Applying cladistics to authoritative texts

The case of the Hebrew Bible

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New Insights in Stemmatology

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The Hebrew Old Testament or Hebrew Bible

The textual tradition

1. **Direct sources**: witnesses in Hebrew
   - Qumran scrolls (from III a.e.v.)
   - Hebrew medieval manuscripts

     Codices vetustissimi*/*optimi:
     - C. *Alepensis* (**925 e.v.**), incomplete
     - C. *Leningradensis* (**1008 e.v.**), most ancient and complete
2. **Indirect sources**: ancient translations (Versions):
   - Greek (Septuaginta, from III e.v.)
     - Codices *Alexandrinus*, *Sinaiticus*, *Vaticanus* (**IV-V e.v.**)
   - Syriac (Peshitta, II e.v.)
   - Latin (Vulgata, IV e.v.)
   - Aramaic (Targumim, VII e.v.)

👉 Direct sources in the original language (excl. Qumran) are **much later** and usually considered as **text-critically less relevant** than indirect sources in translation

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Medieval manuscripts of the Hebrew Bible

The XVIII century collations

The study of medieval MSS flourished in **18th century** thanks to the work of B. **Kennicott** and G.B. **De Rossi**

Kennicott and De Rossi gathered thousands of variants from about **1300 witnesses** of the HB:

- Kennicott:
  - *Vetus Testamentum in Hebraicum* (1776-1778)
  - 600 witnesses (MSS and printed editions)
- De Rossi:
  - *Variae Lectiones Veteris Testamenti* (1788; 1798)
  - 700 wits. (500 MSS, 200 editions)

👉 No other extensive collation of Hebrew MSS is available

Medieval manuscripts of the Hebrew Bible

Evaluation of the research on medieval manuscripts

- Scholars recognized that medieval MSS only differ in *minutiae*, and that the HB text is **substantially uniform**
- **One recension/archetype**
- Medieval MSS are considered as **useless** for textual criticism

Medieval manuscripts of the Hebrew Bible

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> An immense stockpile, indeed a terrible patchwork of mostly empty ears of corn! Through the use of these tools [...], through so much zeal, often bordering on enthusiasm, with which, until Kennicott's Bible appeared, the cause of the manuscripts was pursued, defended, supported - what great, glorious things have we achieved for the Old Testament? It is now proved that [...] the Hebrew copyists copied the text [...] with the most patient diligence, even with superstitious accuracy.
>
> Eichhorn (1789), 563

Medieval manuscripts of the Hebrew Bible

Evaluation of the research on medieval manuscripts

- Scholars recognized that medieval MSS only differ in *minutiae*, and that the HB text is **substantially uniform**
- **One recension**/**archetype**
- Medieval MSS are considered as **useless** for textual criticism

Almost all our evidence from medieval MSS would be explicable as a secondary development from a common archetype and practically all of if as belonging to one recension. Were it not for the disturbing 'almost', the whole chapter on medieval MSS could be regarded as closed and our apparatus be freed from them once and for all.

Goshen-Gottstein (1967), 84-5

Medieval manuscripts of the Hebrew Bible

Modern critical editions

Four main projects of critical edition:

1. ***Biblia Hebraica*** series (1905–1997)
   - MSS are **approximatively counted** (e.g. "*multi*", "*nonnulli*", "*pauci*" etc.)
2. ***Biblia Hebraica Quinta*** (2004–)
3. **Hebrew University Bible Project** (1995–)
4. **Hebrew Bible – A Critical Edition** (2015–)
   - MSS are **excluded** from the critical apparatus
5. Other **independent editions** of individual books:
   - MSS are **listed in full** from traditional collations

☞ Absence of a stemmatic classification of MSS

Medieval manuscripts of the Hebrew Bible

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Stemmatology and Hebrew manuscripts

Background

- Attempts at stemmatic analysis have been made at least since the 1930s
- The aim of (most of) these attempts was to trace ancient (i.e. pre-Masoretic) variants in medieval MSS, by looking for cases of agreement with ancient Versions
- "Classic" stemmatic analysis (groupingMSS into families) was not the main goal

Stemmatology and Hebrew manuscripts

Background: the traditional view

- Most scholars claim that traditional stemmatic analysis of HB MSS is either useless or impossible, because of:
  1. The particular textual history of the HB (**One recension**/**one archetype** theory)
  2. A process of "**controlled transmission**"
  3. Excessive **contamination**

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I would consider a very provocative formulation, i.e. that in our case the *textus receptus* functions practically like the 'archetype' and that we might disregard the MSS by way of *eliminatio codicum descriptorum*. This sounds, of course, like a *reductio ad absurdum* of the Lachmannian method.

Goshen-Gottstein 1967, 77 note 3

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Unfortunately, it is almost, if not wholly, impossible to classify the Hebrew mss. by groups or families. This is what one might expect since the copyists of these mss. were undoubtedly influenced by 𝔐. In consequence, the scribes brought their mss. more and more into the Masoretic tradition [...].

Wevers 1948, 75

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> The MT is the product of a process of controlled transmission that creates a standardized text. [...] That the MT is the result of such a process of controlled transmission suggests that it is not susceptible to classic stemmatic analysis since the distinctive features that stemmatic analysis would treat as the characteristics of an archetype are explained by the process of controlled transmission.
>
> Weis 1996, 357

Stemmatology and Hebrew manuscripts

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From the enormous mass of medieval manuscripts collated by Kennicott and de Rossi, it is impossible to place certain ones in families. It appears rather that certain consonantal copies with varying degrees of accuracy later underwent recension by their vocalizers.

Barthélemy 1982, 275

Stemmatology and Hebrew manuscripts

Background: other views

1. Sacchi 1973
2. Borbone 1990

Stemmatology and Hebrew manuscripts

Background: other views

1. Sacchi 1973
2. Borbone 1990

Data

- Book of Genesis from De Rossi

Method

- Distance-based **clustering** algorithm

Conclusion

- 314 MSS divided into 23 groups
- *Textus Receptus* (TR) ***VS.*** *Anti-Receptus* (AR) theory
- AR group (esp. Ashkenazic MSS) preserves ancient variants

Stemmatology and Hebrew manuscripts

Background: other views

1. Sacchi 1973
2. Borbone 1990

Data

- Book of Hosea from Kennicott

Method

- Sacchi's algorithm

Conclusion

- Textual families are recoverable
- Insignificant for textual criticism (too many accidental variants)

Case study: The book of Qohelet

Goal

- To define families of witnesses by way of phylogenetic analysis

Data

- Kennicott's collation

Method

- Maximum Parsimony

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The book of Qohelet

Content

- Qohelet (or Ecclesiastes or Preacher) is a **wisdom** and **poetical** book of the HB ("*Vanity of vanities, all is vanity...*")

Date

One of the later books of the HB:

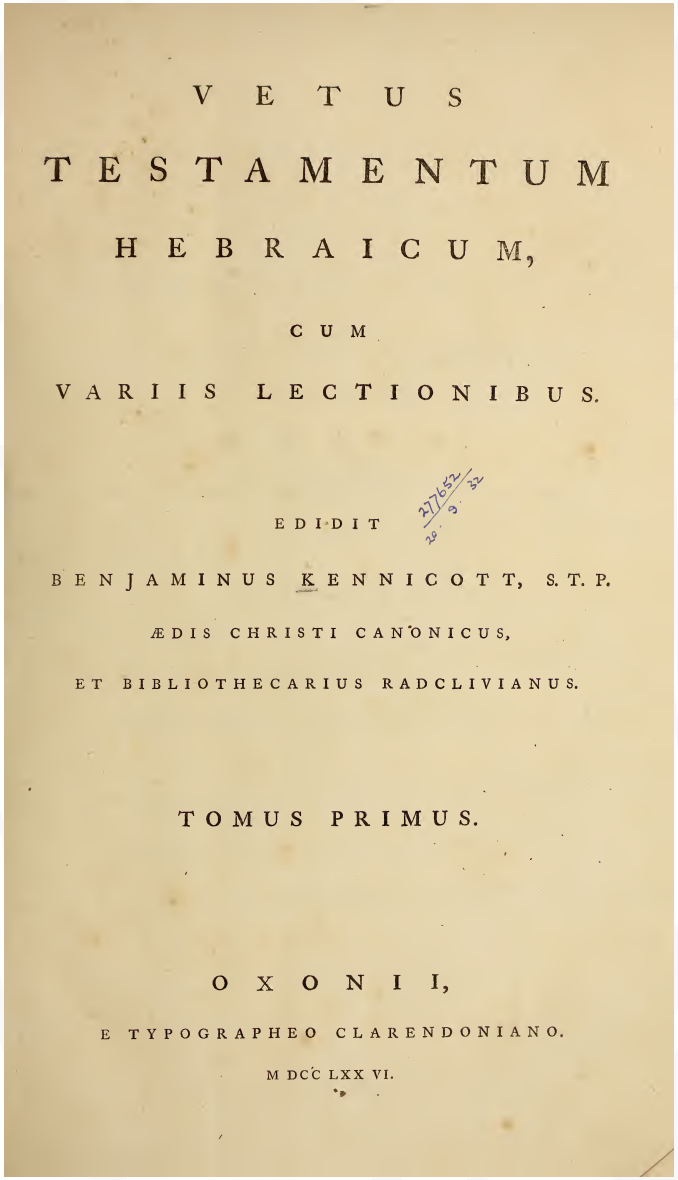
- **Original**: V-III a.e.v. (preferably 300-250 a.e.v.)
- **Archetype**: III a.e.v.

Medieval documentation

Variants from Kennicott's collation:

- 268 witnesses
  - 253 MSS from XI to XVIII century
  - 15 printed editions

Kennicott's collation



V E T U S

T E S T A M E N T U M

H E B R A I C U M,

C U M

V A R I I S L E C T I O N I B U S.

E D I D I T

B E N J A M I N U S K E N N I C O T T, S. T. P.

Æ D I S C H R I S T I C A N O N I C U S,

E T B I B L I O T H E C A R I U S R A D C L I V I A N U S.

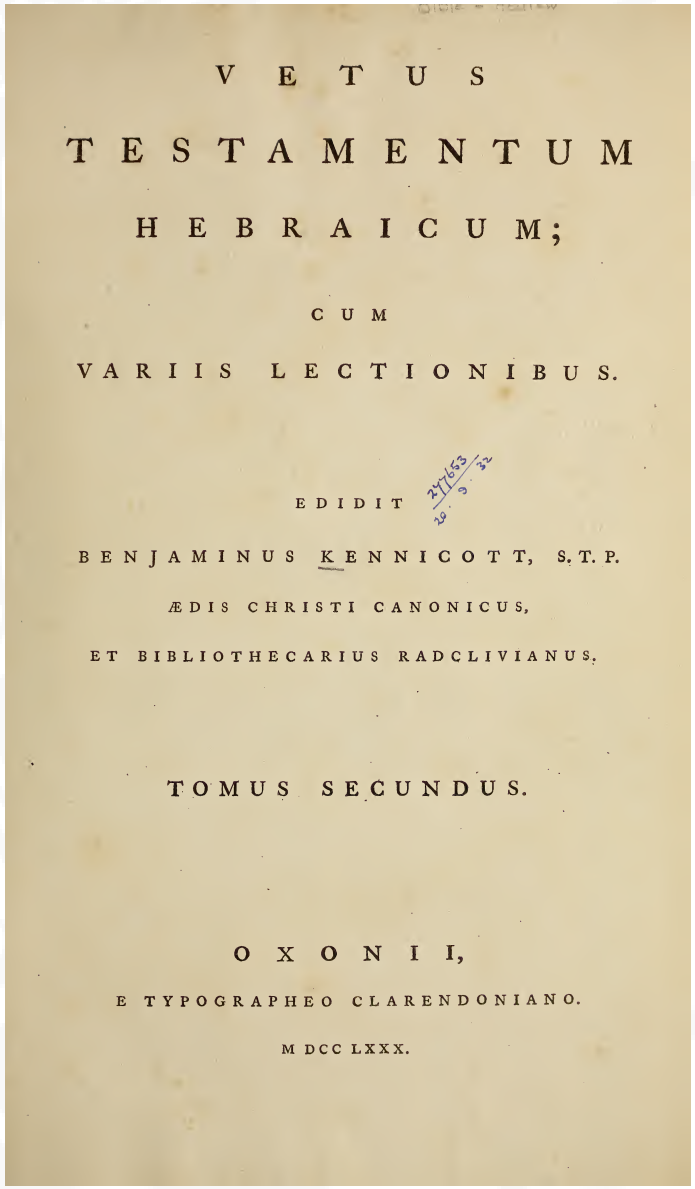
T O M U S P R I M U S.

O X O N I I,

E T Y P O G R A P H E O C L A R E N D O N I A N O.

M D C C L X X V I.

Kennicott (1776), Vol. I



V E T U S

T E S T A M E N T U M

H E B R A I C U M;

C U M

V A R I I S L E C T I O N I B U S.

E D I D I T

B E N J A M I N U S K E N N I C O T T, S. T. P.

Æ D I S C H R I S T I C A N O N I C U S,

E T B I B L I O T H E C A R I U S R A D C L I V I A N U S.

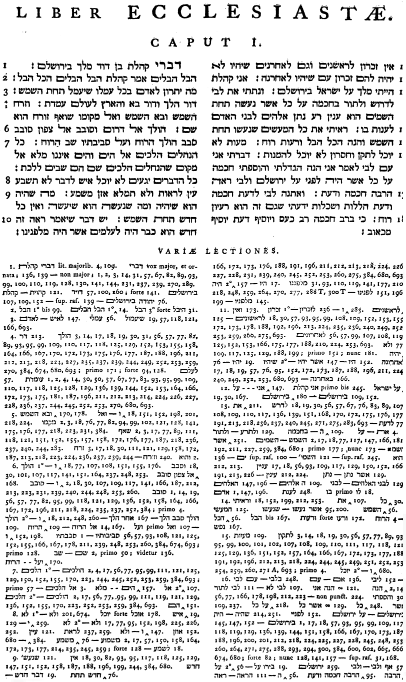
T O M U S S E C U N D U S.

O X O N I I,

E T Y P O G R A P H E O C L A R E N D O N I A N O.

M D C C L X X X.

Kennicott (1780), Vol. II



LIBER ECCLESIASTÆ.

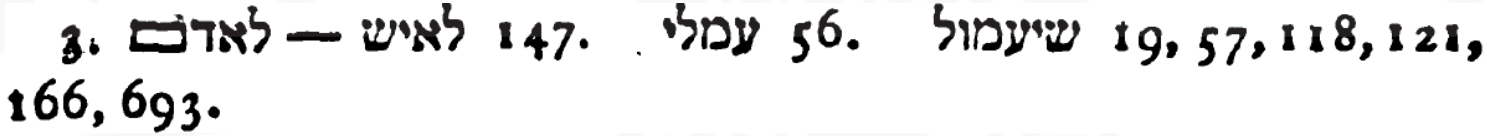
CAPUT I.

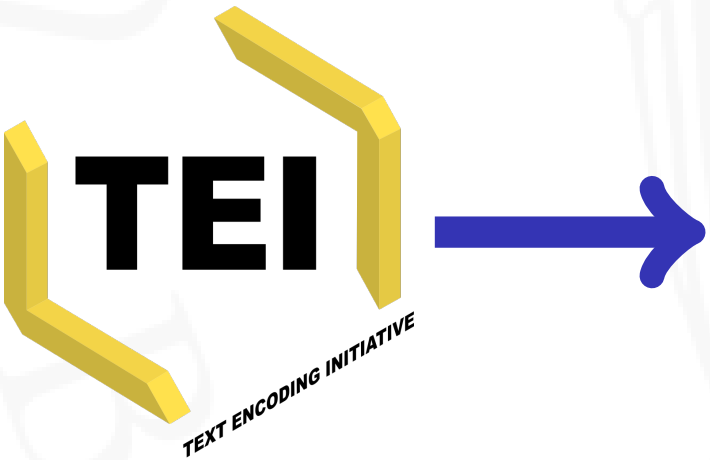
1 דברי קהלת בן דוד מלך בירושלם׃
2 הבל הבלים אמר קהלת הבל הבלים הכל הבל׃
3 מה יתרון לאדם בכל עמלו שיעמל תחת השמש׃
4 דור הלך ודור בא והארץ לעולם עמדת׃ 5 וזרח
השמש ובא השמש ואל מקומו שואף זורח הוא
6 שם׃ הולך אל דרום וסובב אל צפון סובב
7 סבב הולך הרוח ועל סביבתיו שב הרוח׃ כל
הנחלים הלכים אל הים והים איננו מלא אל
מקום שהנחלים הלכים שם הם שבים ללכת׃
8 כל הדברים יגעים לא יוכל איש לדבר לא תשבע
9 עין לראות ולא תמלא אזן משמע׃ מה שהיה
הוא שיהיה ומה שנעשה הוא שיעשה ואין כל
10 חדש תחת השמש׃ יש דבר שיאמר ראה זה
חדש הוא כבר היה לעלמים אשר היה מלפנינו׃

1 אין זכרון לראשנים וגם לאחרנים שיהיו לא
1 יהיה להם זכרון עם שיהיו לאחרנה׃ אני קהלת
1 הייתי מלך על ישראל בירושלם׃ ונתתי את לבי
לדרוש ולתור בחכמה על כל אשר נעשה תחת
השמים הוא ענין רע נתן אלהים לבני האדם
1 לענות בו׃ ראיתי את כל המעשים שנעשו תחת
1 השמש והנה הכל הבל ורעות רוח׃ מעות לא
1 יוכל לתקן וחסרון לא יוכל להמנות׃ דברתי אני
עם לבי לאמר אני הנה הגדלתי והוספתי חכמה
על כל אשר היה לפני על ירושלם ולבי ראה
1 הרבה חכמה ודעת׃ ואתנה לבי לדעת חכמה
ודעת הללות ושכלות ידעתי שגם זה הוא רעיון
1 רוח׃ כי ברב חכמה רב כעס ויוסיף דעת יוסיף
מכאוב׃

VARIÆ LECTIONES.

XML-TEI encoding (Location-referenced method)


3. לאדם — לאיש 147. עמלי 56. שיעמול 19, 57, 118, 121, 166, 693.




```
1  <app loc="1 3">
2    <lem>לאדם</lem>
3    <rdgGrp ana="#subst #sem #noun">
4      <rdg wit="#K147">לאיש</rdg>
5    </rdgGrp>
6  </app>
7  <app loc="1 3">
8    <lem>עמל</lem>
9    <rdgGrp ana="#del #prn #suff">
10     <rdg wit="#K56">עמלי</rdg>
11   </rdgGrp>
12 </app>
13 <app loc="1 3">
14   <lem>שיעמל</lem>
15   <rdgGrp ana="#scr_pl #verb">
16     <rdg wit="#K19 #K57 #K118
       #K121 #K166 #K693">שיעמול</rdg>
17   </rdgGrp>
18 </app>
```

From encoding to data matrix (XSL-T)

```
1  <app loc="1 3">
2    <lem>לאדם</lem>
3    <rdgGrp ana="#subst #sem #noun">
4      <rdg wit="#K147">לאיש</rdg>
5    </rdgGrp>
6  </app>
7  <app loc="1 3">
8    <lem>עמל</lem>
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16     <rdg wit="#K19 #K57 #K118
       #K121 #K166 #K693">שיעמול</rdg>
17   </rdgGrp>
18 </app>
```

Wits.	v_0	v_1	v_3
K19	0	0	1
K56	0	1	0
K57	0	0	1
K118	0	0	1
K121	0	0	1
K147	1	0	0
K166	0	0	1
K693	0	0	1

Data
Witnesses

Total witnesses: **268**

Deletions

- Fragmentary and partially collated MSS
- Late MSS (XVIII c.)
- A number of printed editions

☛ **Witnesses**/**taxa analyzed**: **116**

Data
Variants

Total variants: approx. **2600**

Deletions

- Accidentals (graphic variants)
- *Lectiones singulares*
- Marginal variants
- Second-hand variants (corrections)
- Dubious variants

👉 **Variants**/**character states**: **397** (= no. `<rdgGrp>`)
👉 **Variation places**/**characters**: **371** (= no. `<app>`)

Character state matrix

```
                    1         2         3         4         5         6         7         8
Taxon       12345678901234567890123456789012345678901234567890123456789012345678901234567890...
-------------------------------------------------------------------------------------------------
EK          00000000000000000000000000000000000000000000000000000000000000000000000000000000000
0OKL        00000000000000000000000000000000000000000000000000000000000000000000000000000000000
3IAK1       00000000000000010001000000000000001000000001000000000000000000001000000000010
3SK2        00001000000100000010000000000000000000000000000000000000000010000000000000
4SK3        00000000000000000000000010000000000000000000000000000000000000000000000000000
2AK4        00000101000000000000001000000000001000000000000000000000000010000010000000000
4SK14       00100000000000000100000000000000000000000000001000000000000000000010000000000
3AK17       00000100000100000001001000000000001010000000000000000000010000000010000000000
3AK18       01000010000100001001101000000001010100000100000000000000000011000011000000000
4SK19       00000000001000000000000000000000001000000000000000000000000000000000010000
2AK30       00000010001000000100001000000000000000000000001000000200000000000001000000000
0OK31       00000000000000000001000000000000000000000000000000000000000000000000000000000
3AK50       00001000000000000000000000000000000000000000000000000000000000000000000000000
3AK56       00000000000000000010000001000000000110100000000000000000100000000010000000000
4SK67       00000000000000000000000000000000000000000000000000000000000000000000000000000
2AK76       00000001000000000000001001000000001001100000000000000000000000000000010000000
...
```

Software

P*arsimony* **A***nalysis* **U***sing* **P***AUP*

http://paup.phylosolutions.com/

MP settings in PAUP

Method outlined in "*Phylogenetic Analysis of Gregory of Nazianzus' Homily 27*", Lantin, Baret, and Macé (2004):

- **Multi-state** character encoding ("0", "1", "2" etc.)
- Unordered character state matrix (**Fitch's algorithm**)
- **Unweighted** characters
- Heuristic search:
  - **Tree-bisection-reconnection** algorithm (TBR)
- Ancestral reconstruction:
  - **Accelerated transformation** (ACCTRAN)
- **Strict-consensus** tree, rooted at first *taxon* (reference edition: E. van der Hooght, Amsterdam 1705)

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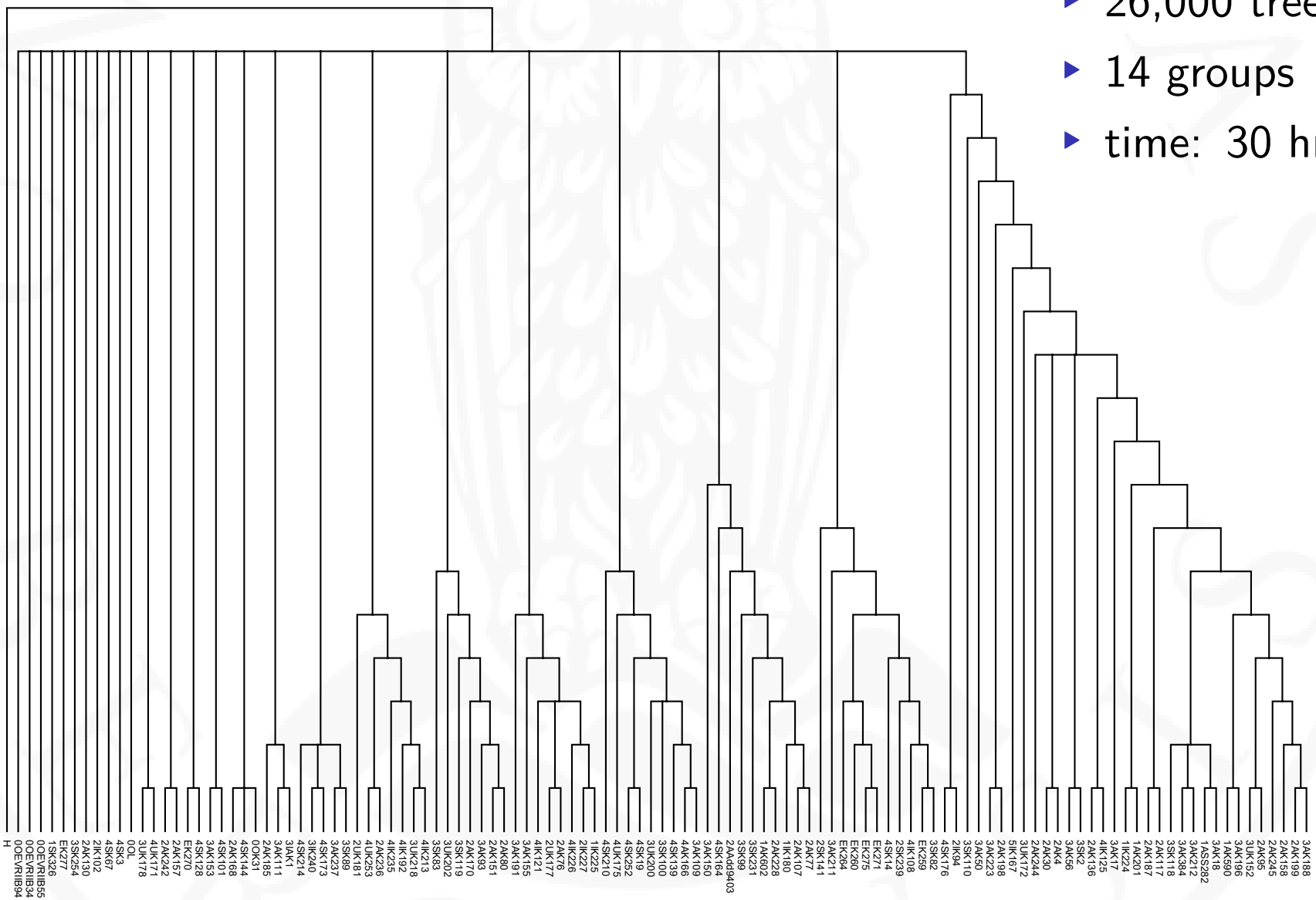
Results

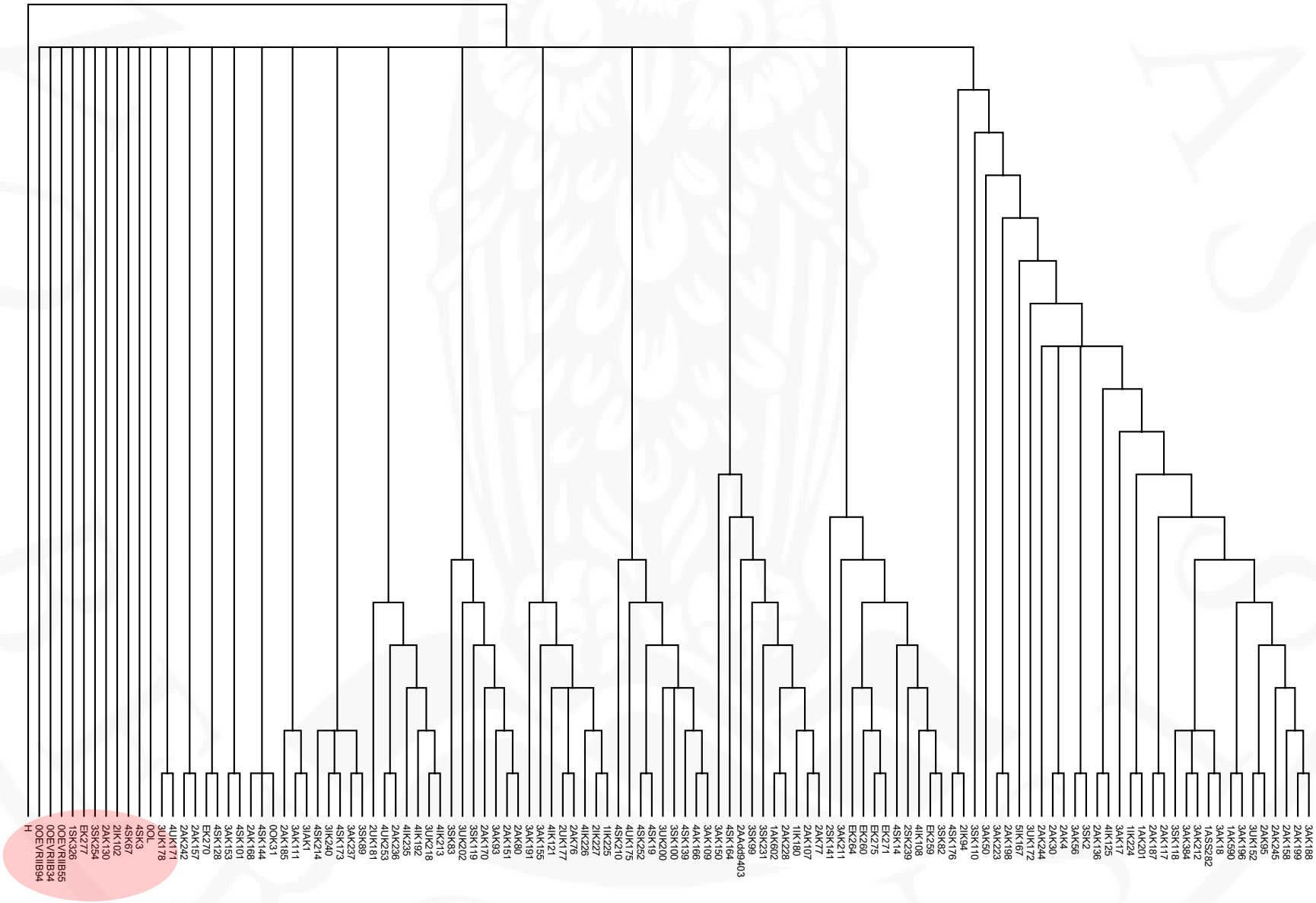
Strict-consensus tree



- 26,000 trees
- 14 groups
- time: 30 hrs.

Results

The *Textus Receptus* group



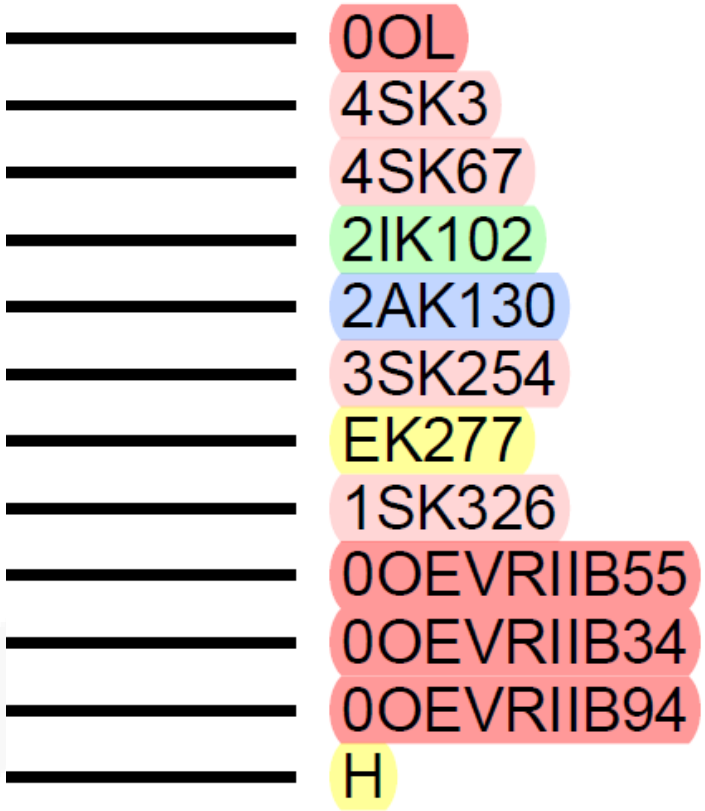
Results

The *Textus Receptus* group

H: v. d. Hooght 1705

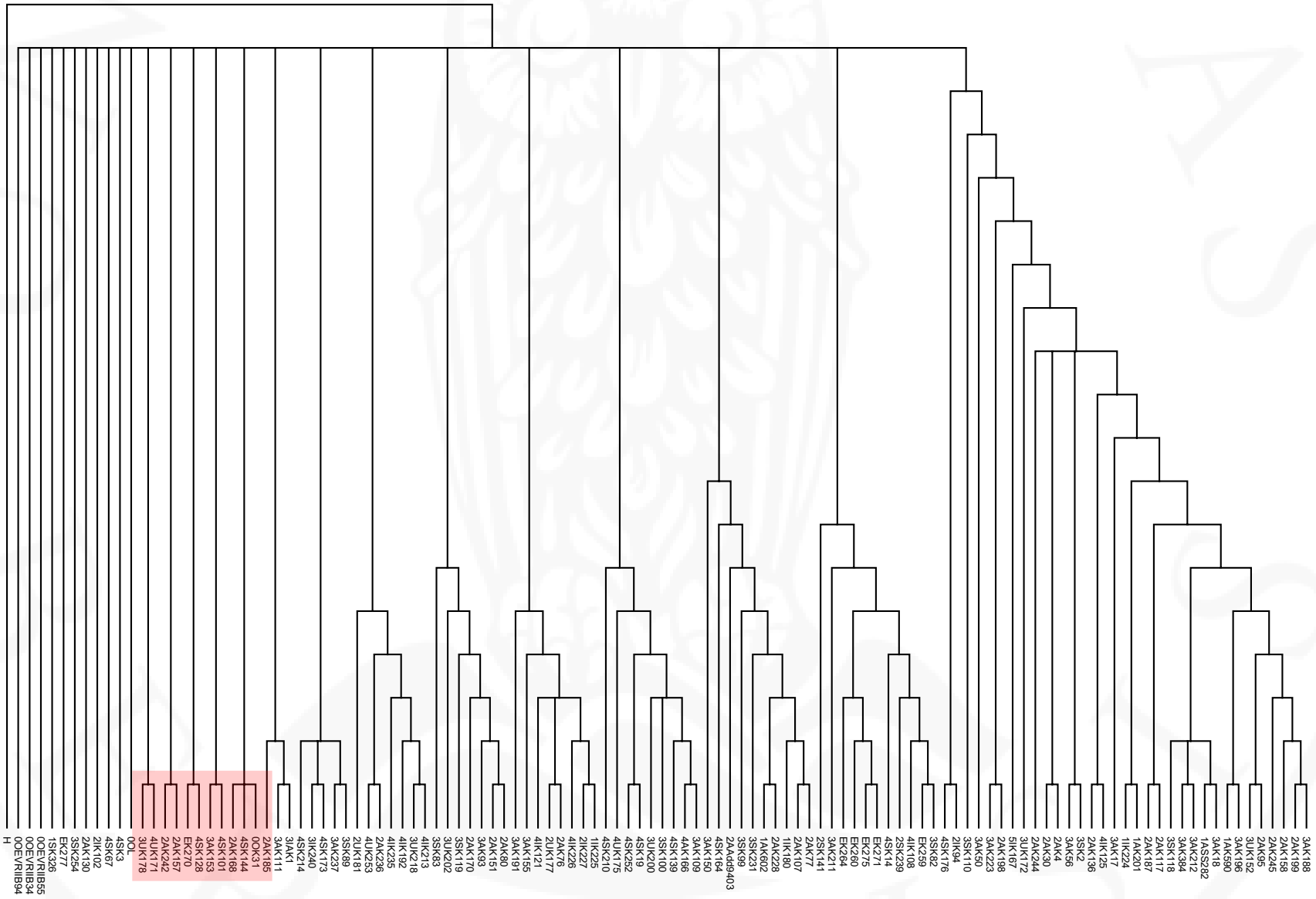
K277: Bomberg 1525

0OL: C. Leningradensis



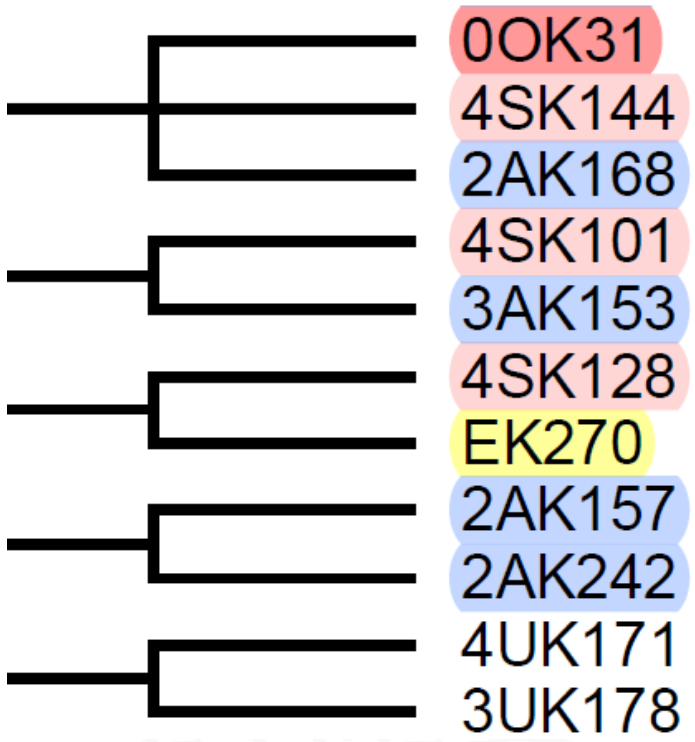
Results

The *Textus receptus* group



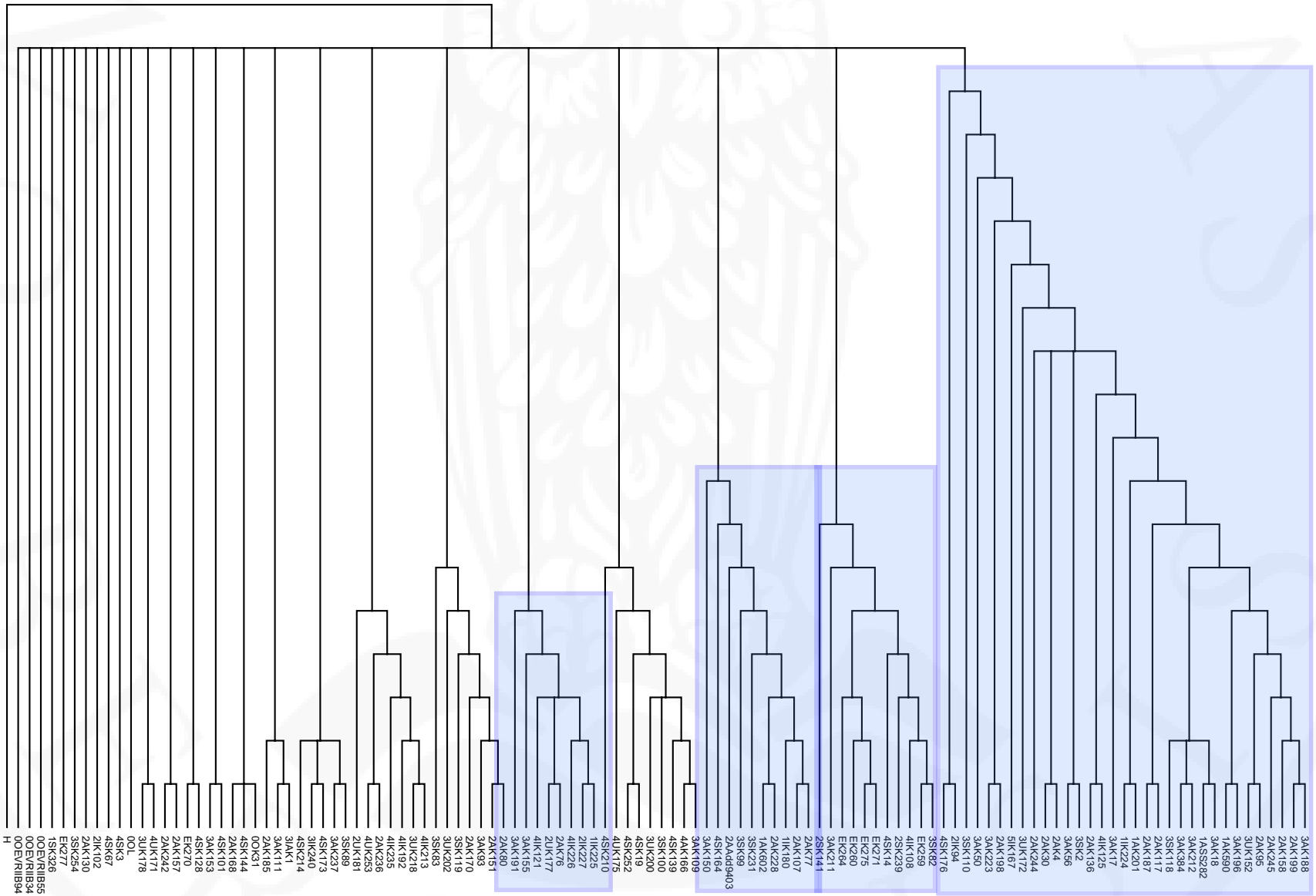
Results

The *Textus receptus* group



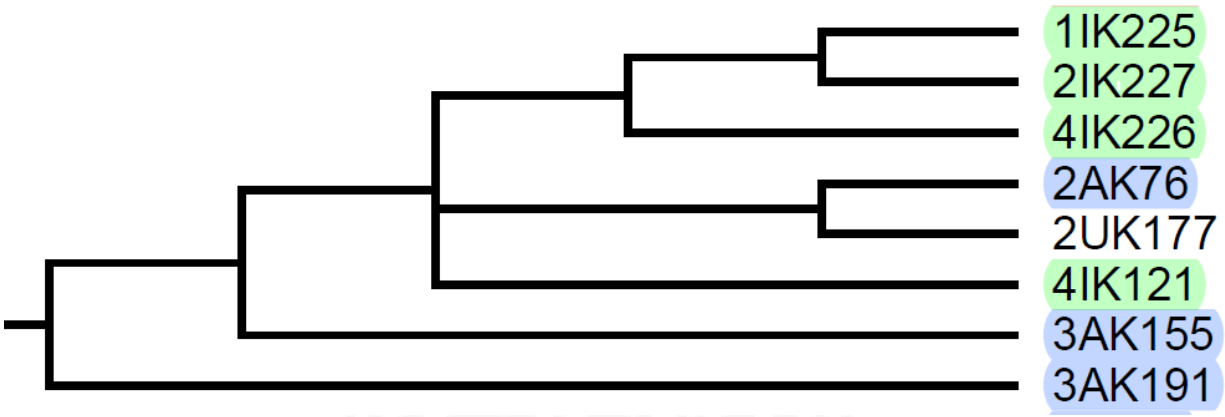
Results

The *Anti-Receptus* group



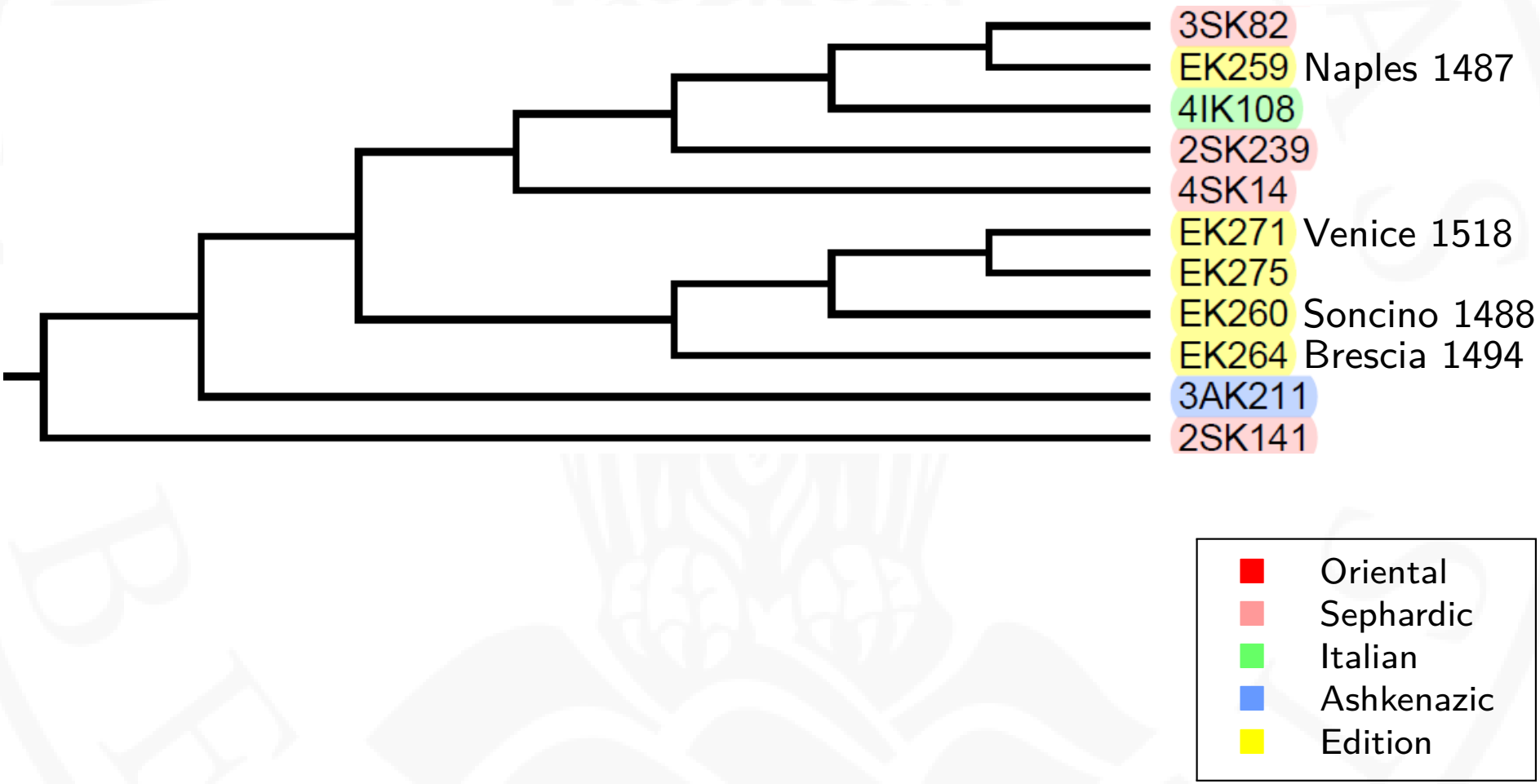
Results

The *Anti-Receptus* group



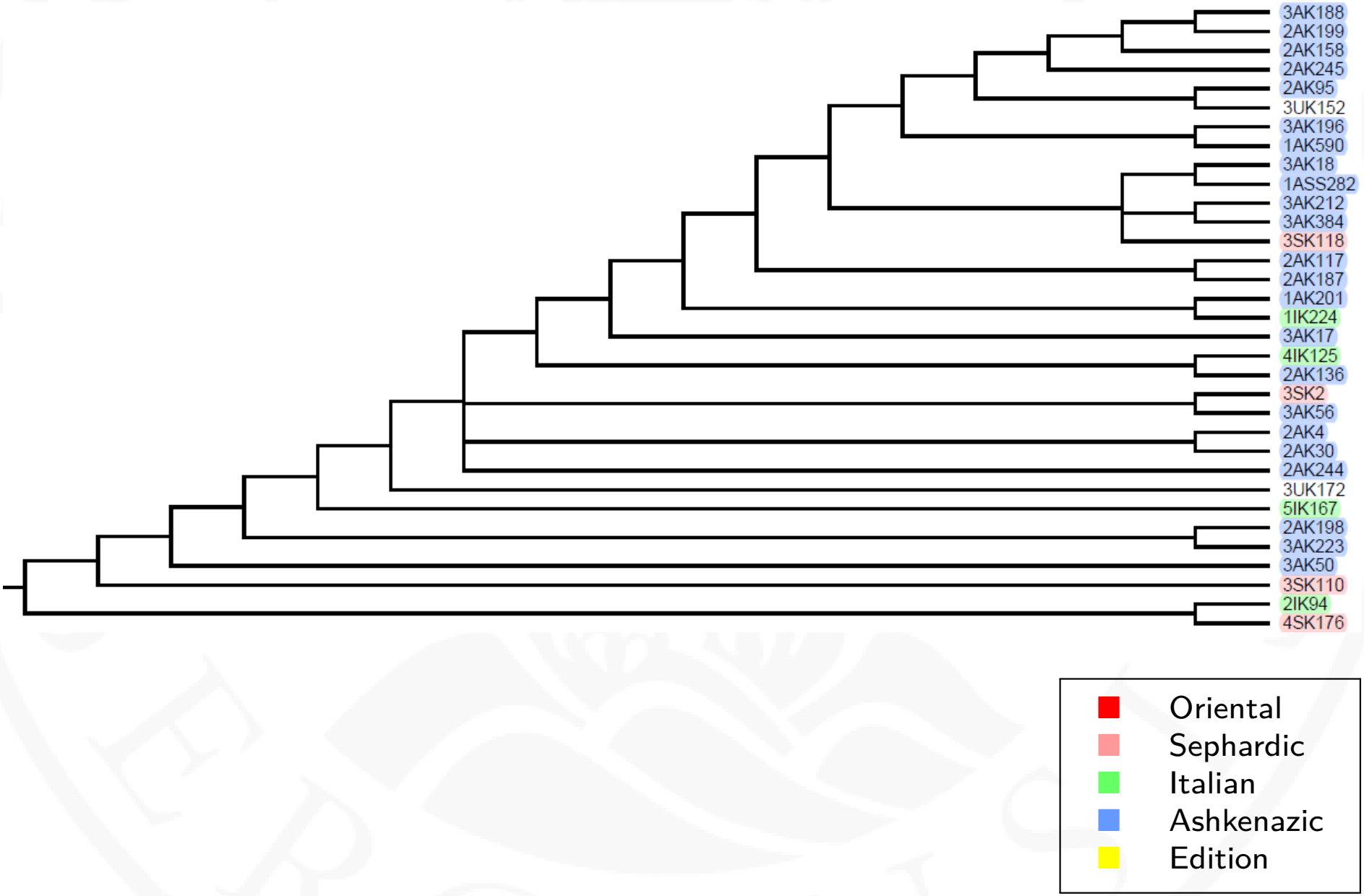
Results

The *Anti-Receptus* group



Results

The *Anti-Receptus* group



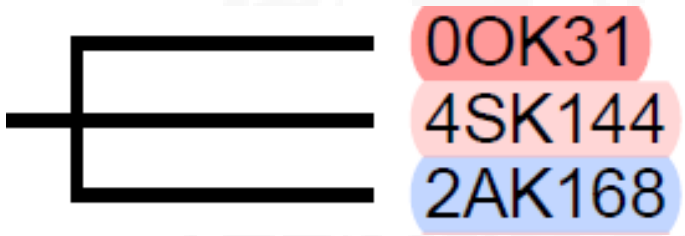
Ancestral reconstruction

General results

- **104** out of **371** places of variation (**28%**) have been identified as ancestral and assigned to common ancestors.
- This means that most variants are classified as **autapomorphies**, that is, as secondary innovations introduced by the scribes of individual MSS.
- **About 20** of these variants can be considered **characteristic**, since they appear only once, or at most, very few times, in the tree (**Consistency Index**, CI)

Ancestral reconstruction

Some groupings

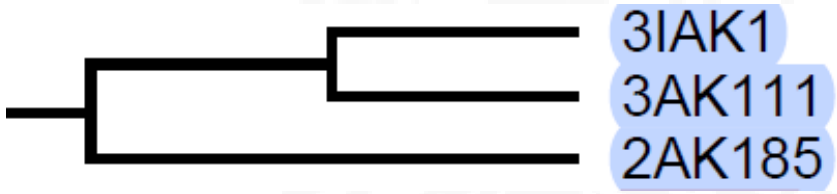


No. variants assigned to the hyparchetype: **1**

1. Q. 1:16 **על ירושלים → בירושלים**

Ancestral reconstruction

Some groupings



No. variants assigned to the hyparchetype of the group: **4**

1. Q. 3:11 **לא** → ∅ (**characteristic**? CI: 0,333)
2. Q. 3:21 **מי** → **ומי**
3. Q. 6:10 **שהתקיף** → **שתקיף**
4. Q. 10:1 **מכבוד** → **ומכבוד**

No. variants assigned to the hyparchetype of K1-K111: **4**

1. Q. 5:8 **היא** → **הוא**
2. Q. 5:10 **ראית** → **ראות**
3. Q. 7:6 **גם** → **וגם**
4. Q. 7:18 **את** → ∅

Characteristic variants (?)

witnesses	place	variant	CI
2AK4 2AK30	6:3	בו → לו	1.000
	6:5	השמש → שמש	1.000
	8:9	המעשה → נעשה	0.500
E271 E275	12:1	מי → ימי	1.000
2AK76 2UK177	2:26	ודעת → –	1.000
2AK77 2AK107	4:4	אני → –	1.000
	2:14	ידעתי → וידעתי	0.400
2AK77 (2AK107) 1IK180	5:6	כי → –	0.500
	5:5	אל → ואל	0.333
2AK80 2AK151	7:21	כל → לכל	1.000
2AK95 3UK152	2:15	גם אני → אני	0.667
	3:19	כן מות זה → –	0.500
	6:9	מהלך → מהלוך	0.500
	8:4	שלטון → ושלטון	0.333
	9:9	חיי הבלך → הבלך	0.333
2IK225 2IK226	2:4	נטעתי → ונטעתי	0.500
	2:10	מכל → בכל	0.333
3AK18 1ASS882	12:9	תקן → ותקן	0.500
	2:5	ונטעתי → נטעתי	0.333
	9:9	כל ימי הבלך → –	0.333
	12:9	תקן → ותקן	0.333
3AK212 3AK384	8:9	מעשה → המעשה	0.500
	5:18	ונכסים וכבוד → ונכסים	0.333
2AK117 2AK187	6:10	ולא → לא	0.500
1AK201 1IK224	5:1	מעשה → המעשה	0.500
	8:11	בני → –	0.333
4SK173 3IK240	12:8	הכל הבל → הבל הבלים הכל	0.500
4IK213 3UK218	7:12	בעליה → את בעליה	0.500

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How reliable is this phylogenetic tree?

Problems

- Variants are assigned to the internodes, but are not inherited by all descendant members (**many autapomorphies**)
- Larger groups are uncertain, **lower levels** of the tree seem more defined (pairs of MSS)
- Qualitatively, variants are **polygenetic** (loss of particles, *homeoteleutons* etc.)
- Characteristic variants are relatively few
- **CI**: $\frac{\textit{variation places}}{\textit{tree length}} = \frac{371}{1659} = \mathbf{0{,}22}$ (**much homoplasy**)
- **Bootstrap**: few groups with support $> 50\%$

How reliable is this phylogenetic tree?

Limitations

- **Contamination** is not handled (tree model)
- The sample examined is **restricted**
- **Collation** errors (Kennicott's and mine)
- **Encoding** errors (TEI, XLS transformation phase)

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Conclusion

- It is **theoretically** possible to apply stemmatic analysis on Hebrew Manuscripts of the Bible
- Groupings have **different degrees of confidence**:
  - Good ones: Many and/or kinship-revealing variants
  - Bad ones: Too few and/or polygenetic variants
- **Qualitative analysis** is required (textual and paleographical/codicological)
- **Theory of bifurcation** of the textual tradition (*Textus receptus VS. Anti-receptus* branches)

Perspectives

Data

1. New collation of manuscripts, modern philological criteria
2. New typologies of kinship-revealing variants:
   - Vowels and accents (absent in Kennicott)
   - Massora (critical notes on margin)
   - Para-textual variants (divisions of text)

Method

1. **Ordered** character matrix?
2. System of **weighting factors**?
3. *Ad hoc* computational models, as for the New Testament?
4. ...

Thank you for your attention!

Any questions and/or suggestions?

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