# Applying cladistics to authoritative texts The case of the Hebrew Bible

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- 2. Medieval manuscripts of the Hebrew Bible
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# The Hebrew Old Testament or Hebrew Bible

#### The textual tradition

- 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.)

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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

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# 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

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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.

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# 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
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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.

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Reference

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 apparatu
- Other independent editions of individual books
  - MSS are listed in full from traditional collation

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♣ Absence of a stemmatic classification of MSS

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Absence of a stemmatic classification of MSS

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- 5. Other **independent editions** of individual books:
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♣ Absence of a stemmatic classification of MSS

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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

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Background: the traditional view

- Most scholars claim that traditional stemmatic analysis of HB MSS is either useless or impossible, because of:
  - 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 descriptcrum*. This sounds, of course, like a *reductio ad absurdum* of the Lachmannian method.

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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  $\mathfrak{M}$ . In consequence, the scribes brought their mss. more and more into the Masoretic tradition [...].

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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.

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## Background: the traditional view

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  - The particular textual history of the HB (One recension/one archetype theory)
  - 2. A process of "controlled transmission"
  - 3. Excessive contamination

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

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Background: other views

- 1. Sacchi 1973
- 2. Borbone 1990

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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

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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)

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# 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
  - $253~\mathrm{MSS}$  from XI to XVIII century
  - 15 printed editions

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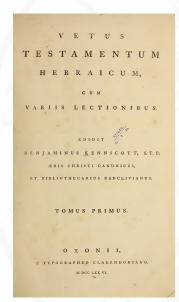
Qohelet

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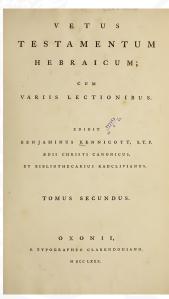
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# Kennicott's collation



Kennicott (1776), Vol. I



Kennicott (1780), Vol. II

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CAPUT L

דברי החלת בן דוד מלך בירושלם: לדרוש ולתור בחכטה על כל אשר נעשה תחת דור הלך ודור בא והארץ לעולם עטרת: חרח השמים הוא עניו רע נתו אלהים לבני האדם השמש ובא השמש ואל מקומו שואף זורח הוא

ז יוכל לתקו וחסרוו לא יוכל להטנות: דברתי אני הנחלים הלכים אל הים והים איננו מלא אל מקום שהנחלים הלכים שם חם שבים ללכת: של כל אשר הידה לפגי על ירושלם ולבי רארה כל הדברים יגעים לא יוכל איש לדבר לא תשבע 8 יו הרבה חכמה ודעת: ואתנה לבי לדעת חכמת עין לראות ולא תמלא אזן משמע: מרה שהיה 9 ורעת הללות ושכלות ידעתי שגם זה הוא רעיון הוא שיהיה ומה שנעשרה הוא שיעשרה ואין כל ון רוח: כי ברב חכמה רב כעם ויוסיף דעת יוסיף חדש תחרת השמש: יש דבר שיאמר ראה זה 10 חרש הוא כבר היה לעלמים אשר היה מלחנינו:

to mino man lit, parierly, 4, 106. Than you major, et avners, 136, 139 - non major; 1, 2, 3, 14, 11, 57, 67, \$2, \$9, 93, 99, 100, 110, 119, 128, 130, 141, 144, 231, 237, 239, 270, 289. בירשלים . חירום ומו. דירו 57, 100, 200 ; force 141. בשלשרים 107, 100, 152 - fup, raf. 139 - Exhanne mirr 16.

a, ban t" bis og. בשל בהל חבל חבל הבלים . g' foete barn gt. 1. mino - wab 147. how 56. hope 19, 57, 118, 121,

4. 77 211. 7777 1. 14. 17. 18. 10. 20. 21. 26. 27. 27. 84. \$9, 92, 95, 99, 109, 110, 117, 118, 125, 129, 172, 153, 155, 155, 164, 166, 107, 170, 172, 171, 175, 176, 177, 187, 188, 196, 111, 212, 212, 218, 224, 227, 255, 257, 259, 244, 249, 252, 253, 259, 270, 184, 674, 680, 693; primo 171; forte 94, 128. 2795 er. PTDW 1, 2, 4, 14, 10, 10, 17, 67, 77, 81, 91, 91, 90, 100, 110, 117, 118, 125, 128, 129, 136, 139, 144, 152, 153, 164, 166, 172, 173, 174, 181, 187, 196, 211, 212, 213, 214, 224, 226, 227, 228, 236, 237, 244, 245, 252, 253, 270, 680, 693.

C. WOUTH NOT, 170, 178. Set - 1, 18, 151, 152, 198, 201, 218, 224. 1020 8, 3, 18, 76, 77, 82, 94, 99, 102, 121, 128, 141, 175, 176, 177, 218, 221, 211, 184. QMD 2, 1, 17, 77, 80, 111, 118, 121, 121, 123, 124, 125, 127, 128, 178, 176, 177, 187, 218, 226, #17, #40, #44, #33. PTN 3, 17, 18, 30, 111, 121, 120, 148, 172, 187, 213, 218, 223, 224, 216, 237, 239, 244 - FTYR 240, MCR 2, 6. 7007 1"-1. 18, 27, 107, 108, 101, 100, 176, 2301 18. 40, 101, 107, 117, 141, 151, 164, 237, 248, 258. Daid you'le. 168. 2212 - 1 . 2, 18, 10, 107, 109, 117, 141, 166, 187, 212, 213, 223, 231, 239, 240, 244, 248, 253, 260, 3310 1, 14, 19, c6, c7, 77, 82, qc, qq, 118, 121, 120, 126, 152, 158, 164, 166, 167, 172, 106, 211, 218, 224, 215, 227, 252, 184 ; primo 4. רולד מכב הלר -- 1, 18, 212, 248, 260 -- חלך מחר הלך -- 1, 18, 212, 248, 260 -- חלך 100. mm. 100 - mm be 14, 167. by prime bet 107 -1, 152, 198. YADD 1 - YAYDD 56,57,93, 108, 121, 125, 152, 156, 166, 167, 178, 211, 239, 248, 253, 260, 384, 674, 693; primo 128. 30' - 20' z, primo 50 ; videtur 136. mma - - 301 - 120-

7. main 1"- main a, 4, 17, 56, 77, 95, 99, 111, 121, 125, 180, 100, 103, 100, 170, 221, 244, 240, 202, 202, 200, 184, 601; prime כך - בחילא זא ז. אל הלבים - באו בין, וכך. או בים וסק. באו בים וסק. mohn a"- mohn a, 17, 56, 77, 95, 99, 111, 119, 121, 129, 156, 142, 144, 170, 223, 252, 253, 259, 384, 693. En 151. 8. אל ו" - אלו 201,674. לא forte למר 178. ולא - 19, 129 - 1, 259. No 2\*- No 17, 77, 95, 152, 198, 225, 226, 241. PF 121. FN75 217, 260. N51-1.142. TH 168. 680 - 384- poets 76 - procts a, 17, 57, 150, 158, 164, 172, 173, 177, 214, 235, 245, 259; force 128 - PDU? 18. o. 'DUID 121. TH 18. to. 82. os. oc. 112. 118. 124. 120. 147, 151, 152, 158, 187, 188, 196, 199, 244, 184, 680. WITT - 10, חדש תחת , 10, דבר חדש , 76.

נ איז זכרון לראשנים וגם לאחרנים שיחיו לא ז יהיה להם זכרון עם שיהיו לאחרנה: אני קהלת הבל תבלים אפר קהלת הבל הבלים הכל הבל: 2 ז הייתי מלד על ישראל בירושלם: זנתתי את לבי מה יתרוז לאדם בכל עמלו שיעמל תחת השמש: 3 ז לענות בו: ראיתי את כל המעשים שנעשו תחת שם: הולך אל דרוכו וסובב אל צפון סובב 6 ז השמש והנה הכל הבל ורעות רוח: מעות לא סבב הולך הרוח ועל סביבתיו שב הרוח: כל 7 עם לבי לאמר אני הנה הנדלתי והוספתי חכמה מכאוב נ

#### VARIÆ LECTIONES.

166, 142, 172, 176, 188, 101, 106, 217, 212, 212, 218, 418, 446 ##7, ##8, #41, #50, #40, #45, #5#, #58, #60, #75, #84, 680, 604 TYT 2", 157 -- YT 17. 12890 31,93, 110, 119, 141, 177, 210 218, 248, 259, 264, 270, 277, 286 T, 300 T - 17207 151, 196 100 - 70070 145-

11. PM 171. PPG 1"- PPGP 816 - 1. 481. EDITERNO 115 - E718917 18, 30, 57, 93, 95, 99, 108, 109, 152, 153, 155 172, 172, 178, 188, 192, 195, 213, 224, 235, 236, 240, 249, 252 251, 250, 260, 275, 601. EDITORY C6, 67, 69, 107, 108, 110 125, 152, 153, 166, 175, 177, 188, 210, 224, 253, 693. Hby 77 100, 117, 125, 129, 188, 199; primo 151; nunc 181. 7979 26 - NT 10. NTW 8"- TT TWN 147 - 17 102. THYTH 17, 18, 19, 57, 76, 95, 152, 172, 173, 187, 188, 196, 211, 224 240, 240, 252, 251, 680, 601 - TOTAL 166, יצל ישראל . - - ישר בולה באר ביולה . הוא ביים באר peimo bis auc. לארום ישר ישר ישר ביולה ביולה

ופן, 167, בירושלים ב 180 בירושלם ופק, 167, 14. DR . 211. WTT 18. 19. 10. 16. 17. 67. 16. 81. 80. 101 108, 109, 110, 117, 136, 139, 151, 168, 170, 172, 175, 176, 177 191, 212, 218, 216, 217, 240, 245, 271, 275, 281, 691 - 1975 77 . ארד - על 100. ה - בחבבה 110. ולחרע - ולחור THE RELEASE TO STATE OF THE PARTY AS A 17, 18, 27, 117, 147, 166, 184 192, 211, 227, 259, 184, 680; primo 177; ause 171 - 270; 116 - - fup, raf, 100 - '10277 121 - fup, raf, 244, MIT 212, 213. [\*39 17, 18, 56, 93, 109, 117, 129, 150, 152, 166 191, 211, 226 - 199 212, 224. 100 - 100 70% 129. шпінп 147, 196 — шпін п 199. чай — шпінсп чай 129 шпн 1, 147, 196. пцй 248. та реіно ті 18.

14. VINTO 18, 152, 199, 212, 253. DN . 107. 32 . 10. מונשי – 135. מושמש – 135. מונשי בינשו – 135. מונשי בינשו – 135. מונשי בינשי – 136. מונשי בינשי הבל –136. מונשי בינשי הבל –136. מונשי בינשי הבל

16. JUSTO 100. TOPO 3, 14, 18, 19, 30, 56, 57, 77, 89, 93 01. 00. 100, 101, 102, 107, 108, 109, 110, 111, 117, 118, 121 120, 120, 126, 101, 102, 107, 164, 166, 167, 178, 174, 177, 186 101, 102, 106, 212, 213, 218, 224, 244, 245, 249, 251, 252, 251 254, 259, 260, 271 A, 693 ; primo 4. 527 2"-1, 680, 16. 10 top - 10 248. Ept - Eps 116. 127 162 -יוו לבי לחור בי הנה אני . 107 לבי לא - 111 לבי לחור בי לחור c6, 77, 166, 178, 198, 212, 223 - acq puntt. 224. Vippin sc ומר 248, כל 129. אישר כל 18. על כל 19. ב. 129. מים 19. במים 19. ב 145, 147, 152 - (2)2772 1, 17, 18, 57, 93, 95, 99, 109, 117 118, 110, 120, 126, 120, 144, 121, 128, 166, 167, 170, 171, 181 188, 196, 200, 201, 212, 218, 224, 225, 227, 228, 245, 248, 252 260, 264, 271, 275, 288, 193, 294, 300, 384, 600, 602, 665, 666 674, 680; force 81; rune 128, 141, 107 - fup, raf, 21, 168. ים אף ולבי-ולבי בנים או ביות על - 10 ביות על - 10 ביות על - 10 ביות על חרבה . 10. חרבה תכמה ורשת . 60. ה - 111 הראה - ראה

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#### **Qohelet**

# XML-TEI encoding (Location-referenced method)

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3. שיעמול – לאדם 147. לאדם 19, 57, 118, 121, 166, 693.
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<lem>לאדם</lem>
                                   <rdgGrp ana="#subst #sem #noun">
                                     <rdg wit="#K147">לאיש</rdg>
                                   </rdgGrp>
                                 </app>
                                 <app loc="1 3">
                                   <lem>\u0</lem>
TEI
                                   <rdgGrp ana="#del #prn #suff">
                                     <rdg wit="#K56">עמלי</rdg>
                                   </rdgGrp>
                             11
                                 </app>
                             12
                                 <app loc="1 3">
                             13
                                   <lem>שיעמל</lem>
                             14
                                   <rdgGrp ana="#scr pl #verb">
                             15
                             16
                                     <rdg wit="#K19 #K57 #K118
                                     #K121 #K166 #K693">שיעמול</rdg>
                                   </rdgGrp>
                             17
                                 </app>
```

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# From encoding to data matrix (XSL-T)

```
<app loc="1 3">
     <lem>לאדם</lem>
     <rdgGrp ana="#subst #sem #noun">
       <rdg wit="#K147">לאיש</rdg>
                                                 Wits.
                                                          v_0
                                                               V_1
                                                                     V_3
     </rdgGrp>
                                                  K19
    </app>
   <app loc="1 3">
                                                  K56
     <lem>עמל</lem>
                                                  K57
8
     <rdgGrp ana="#del #prn #suff">
9
                                                  K118
       <rdg wit="#K56">עמלי</rdg>
10
                                                  K121
11
     </rdgGrp>
                                                  K147
    </app>
12
                                                  K166
    <app loc="1 3">
13
                                                  K693
     <lem>שיעמל</lem>
14
     <rdgGrp ana="#scr_pl #verb">
15
       <rdg wit="#K19 #K57 #K118
16
       #K121 #K166 #K693">שיעמול</rdg>
```

</rdgGrp>

</app>

17

18

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# Data Witnesses

Total witnesses: 268

### **Deletions**

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

**★ Witnesses/taxa analyzed**: 116

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# 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>)

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## **Character state matrix**

		1	2	3	4	5	6	7	8
Taxon	12345678	9012345678	9012345678	9012345678	9012345678	9012345678	39012345678	39012345678	90
EK								90000000000	
00KL	00000000	90000000000	0000000000	0000000000	0000000000	10000000000	90000000000	90000000000	100
3IAK1	00000000	00000000100	0100000000	0000000010	00000000010	0000000000	900000000001	10000000000	10
3SK2	00001000	0001000000	1000000000	0000000000	0000000000	0000000000	90000001000	90000000000	100
4SK3	00000000	90000000000	0000000010	0000000000	0000000000	0000000000	90000000000	9090909999	100
2AK4	00000101	.0000000000	0000100000	0000000100	000000000	0000000000	9000001000	90010000000	100
4SK14	00100000	0000000000	1000000000	000000000	000000000	0100000000	9000000000	90010000000	100
3AK17	00000100	0001000000	0100100000	0000000101	.0000000000	0000000000	90001000000	00010000000	100
3AK18	01000010	0001000010	0110100000	0001010100	0001000000	0000000000	0000001100	00011000000	100
4SK19	00000000	0010000000	000000000	0000000100	000000000	0000000000	9000000000	00000000100	100
2AK30	00000010	0010000001	0000100000	000000000	000000000	1000000200	9000000000	90010000000	100
00K31	00000000	0000000000	0100000000	0000000000	000000000	0000000000	9000000000	9090999999	100
3AK50	00001000	0000000000	000000000	000000000	000000000	0000000000	9000000000	9090999999	100
3AK56	00000000	0000000000	1000000100	0000000110	1000000000	0000000000	1000000000	001000000000	100
4SK67	00000000	9099999999	000000000	0000000000	000000000	000000000	9000000000	9090999999	100
2AK76	00000001	.0000000000	0000100100	0000001001	1000000000	0000000000	90000000000	90000100000	100

## **Software**

Parsimony Analysis Using PAUP



http://paup.phylosolutions.com/

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# 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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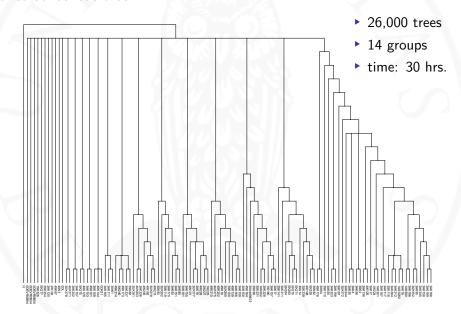
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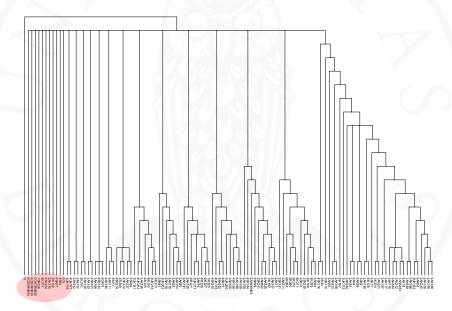
# Results

## Strict-consensus tree



# Results

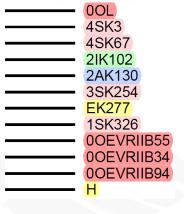
## The Textus Receptus group



## The Textus Receptus group

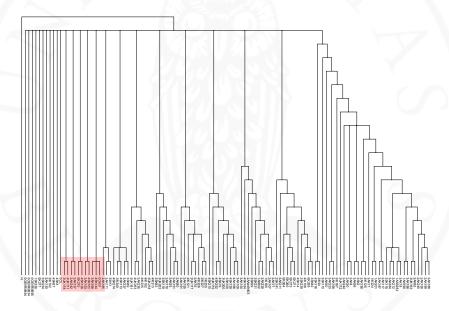
**H**: v. d. Hooght 1705

**K277**: Bomberg 1525 **00L**: C. Leningradensis

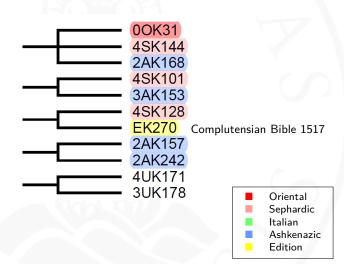


Oriental
Sephardic
Italian
Ashkenazic
Edition

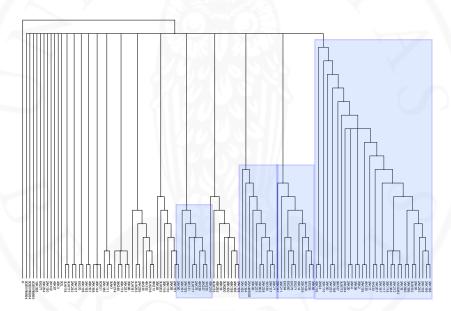
## The Textus receptus group



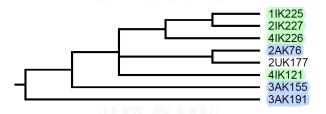
#### The Textus receptus group



Results
The *Anti-Receptus* group

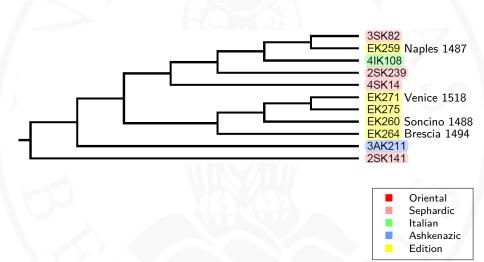


#### The Anti-Receptus group

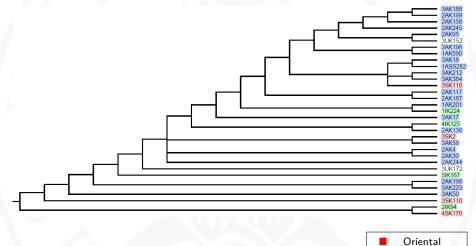




#### The Anti-Receptus group



#### 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)

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## **Ancestral reconstruction**

#### Some groupings



No. variants assigned to the hyparchetype: 1

1. Q. 1:16 בירושלים  $\rightarrow$  על ירושלים

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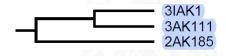
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## **Ancestral reconstruction**

#### Some groupings



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

- 2. Q. 3:21 a→ 'a'
- 3. q. 6:10 שתקיף  $\to$  שהתקיף
- 4. Q.~10:1 דומכבוד → מכבוד

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

- 1. Q. 5:8 היא → הוא
- 2. Q. 5:10 ראות  $\rightarrow$  ראות
- 3. Q. 7:6 □1 → □11
- 4. Q. 7:18 \(\mathbf{N}\mathbf{N}\) → \(\infty\)

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## 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 → ידעתי	0.400
2AK77 (2AK107) 1IK180	5:6	→ -	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	מהלוך → מהלך	0.500
	8:4	ושלטון → שלטון	0.333
	9:9	חיי הבלך → הבלך	0.333
2IK225 2IK226	2:4	ונטעתי → נטעתי	0.500
	2:10	בכל → מכל	0.333
3AK18 1ASS882	12:9	ותקן → תקן	0.500
	2:5	נטעתי → ונטעתי	0.333
	9:9	כל ימי הבלך → -	0.333
	12:9	ותקן → תקן	0.333
3AK212 3AK384	8:9	המעשה → מעשה	0.500
	5:18	ונכסים וכבוד → ונכסים	0.333
2AK117 2AK187	6:10	לא → ולא	0.500
1AK201 1IK224	5:1	המעשה → מעשה	0.500
	8:11	→ - בני	0.333
4SK173 3IK240	12:8	הבל הבלים הכל הבל → הכל הבל	0.500
4IK213 3UK218	7:12	את בעליה → בעליה	0.500
	1		

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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:  $\frac{variation\ places}{tree\ length} = \frac{371}{1659} = 0,22\ (much\ homoplasy)$
- ▶ **Bootstrap**: few groups with support > 50%

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## 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)

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## **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. ...

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# Thank you for your attention!

Any questions and/or suggestions?

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