $\sqrt{3}$.
- The glyph \mathcal{N} is counted every time \mathcal{N} , \mathcal{N} , and \mathcal{I} appear consecutively.
- The glyph ι is counted every time it is not part of $\iota \Im$ or $\iota \iota \Im$ as well as in instances of τ .

Letter(s)	Glyph	Count (Percent)		
		Takahashi		Takahashi/Bauer
0	0	25,468	(15.636)	
е	С	20,070	(12.322)	
У	9	$17,\!655$	(10.839)	
a	α	$14,\!281$	(8.768)	
ch	cc	$13,\!154$	(8.076)	
d	රී	12,973	(7.965)	
k	ľ	10,934	(6.713)	
1	9	10,518	(6.458)	
r	5	$7,\!456$	(4.578)	
t	11	6,944	(4.263)	
q	†	$5,\!423$	(3.329)	
Sh	ત્ત	4,501	(2.763)	
iin	110	4,232	(2.598)	
s	S	$2,\!886$	(1.772)	
in	61	1,752	(1.076)	
р	#	1,630	(1.001)	
i	\	1,240	(0.761)	
m	В	1,116	(0.685)	
f	₽*	505	(0.310)	
g	ද්	96	(0.059)	
x	ᆽ	35	(0.021)	
V	٨	9	(<0.001)	
		162,878		

Table 4: Glyph frequencies in Takahashi's transliteration

3.2 Entropy

Next, let's take a look at the manuscript's entropy. To this end, I utilize the conceptualization of information entropy by Shannon (1948), basically measuring the variability of glyphs in the manuscript. Entropy H can be defined as shown in (1), where p_z denotes the probability of z, with z being an element of the alphabet Z.

$$H = -\sum_{z \in Z} p_z \log_2 p_z \tag{1}$$

To calculate the entropy, I suppose the above stipulated glyphs to form alphabet Z (see Table 4). Accordingly, changes to the corpus are made so that each stipulated glyph has a single corresponding character in the transliteration. Changes are made according to the following rules:

- The glyph α is represented by Sh in EVA. For calculating the entropy, every time S and h appear consecutively, they are replaced by 1
- The glyph σ is represented by ch in EVA. Every time c and h appear consecutively, they are replaced by 2. Following the above stated rules for glyph counting, σ is also believed to be present when σ and τ are separated by #, #, #, or #, represented by T, K, P, or F in EVA. In those cases, it is believed that #, #, or # are also present. They are represented by t,k, p, or f in EVA. Hence, they are replaced by 2t, 2k, 2p, or 2f.
- The glyph of, represented by z in EVA, is counted as ff, represented by k in EVA. Hence, every z is replaced by k.

- The glyph $\sqrt{3}$ is represented by in in EVA. Every time i and n appear consecutively, they are replaced by 4.
- Lastly, the glyph τ , represented by I in EVA, is counted as ι , represented by i in EVA. Hence, every I is replaced by i.

Calculating the entropy for this converted corpus results in H=3.866. As comparisons, Table 5 also offers the entropy values for the unconverted transliteration as well as for a randomly generated text consisting of 22 different characters and being 234,956 characters long (just as the converted transliteration).

Corpus	H
Takahashi	4.021
Takahashi (converted)	3.866
Takahashi/Bauer	
Takahashi/Bauer (converted)	
Random text	4.459

Table 5: Entropy (H) for different transliterations.

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