Short Guide to the CBGM - Mark (Phase 3.5)

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The links on the start page take the user to contents related to:
1. Coherence and Textual Flow
2. Comparison of Witnesses
3. Optimal Substemma
4. Minimum Set Cover
5. Find Relatives

The functions described here are also available for the ***CBGM Acts and Mark in a Docker Container***, which can be downloaded here. The Docker version enables you to run the CBGM for Acts and Mark on your own computer. Video instructions for the CBGM Acts Docker, which are similar to Mark, are here, with a short introduction to the CBGM:

1. Coherence and Textual Flow

Navigation Bar
Enter the numerical address of a variation unit, e.g. 1:9/14-16, to populate the sections below. Click the appropriate arrow to go to the previous or next variation unit.

Apparatus
The apparatus shows the Greek manuscript witnesses for each of the variants of the selected passage. Deficiencies are listed under "zz".
"Splits" will split the display of witnesses if their genealogy points to diverse ancestry within the range of **Connectivity** 5.

> Example: At 1:9/14-16 "Splits" will distinguish *a1* from *a2*. The two witnesses displayed under *a2*, 837 and 1675, have no potential ancestors in the *a* attestation within a connectivity range of 5.

Click on the variant text to see the respective Textual Flow Diagram under "Coherence in Attestations" below.

Click on the number of a witness to see a list of its relatives, e.g. 01. (This feature is also available for witness numbers in the sections below.)

Relatives
The witnesses displayed in the apparatus or one of the textual flow diagrams are each linked to a list of their closest relatives. For example, click on 05, a witness of variant *b*, at 1:9/14-16.

The user may choose between several display options from the bar above the list.
Rel (default) – Show all relatives
Anc – Show potential ancestors only
Des – Show potential descendants only

10/20/All (default) – Show up to 10/20/All witnesses of the selected category

Variant: All+Lac (default) – Show all witnesses of the selected category regardless of whether they support a variant or are deficient at the given passage
Variant: All – Output restricted to witnesses extant at the given passage
Variant: a ... – Output restricted to witnesses supporting the selected variant

Chapter: All (default) – Show relatives on the basis of evidence from all chapters of Acts or select a specific chapter from the bar menu

A/MT – Click to exclude (default) or include the reconstructed initial text *A* and/or the majority text *MT*. Note that *MT* is cited as deficient (i.e. labeled *zz*, as in 1:9/14-16) if *Byz* is not defined in the ECM Acts apparatus.

Frag – Click to exclude (default) or include minor fragments. A minor fragment is defined by the number of passages where it shares text with the witness in question. If the number is lower than a half of the passages where the witness in question is extant, then the compared witness is considered a minor fragment. Minor fragments can be displayed and get the mark ">", but they are not included in the ranking of potential ancestors.

Rec/Sim – Recursive/Simple (default) relationships between variants in the local stemmata. If "Sim" is selected, then indirect relationships between variants (e.g. between a and c in a chain *a*<*b*<*c*) are counted as "no relation". If "Rec" is selected, then such a relation is included like a direct one.

MT • MT/P • AA • MA

The header below the bar of options displays four percentages, referring to the witness in question, which help to put the agreement values in the table below into perspective: the share of variants pertaining to the majority text (**MT** and **MT/P**),[1] the percentage of the average agreement (**AA**) and the median agreement (**MA**) with all witnesses included.

MT indicates the percentage of majority readings at passages where the respective manuscript is extant *and* **MT** is defined. **MT/P** indicates the percentage of majority readings on the basis of all variant passages where the respective manuscript is extant.[2]

The list produced with default parameters will show 03 (**W2**) as the closest relative of 01. The ranking number in the second column (**NR**), together with ">" in the third (**D**), marks 03 as the first potential ancestor.

The column headings are explained on mouse-over. The categories and figures are the same as in "Comparison of Witnesses".

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[1] The variants of the majority text were determined by a selection of nearly pure representatives of the Byzantine text (cf. ECM I.1, part 2 Supplementary Material, §2.2 Codices Byzantini). Where these representatives point to a split Byzantine attestation, it is not possible to determine the majority reading with certainty. Such passages were not included for determining the MT value in the "Potential Ancestors and Descendants" module.

[2] If x is the number of passages where the manuscript is extant, y the number of passages where the majority text is defined, z the number of passages where the manuscript agrees with the majority text, then **MT** = *z*/*y* and **MT/P** = *z*/*x*.

Local Stemma

A local stemma display provides a graph of the relationship between the variants of a passage. If the source of a variant is unclear this is expressed by a question mark. Note that this can also refer to a variant in specific witnesses, as indicated by the split *a1*/*a2* at 1:9/14-16. In the local stemma of 1:9/14-16, *a2* designates variant *a* in two witnesses, 837 and 1675, because their genealogy does not agree with the rest of the *a* attestation.

Coherence at Variant Passages (GraphViz)

This module shows relationships between pairs of witnesses at a given passage, if one of them is a potential ancestor that, within a set range of connectivity, supports another variant. "GraphViz" is the software used for the graph.

At 1:9/14-16, for example, there are eight witnesses supporting *b* whose first or second potential ancestor have variant *a*. This is expressed by the direction of the arrows to which the appropriate number is attached, if the arrow does not come from the first potential ancestor. In two cases the relationship is converse: 1675 and 837 are witnesses of *a*, but their third or first potential ancestor (349 for 1675 and 543 for 837) support *b*.

Options

Splits, default if applicable, shows to which split of an attestation the displayed witnesses belong.

Conn – Connectivity is the estimated capacity of a variant to connect ancestors and descendants genealogically. It is set to five by default, which is a relatively low value. Move the slider in either direction and observe the effect on the display of relationships. The higher the connectivity, the fewer interrelations are shown. The reason is that the application retrieves potential ancestors within the same attestation as long as the respective ranking number does not exceed the set connectivity value. If connectivity is set to ten, Coherence at Variant Passages will only show pairs, if no potential ancestor with a ranking number up to 10 is found within the same attestation.

Chapter: All – see above

A/MT – see above

Rec/Sim – see above

A=a – If the initial text A has been included by clicking on A in the fourth unit of the options bar, this drop-down menu allows to assign each of the readings of a passage to the initial text.

Coherence at Variant Passages (Chord)

The "Chord" software produces a different view of the same relationships.

Coherence in Attestations

Variant – Select a variant from this menu or click on it in the apparatus module to see the respective textual flow diagram.

The other options have been explained above. The user can explore how they affect the graph.

The graph shows the genealogical relationships within the same attestation according to a set connectivity. If no potential ancestor is found within the same attestation for this connectivity, potential ancestors supporting other variants are taken into account. For 1:9/14-16a, we see such relationships for 837 and 1675 again. The displayed relationship is a "first order relationship" unless a number is attached to the connecting line.

General Textual Flow
This module maps the attestations at a given passage onto a graph in which each witness is connected to its first potential ancestor. The attestations are color-coded. In addition, the witnesses at the top of a genealogical cluster are assigned the variant label. Lacunose witnesses (assigned to *zz*) are included by default if they establish a relationship to a descendant. If lacunose witnesses constitute terminal nodes, they are included only if the *Z* option is selected from the second unit in the options bar. Again, the user may include or exclude the reconstructed entities *A* and/or *MT*.

Chapter: All – see above.
Rec/Sim – see above.

2. Comparison of Witnesses

Enter two witness numbers, e.g. 01 and 02. The resulting list shows a summarization of results in the first line and the results for each individual chapter in the subsequent lines. The figures in the first line are in accordance with those in the lists of relatives of the compared witnesses.
The column headings are explained on mouse-over. The categories and figures are the same as in lists of relatives.
Click "+" in the first column of the list to see a list of passages with differences between the compared witnesses for the respective chapter.

3. Optimal Substemma

This module enables the user to survey a range of *potential* ancestors regarding their capacity to explain a witness's text and thereby qualify as *stemmatic* ancestors. The text of a witness is considered explained if its variants either agree with or are posterior to the variants found in its stemmatic ancestors. An optimal substemma consists of a range of ancestors as small as possible to explain a maximum number of variants in the respective witness.[3]

The *Optimal Substemma* (OS) interface can be populated manually or through the relatives list of a witness. Suppose you want to construct the optimal substemma for 02. Open the relatives list by clicking 02 in the apparatus or one of the textual flow diagrams. There is a stemma symbol on the rightmost column for the first fifteen potential ancestors. If you click the symbol in the 15th line, the OS interface opens, 02 appears in the Witness field, and the first fifteen potential ancestors are in the Ancestors field. In the frame below, the first fifteen lines show the best results for all combinations of 1-15 potential ancestors. Farther down, all combinations of 1-14 potential ancestors are displayed.

[3] On the construction of optimal substemmata and a global stemma: Mink, Gerd, *The Coherence-Based Genealogical Method (CBGM) - Introductory Presentation*, Release 1.0 (2009), online: <https://www.uni-muenster.de/INTF/cbgm_presentation/download.html> 475-574

Witness: 02 Ancestors: 041 017 178 2517 105 3 351 35 18 23 261 26 1542 011 873 Go

Optimal Substemma for Witness 02 (5611) using 041 017 178 2517 105 3 351 35 18 23 261 26 1542 011 873

CSV

Ancestors	N	Equal	Post	Unknown	Open	Hint
041 017 178 2517 105 3 351 35 18 23 261 26 1542 011 873	15	5479	99	32	1	<<
041 017 178 2517 105 3 351 35 18 23 261 26 011 873	14	5478	100	32	1	<<
041 017 178 2517 105 3 351 35 18 23 261 011 873	13	5475	103	32	1	<<
041 017 178 2517 105 3 351 35 18 23 011 873	12	5474	104	32	1	<<
041 017 178 2517 105 3 351 35 23 011 873	11	5474	104	32	1	<<
041 017 178 2517 105 3 351 23 011 873	10	5474	104	32	1	<<
041 017 178 2517 105 3 23 011 873	9	5473	105	32	1	<<
041 017 178 2517 105 23 011 873	8	5471	107	32	1	<<
041 017 178 2517 23 011 873	7	5470	108	32	1	<<
041 178 2517 23 011 873	6	5468	110	32	1	<<
041 178 23 011 873	5	5467	110	33	1	<<
178 261 011 873	4	5443	132	35	1	<<
178 011 873	3	5433	138	36	4	<<
041 105	2	5429	130	49	3	<<
041	1	5321	137	58	95	<<
041 017 178 2517 3 351 35 18 23 261 26 1542 011 873	14	5479	99	32	1	
041 017 178 2517 105 3 351 18 23 261 26 1542 011 873	14	5479	99	32	1	

OS results for the first 15 potential ancestors of 02 in Mark Phase 3.5

041, the first potential ancestor, alone explains the variants in 02 in 5,321 passages by agreement (Equal) and in 137 passages by posteriority (Post). In 58 passages, the genealogy of the variant is unknown, i.e. assigned to a question mark in the local stemmata. In 95 cases, 02 is neither equal with nor posterior to 041 (Open).
For a combination of two potential ancestors, the result is optimal with 041 and 105. The number of explained variants increases to 5,429, and the numbers under Unknown and Open decrease to 49 and 3.
Up to a combination of six ancestors, the numbers under Unknown and Open keep decreasing. Then, only the numbers under Equal increase slightly compared to the number under Post. Therefore, the combination of six ancestors (041 178 2517 23 011 873) promises the optimal result. If we go for this option, the next step would be to revise the local stemmata for the list of passages displayed when we click the + sign left of the combination of six.
It is possible, however, that the OS result could be improved if we include more than 15 potential ancestors. The restriction to 15 is due only to the concern that more would exceed the capacity of the server, as the number of possible combinations increases exponentially. The Minimum Set Cover method provides means to improve the OS result by a better preselection of potential ancestors.

4. Minimum Set Cover

To run the Minimum Set Cover (MSC) algorithm without preselection of ancestors, enter its GA number into the Witness field and click Go. For 02, this produces a list of 12 potential ancestors to be processed by Optimal Substemma (OS).

Witness: 02 Pre-Select: Go

Minimum Set Cover for Witness 02 (5611))

A MT Fam

No.	Ancestor	Equal	Post	Unknown	Total Open	Total Explained	
1	041	5321	137	58	95	5458	
2	105	100	1	49	3	5559	
3	1495	11	1	38	2	5571	
4	011	5	0	33	2	5576	
5	03	4	0	30	1	5580	
6	873	3	0	27	1	5583	
7	04	2	0	25	1	5585	
8	043	2	0	23	1	5587	
9	064	1	0	22	1	5588	
10	23	1	0	21	1	5589	
11	33	1	0	20	1	5590	
12	178	1	0	19	1	5591	

MSC results for 02 in Mark Phase 3.5

MSC starts with the first potential ancestor, 041, and in the next step, determines the witness that will reduce the greatest number of unresolved cases: 105. By selecting these two witnesses for OS, the numbers under Unknown and Open would decrease to 49 and 3. The third suggested ancestor, 1495, is a witness that is the number 24 in the list of potential ancestors of 02. It lies outside the scope of 15 potential ancestors for which OS is applicable and still explains more of the remaining unresolved cases than a closer potential ancestor. The reason is that closer potential ancestors do not have more to contribute to explaining the text of 02 than the first and the fifth potential ancestors, 041 and 105, because they are so similar to these.

A combination of all 12 suggested ancestors would explain most of the variants in 02, but there would remain 20 unresolved cases. Considering that we are looking for a combination of ancestors as small as possible to explain a maximum number of variants in 02, we now have to revisit the local stemmata that pose issues and see whether it is possible to improve them. Here, running OS with a small combination of ancestors is advisable. We may start with three. To do this, click on the stemma symbol in the third line of the MSC table to run OS for the optimal combination of three potential ancestors.

Witness: 02 Ancestors: 041 105 1495 Go

Optimal Substemma for Witness 02 (5611) using 041 105 1495

CSV

	Ancestors	N	Equal	Post	Unknown	Open	Hint
⊕	041 105 1495	3	5450	121	38	2	<<
⊕	041 105	2	5429	130	49	3	<<
⊕	041	1	5321	137	58	95	<<
⊕	041 1495	2	5424	128	41	18	
⊕	105 1495	2	5332	185	80	14	
⊕	105	1	5252	205	117	37	
⊕	1495	1	5120	178	96	217	

OS results for 02 with three ancestors suggested by MSC

To get a list of unresolved passages for this combination, click + left in the first line of the OS list for 041, 105, and 1495.

Witness: 02 Ancestors: 041 105 1495 Go

Optimal Substemma for Witness 02 (5611) using 041 105 1495

CSV

	Ancestors	N	Equal	Post	Unknown	Open	Hint
⊖	041 105 1495	3	5450	121	38	2	<<

Details of Combination 041 105 1495

CSV

Type	Passage	Lesart
unknown	Mc 1:13/2-10	και ην εν τη ερημω
unknown	Mc 2:16/14-26	αυτον μετα των τελωνων και αμαρτωλων εσθιοντα
unknown	Mc 3:28/12-24	αφεθησεται τοις υιοις των ανθρωπων τα αμαρτηματα
unknown	Mc 3:28/26-30	και αι βλασφημιαι
unknown	Mc 3:35/24-26	και αδελφη
unknown	Mc 4:8/26-28	και αυξανομενον

OS results for 02 with three ancestors suggested by MSC: list of unresolved passages

We see that constructing an optimal substemma requires a new iteration through cases left open in previous editorial work.

5. Find Relatives

Enter book (e.g. Mark), chapter, version, and word address, then select which variant to see. The resulting data gives a total count of witnesses for the variant and opens a Relatives table for each witness. Clicking on a witness will scroll the page down to its Relatives table.