

Mapping the Textual History of Hebrews

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Abstract. The multivariate technique of classical scaling is applied to the textual tradition of the New Testament Epistle to the Hebrews. The resultant maps may be interpreted as representing the textual development of the Epistle in time, and, perhaps, space. The data matrices from which the maps are produced have a high inherent dimensionality, so the maps are limited in their ability to convey the textual situation sufficiently. Comparison with a set of critical principles suggests that the texts of P46 and *Codex Vaticanus* are the most primitive among the extant witnesses.

Résumé. La technique multivariée de l'analyse hiérarchique classique est appliquée à la tradition textuelle de l'Épître aux Hébreux du Nouveau Testament. Les graphiques qui en découlent peuvent être considérées comme représentant le développement textuel de l'Épître dans le temps et, peut-être, l'espace. Les matrices de données ayant servi à produire ces graphiques présentent une dimensionalité inhérente élevée, ce qui limite leur capacité à exprimer de façon fiable la situation textuelle. Une comparaison à un ensemble de principes critiques permet de penser que les textes de P46 et du *Codex Vaticanus* sont les plus anciens.

Keywords: Classical scaling, multivariate analysis, textual criticism, Epistle to the Hebrews, New Testament.

Mots-clés : Analyse hiérarchique classique, analyse multivariée, critique textuelle, Épître aux hébreux, Nouveau Testament.

1. Introduction

The New Testament is supported by a rich and diverse textual tradition. Besides thousands of extant manuscripts in its original Greek language, there are tens of thousands of other witnesses including quotations

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by Church Fathers and versions in languages such as Latin, Coptic, and Syriac. (Where versions are concerned, the presumed ancestral Greek text is of primary interest.) Each of these testifies to a substantially uniform text, yet only the smallest scrap of a manuscript is likely to have a text identical to another witness because textual variation is an all-pervasive feature. This is not surprising, given that the surviving witnesses probably constitute only a very small proportion of the total number of copies made before the invention of printing, and that they are hand-copies subject to the usual scribal corruptive tendencies.

A great deal of known textual variation is already present in witnesses dated to the third and fourth centuries C.E. Therefore, apart from involuntary errors, New Testament textual development after the fourth century was largely a matter of choosing between existing readings rather than creating new ones. Efforts to select the appropriate reading are evident in Origen's writings (*ca.* 200 C.E.), which shows that New Testament textual criticism is nearly as old as the text itself. Current New Testament textual research is predominantly concerned with recording the full range of variation, discerning which readings are most likely to be original, and producing a coherent history of the text's development.

These last two tasks are related, and are hampered by the difficulty of comprehending relationships among witnesses in a complicated tradition. The usual method of conveying such information is by way of a chart which tabulates the percentage of common readings in a given set of variation units for each pair of witnesses. (The term 'variation unit' is used to describe the array of possible readings which can be found at a particular location in the text.) The purpose of this paper is to apply a multivariate technique called classical scaling (also known as principle coordinates analysis) to present these relationships graphically, and to discuss possible implications of the resultant maps. Its subject matter is restricted to the witnesses and variation units given in the fourth edition of the United Bible Societies' (UBS) *Greek New Testament* (1993) for the Epistle to the Hebrews.

2. Description of the procedure

The first requirement of the procedure is to construct a data matrix which records the reading of each witness for each variation unit. (From this point on, I shall use the term 'witness' for any class of textual evidence, including manuscripts.) The apparatus of the *Greek New Testament* (1993) contains forty-four variation units for the Epistle to the Hebrews, in which the readings of about 160 witnesses are recorded. The evidence of most of these witnesses is not given for all of the forty-four variation units, either because the requisite collations have not been performed in a complete manner, the witnesses are fragmentary, or their readings cannot be determined with confidence as is frequently the case for patristic and versional citations. Such missing data hinders, but does not halt, subsequent analysis.

Each reading of a variation unit given in the apparatus is assigned its own integer. Missing data are signified by negative one (-1). Apart from assigning a negative value to missing data, the numbering scheme is arbitrary. The data are nominal, with the numbers merely serving as convenient labels by which corresponding readings can be compared at a later stage. (There may be some ordinal significance to the sequence of readings given in the apparatus. One of the critical principles employed by the editors of the UBS text is to prefer the reading which is the most likely cause of the others. The first reading of each variation unit is the text preferred by the editors after the application of this and other criteria.) As the data are nominal, the range of appropriate multivariate techniques is restricted to those which only test whether corresponding data matrix entries are the same or different.

A small section of the resultant data matrix is presented here for illustration (Table 1). The column headings are sigla for the witnesses, and the row labels are chapter and verse references. (These are removed from the data matrix before analysis.)

In order to allow comparison between the positions of modern scholarship and the witnesses already mentioned, I have supplemented the data matrix with the preferred readings of a number of other editions of the *Greek New Testament*, the readings chosen by some recent authors who have written commentaries on the text of Hebrews, as well as readings selected by the application of certain critical principles. That is, the readings of each edition, author, and critical principle have been added to the data matrix, constituting additional classes of witnesses besides manuscripts, versions, and Church Fathers.

Table 1
A small part of the data matrix

ref	P13	P17	P46	P79	01	01^2	A	B	B^2	C	C^3
1.3	-1	-1	1	-1	0	-1	0	0	-1	-1	-1
1.8	-1	-1	1	-1	1	-1	0	1	-1	-1	-1
1.12a	-1	-1	0	-1	1	0	0	0	-1	-1	-1
1.12b	-1	-1	0	-1	0	-1	0	0	-1	-1	-1
2.7	-1	-1	0	-1	1	-1	1	0	-1	1	-1
2.8	-1	-1	1	-1	0	-1	0	1	-1	0	-1
2.9	-1	-1	0	-1	0	-1	0	0	-1	0	-1
3.2	1	-1	1	-1	0	-1	0	1	-1	0	-1
3.6a	0	-1	2	-1	0	-1	0	0	-1	0	-1

Taking variation unit 3.6a as an example, the first reading in the apparatus is assigned the number 0, the second reading 1, and so on. P13, 01 (Codex Sinaiticus or *Aleph*), A, B, and C have the reading labelled by the number 0, and P46 has the reading labelled 2. The readings of P17, P79, the second corrector of 01, the second corrector of B, and third corrector of C are not known for this variation unit. (The reading labelled 1 occurs in some of the witnesses which are not shown here.)

The editions are: Merk (9th edn, 1964); Souter (2nd edn, 1947); Tasker (1964); Tischendorf (8th edn, 1872); the 1873 Oxford edition of H KAINH ΔΙΑΘΗΚΗ which is the accepted standard used to represent the *Textus Receptus*; Westcott and Hort (1881); Nestle and Aland (25th edn, 1963); Bover (5th edn, 1968); Vogels (4th edn, 1955); and von Soden (1913). The readings of G. D. Kilpatrick's hand-amended copy of H KAINH ΔΙΑΘΗΚΗ (British and Foreign Bible Society, 2nd edn, 1953), a copy of which was kindly supplied by Dr J. Keith Elliott of Leeds University, were also added as a quasi-edition. It should be noted that the text of the current 27th Nestle-Aland edition (NA27) is identical to that of the 4th edition of the UBS *Greek New Testament* (GNT4).

The recent authors, along with their corresponding volumes, are: H. W. Attridge, *The Epistle to the Hebrews* (1989); F. F. Bruce, *The Epistle to the Hebrews* (1990); P. Ellingworth, *The Epistle to the Hebrews: A commentary on the Greek text* (1993); W. L. Lane, *Hebrews 1-8* (1991), and *Hebrews 9-13* (1991); B. M. Metzger, *A textual commentary on the Greek New Testament* (2nd edn, 1994); and G. Zuntz, *The text of the Epistles: a disquisition upon the Corpus Paulinum* (1953).

The critical principles have, in the main, been compiled from a survey by E. J. Epp (1993, 141-173), and are listed below:

- (1) **Authentic:** Prefer the reading most likely to have been written by the author.

- (2) **Difficult:** Prefer the more difficult reading.
- (3) **Discordant:** Prefer the reading which is not in harmony with a parallel passage.
- (4) **Elemental:** Prefer the reading which is not a conflation of alternative elemental readings.
- (5) **Explanatory:** Prefer the reading which is most likely to have caused the others.
- (6) **Short:** Prefer the shorter reading.
- (7) **Stable:** Prefer the stable reading. That is, reject readings which are absent in some witnesses and have a variable position in others.
- (8) **Diverse:** Prefer the reading supported by diverse witnesses. 'Diverse' refers to witnesses which are not kindred.
- (9) **Early:** Prefer the reading of earlier witnesses.
- (10) **Manifold:** Prefer the reading of ancient groups of witnesses.
- (11) **Prevalent:** Prefer the reading of the majority of witnesses.
- (12) **Reliable:** Prefer the reading of reliable witnesses.

Where possible, elements of the listed authors' discussions of the text at the forty-four variation units have been classified according to these twelve principles. Some of the principles are less reliable than others, but all are employed by the authors. Occasional conflicts occur when authors choose different readings based on the same criterion. In these cases, the conflict is resolved in favour of the author with the most compelling argument, or the affected variation unit is treated as a missing datum if neither side prevails.

Once the data matrix is finished, classical scaling maps are produced by processing subsets of the matrix with a suitable computer program. The software package used here is the SYN-TAX program written by J. Podani of Eötvös University. As the data are nominal, the only suitable means of calculating the similarity between witnesses represented by the column vectors of the data matrix is the Gower coefficient. (This coefficient gives the same results, except for a factor of 100, as the calculation of percentage agreements to which textual critics are accustomed.) Hence, for each pair of witnesses, the *dissimilarity* is the complement of the proportion of the number of agreements to the number of variation units for which both witnesses are present. To illustrate, the dissimilarity between witnesses B and C for the limited number of variation units given above is $1 - (2/5) = 0.60$ because there are two readings in common (which happen to be signified by zeros in both cases) out of five variation units for which both B and C are represented.

Separate maps have been produced for each of the classes of manuscripts, versions, Fathers, editions and authors, and critical principles. Each class map is produced from a subset of the complete data matrix which includes twenty reference witnesses and witnesses from the relevant class which are present in a sufficient number of variation units. Missing data produce two problems in this analysis. Firstly, if two witnesses do not overlap in the variation units for which they are extant, then the Gower coefficient is undefined because the divisor, being the number of common variation units, is zero. Secondly, the smaller the number of common variation units, the larger the uncertainty in the calculated dissimilarity. Consequently, as a general rule, only those witnesses have been included which exist in ten or more of the forty-four variation units. Also, where two witnesses each exist in ten or more variation units but have no variation units in common, a separate map is produced for each one. Fortunately, this only occurs twice for the witnesses of this study.

The sufficiency limit of ten has not been chosen in a scientific manner. It is an intuitive guess as to a figure which is large enough to reduce uncertainties and the number of mutually exclusive witnesses, but small enough to allow a wide range of witnesses to be included. The twenty reference witnesses give a set of reference points common to each class map with which the locations of each of the witnesses in the class may be compared. They are relatively complete (existing in more than forty of the variation units) and representative of a wide range of textual complexions. Also, to reduce clutter, some which would otherwise qualify have been excluded because of their close similarity to others chosen as reference witnesses.

This strategy has been chosen because it enables many witnesses to be included in few maps. For completeness, a more appropriate method would be to produce a separate map for each witness by including only those variation units for which the witness is present, along with the other witnesses which exist for all of the same variation units. However, space limitations are against this approach. (There are more than 180 witnesses when the editors, authors, and critical principles are included.)

In producing the following maps, two important witnesses have been exempted from the constraints described above. *Codex Vaticanus* (siglum = B) has been included as a reference witness where possible, even though it is missing for the second half of Hebrews. Also, Origen has been included despite being present in less than ten variation units. In fact, his witness is a conflation of the relevant Latin and Greek citations given in the UBS apparatus, yet still only covers eight variation units.

(Where Latin and Greek readings of Origen conflict, the Greek has been preferred.)

Only the two most significant dimensions (*i.e.* axes) of the resultant maps are plotted. An illusion of similarity between witnesses can occur when higher dimensions are not shown. As an analogy, stars which appear next to each other in the night sky may actually be many light years apart. The illusion of proximity is caused by our inability to perceive the depth dimension at such great distances. To help determine whether apparent similarity is genuine, minimum spanning tree diagrams are also given for each class of witnesses. As the methods by which witness positions are determined for the maps and tree diagrams are quite distinct, if a pair of witnesses are close in both representations then it is likely that they are close in reality. Thus, the classical scaling maps ought to be viewed in conjunction with their corresponding minimum spanning trees when surveying witness locations.

The presentation of the first two dimensions of the classical scaling map along with the corresponding minimum spanning tree diagram allows the broad outlines of witness affinities to be comprehended with only two diagrams per class. By contrast, a complete approach requires a separate map for each pair of dimensions. (For n dimensions, this requires $n(n - 1)/2$ maps. The number of dimensions is one less than the number of witnesses included in the map, which is at least nineteen.)

3. Results

Figures 1a to 8b present the classical scaling maps and minimum spanning tree diagrams for the manuscripts, versions, Church Fathers, editions and authors, and critical principles witness classes. The two dimensions provided in these maps account for between 27 and 45 percent of the variation among the witnesses. That is, they present roughly a third to a half of the full picture. More complete representation requires more dimensions. The two dimensions provided are, however, the most significant, so these maps have a claim to being the most efficient two-dimensional representations of the witness similarity information contained in the corresponding data matrices.

Two maps are provided for each of the versions and critical principles classes. This is because pairs of witnesses within these classes (it^v and it^z , and the 'difficult' and 'shorter' principles, respectively) occur in

mutually exclusive domains, so there is no alternative but to present them separately.

4. Interpretation

The beauty of a map, as compared with a grid of percentage agreements, is that it can evoke an immediate response in the mind of the observer. At the same time, caution is necessary because pattern recognition is such a highly developed aspect of human perception that it is easy to misinterpret the significance of an array of points. These maps do not represent a sleeping cat or Ursa Major, but are mathematical constructs representing the mutual configuration of each eligible witness of Hebrews with respect to each other.

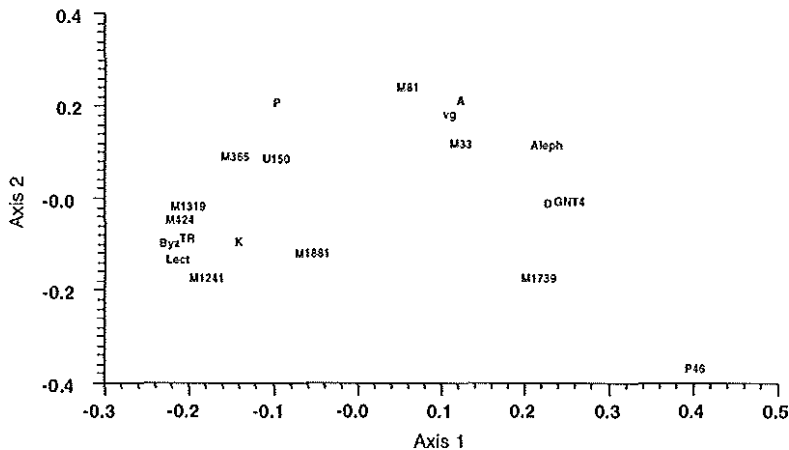


Fig. 1a.- Reference witnesses

Figure 1a shows the twenty reference witnesses, and provides an example of apparent, but non-genuine, similarity. Whereas the texts of Codex D and the UBS *Greek New Testament* (siglum = GNT4) appear to be close in the map, the associated tree diagram in figure 1b shows that this is an illusion because the two are separated by quite a few spans. (The lengths of the spans in these tree diagrams do not reflect the actual 'distances' between adjacent witnesses.) Witnesses that are known to be similar, such as the *Textus Receptus* (TR), and the Byzantine (Byz) and

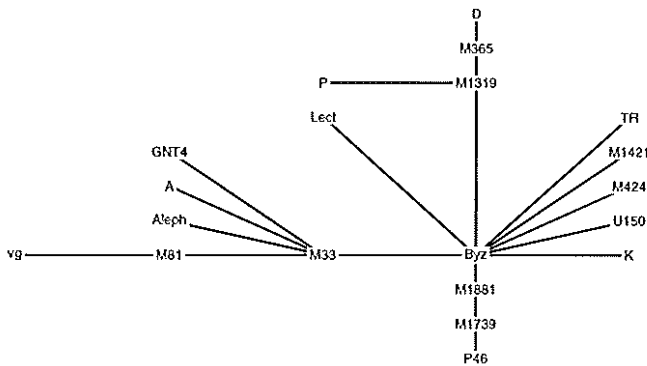


Fig. 1b.- Reference witnesses minimum spanning tree

lectionary (Lect) texts, occur in close proximity in both the map and the tree diagram.

The positions of the reference witnesses are significantly affected by the presence of other witnesses in the subsequent maps. For this reason, it is not generally safe to assume that a witness displayed in one class map is similar to one which has similar coordinates in another class map. It is better to gauge the affinity of a witness by finding its nearest reference witnesses and to make comparisons across classes on this basis.

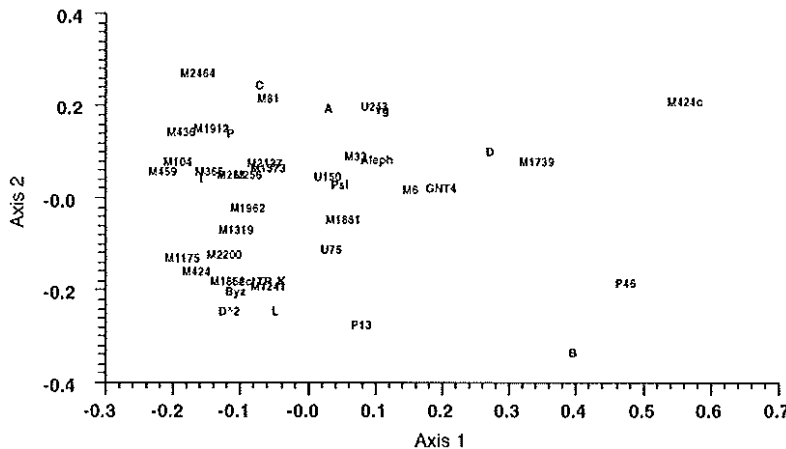


Fig. 2a.- Manuscripts

The class map of all of the eligible manuscripts in the *Greek New Testament* (1993) apparatus (fig. 2a) exhibits a wide spread of witness

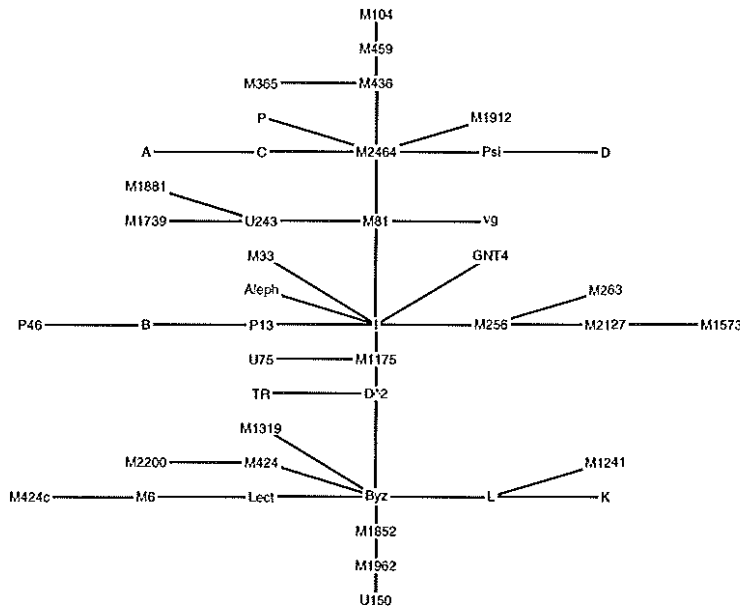


Fig. 2b.- Manuscripts minimum spanning tree

locations with a few points of concentration. This goes against the common belief that New Testament manuscripts generally fall into well defined groups. Instead, grouping in the range of texts represented by these manuscripts is the exception rather than the rule.

A temporal pattern is preserved in this map. The earliest manuscripts are papyri and uncials (sigla preceded by P, U, or just a capital letter such as B or *Aleph*) while the latest are minuscules (sigla preceded by M). In general, the manuscripts lie along a horseshoe-shaped arc which begins in the lower right where the earliest manuscripts lie, curves upwards to the region where there is a relatively even balance of late uncials and minuscules, then swings down to the bottom left where there are fewer uncials. A number of witnesses do not conform to this pattern. This is expected for minuscules such as 33, 81 and 1739, which are thought to preserve more ancient copies and their texts. The tree diagram shows that some witnesses such as P13 and the corrector of minuscule 424 (M424c) are less aberrant than indicated in the map.

Geographical information appears to be inherent within the manuscript relationships as well. P46 was found in Egypt, and there are reasons for supposing that B (Codex Vaticanus) was written there as well

(Metzger, 1981, 74). Zuntz (1953, 73) thinks that the ancestor of the exemplar of minuscule 1739 was written in Caesarea, Palestine. Most later manuscripts reflect a text which is called Byzantine. If fig. 2a is rotated through 90 degrees, it appears to represent this geographical situation, with Egypt and Alexandria in the ‘south’ (P46 and B), Byzantium (*i.e.*, Constantinople) in the ‘north’, and Palestine between the two (minuscule 1739).

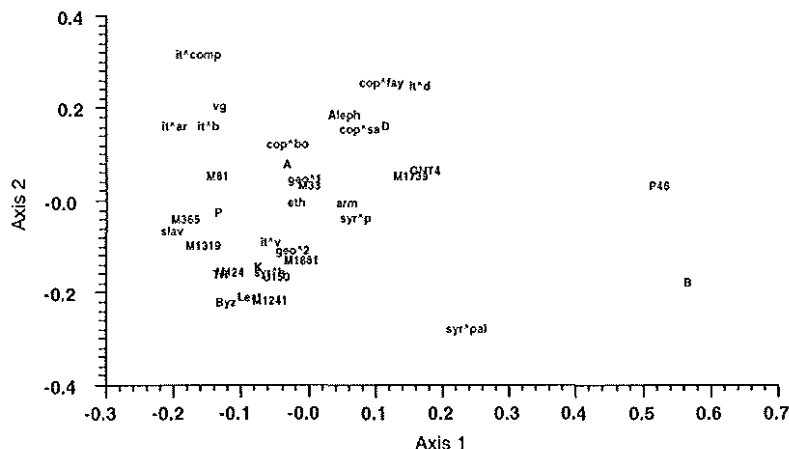


Fig. 3a.— Versions (excluding it²)

The version maps (fig. 3a and 4a) do not, at first sight, appear to support the hypothesis that the witness relationships contain geographical information. However, if the maps are again rotated through 90 degrees then reflected so that witnesses in the ‘east’ become witnesses in the ‘west’, and vice versa, the Latin and Syriac versions fall into the expected regions. The Palestinian Syriac (syr^{pal}) has been described as a Caesarean text (Metzger, 1992, 71), and it lies in the right part of the world when the version maps are interpreted in this way.

Rotation and reflection changes the perspective of the observer but not the relative dispositions of the witnesses. The maps can also be distorted as if they were printed on a sheet of rubber. Such a procedure does change distances between witnesses, but in a topologically non-violent manner. In this way, the horseshoe-shaped trend line mentioned before can be straightened. The maps are likely to be distorted with respect to their geographical counterparts because a dissimilarity calculated from

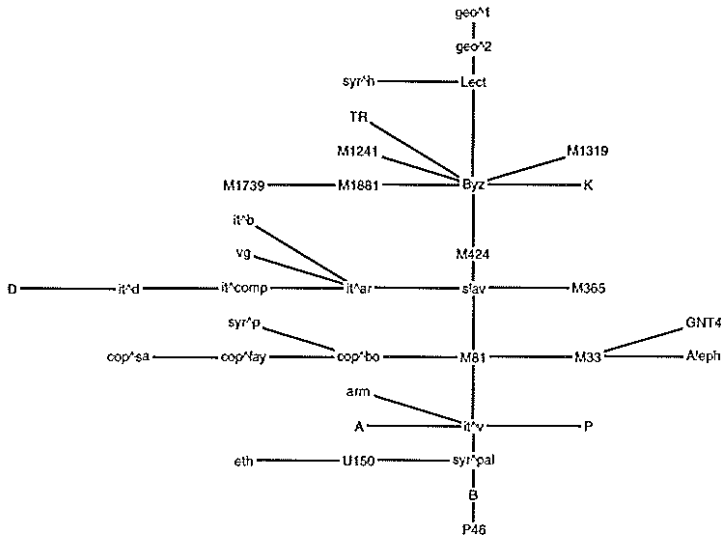


Fig. 3b.— Versions minimum spanning tree (excluding it^z)

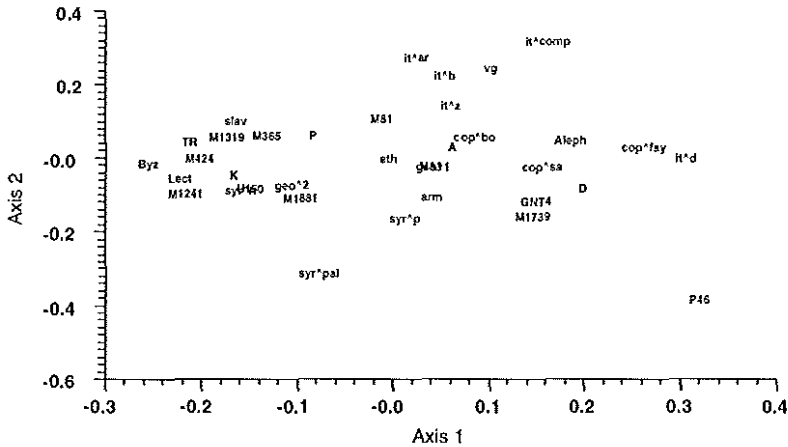


Fig. 4a.— Versions (excluding it^v)

textual agreements between a pair of witnesses is not likely to be linearly related to the Euclidean distance between their places of origin.

With respect to the Coptic versions, Sahidic (cop^{sa}) was spoken in the south of Egypt, Bohairic (cop^{bo}) in the north, and Fayyumic (cop^{fay}) was one of the languages spoken in the intermediate region. It is interesting to note that this order is preserved in the corresponding tree diagrams,

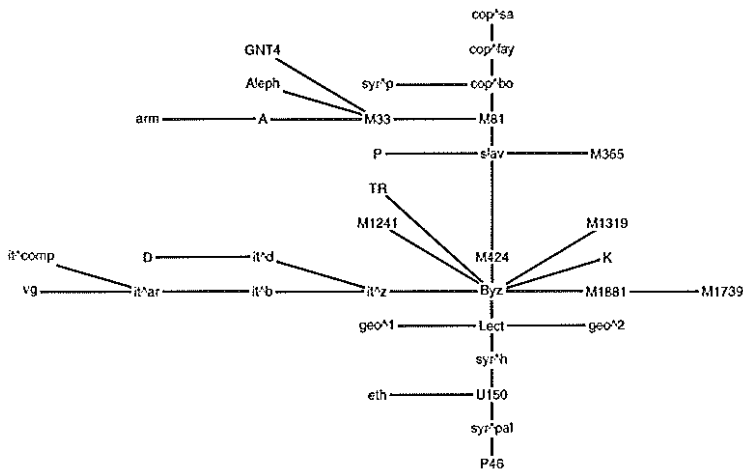


Fig. 4b.– Versions minimum spanning tree (excluding it^v)

figures 3b and 4b, but not in the maps. The anomaly may be caused by temporal information dominating geographical information contained in the data matrices. The previously noted time element inherent in the maps complicates interpretation as the hypothetical ‘north’–‘south’ dimension is also characterised by a progression from earlier to later texts. This explains the position of the Sahidic which is regarded as older than the Bohairic translation (Metzger, 1992, 80). The map position of the Fayyumic in relation to the Sahidic and Bohairic is problematic. The difficulty may simply be due to its location having been calculated from fewer variation units than the other two.

The map of Church Fathers provides the unsurprising results that Chrysostom (*ca.* 344–407 C.E., Antioch and Constantinople) used a Byzantine text, while Didymus (*ca.* 313–398, Alexandria) is associated with Alexandrian texts such as Codex Sinaiticus (*Aleph*) and minuscule 33. It is astounding that the Latin-speaking Ambrose (Bishop of Milan from 374 to 397) appears to have used a text similar to P46 and B. Surely this is an error caused by an insufficient sample of variation units. Another unexpected result is that Origen (185–253/254, Alexandria then Caesarea) appears to be further from the early Alexandrian text than Didymus, although this could be explained by his move to Caesarea and the small number of points from which his position is calculated. The text of Theodoret (*ca.* 393–*ca.* 466, Antioch and Cyrrhus) appears most closely related to that of Cyril (Patriarch of Alexandria from 412–444), whose

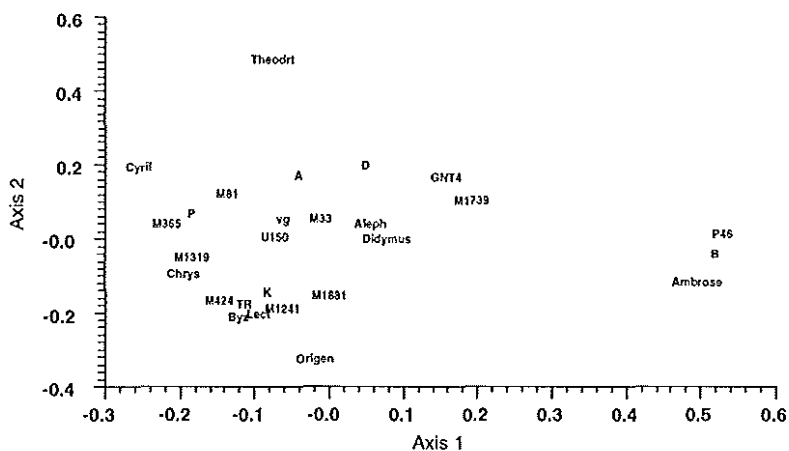


Fig. 5a.- Church Fathers

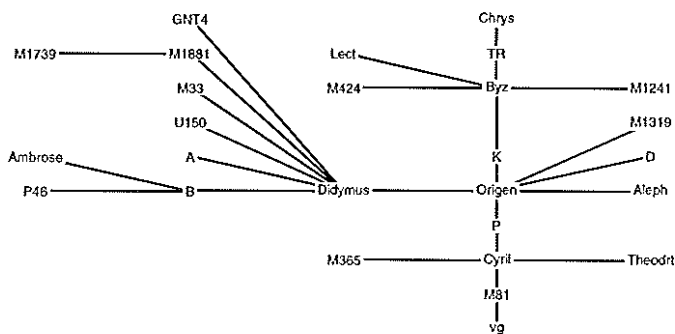


Fig. 5b.- Church Fathers minimum spanning tree

location shows that by his time an Alexandrian might be using a text with a large Byzantine component.

The texts of the editions and authors (fig. 6a) lie along the arc which extends from P46 and B, up to Codex Sinaiticus (*Aleph*) and down to the Greek text presumed to lie behind the Latin Vulgate (*vg*). This is not surprising, given that the quality of codices Vaticanus and Sinaiticus has been recognised since the time of Tischendorf and Westcott and Hort, and that the Vulgate has continued to exert an influence, especially in Roman Catholic editions. With respect to the texts lying between *Aleph* and P46/B, their close conformity to this arc suggests that their readings have been selected from these witnesses alone, almost oblivious of the rest of the tradition.

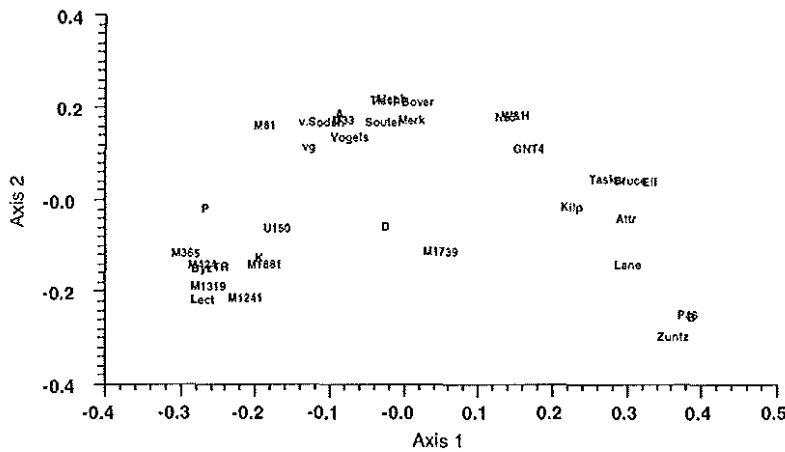


Fig. 6a.- Editions and authors

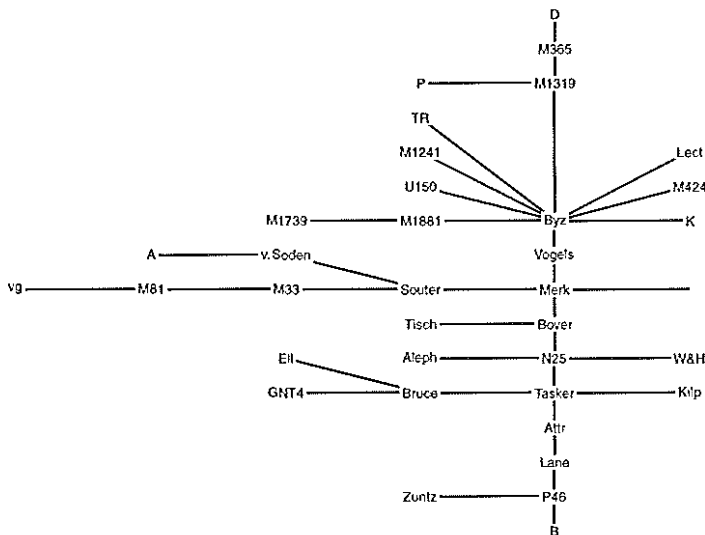


Fig. 6b.- Editions and authors minimum spanning tree

The last maps, figures 7a and 8a, are the most important. They include critical principles by which modern scholars attempt to isolate the original text, along with the reference witnesses and some of the more influential editions and authors. The 'prevalent' criterion falls near the majority of witnesses, as expected. A highly regarded principle, the 'explanatory' criterion, favours the text of minuscule 1739, whereas the majority view of

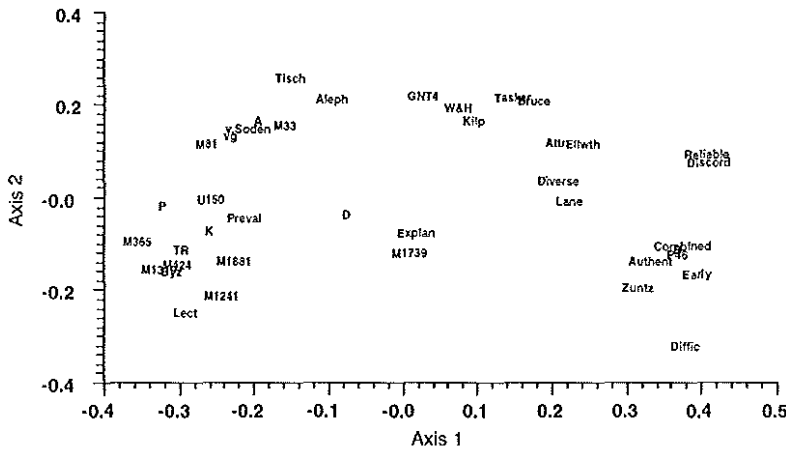


Fig. 7a.- Critical principles (excluding 'shorter')

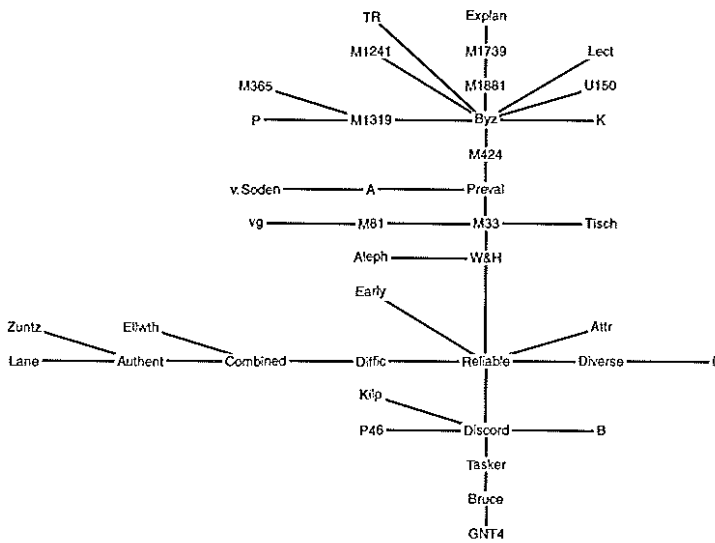


Fig. 7b.- Critical principles minimum spanning tree (excluding 'shorter')

all of the principles (siglum = 'combined') indicates that P46 and B are the most primitive texts. The readings of the combined witness are those most frequently chosen by the twelve critical principles listed before. (On the rare occasions when there are ties between readings, the affected variation units are treated as missing data.)

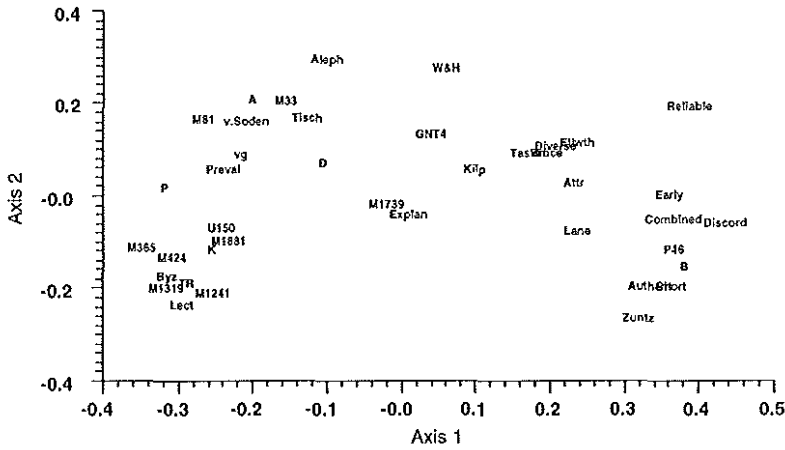


Fig. 8a.- Critical principles (excluding 'difficult')

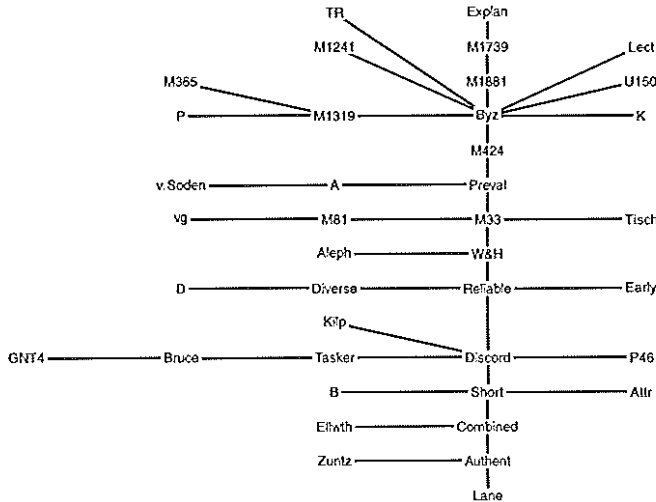


Fig. 8b.- Critical principles minimum spanning tree (excluding 'difficult')

5. Discussion

The procedure outlined here has many potential failings. Classical scaling attempts to find a configuration of points consistent with the dissimilarities between them, which are assumed to be Euclidean distances. This assumption is most unlikely to be valid for proportional agreements

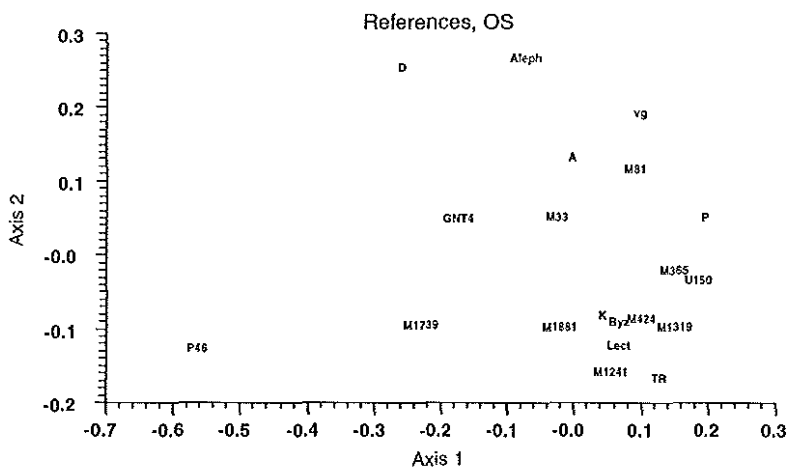


Fig. 9a.— Ordinal scaling map of reference witnesses (stress = 0.146)

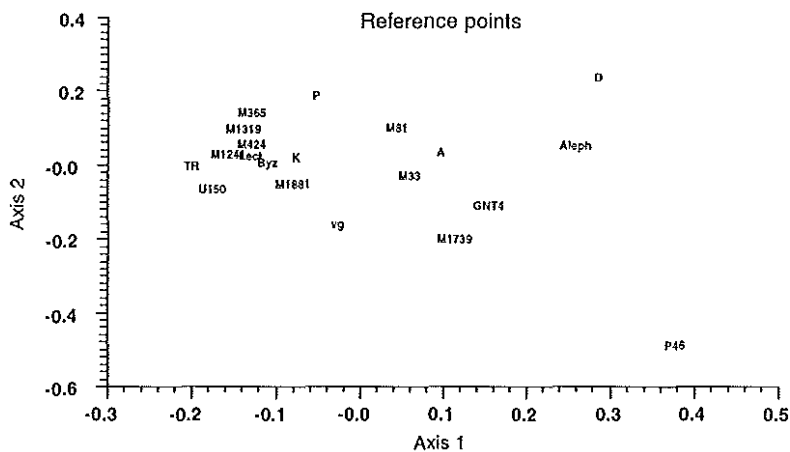


Fig. 9b.— Ordinal scaling map of reference witnesses (stress = 0.168)

among manuscript readings. Fortunately, the technique is quite robust to deviations from the Euclidean ideal. Ordinal scaling, which attempts to find a configuration based on the order of dissimilarities alone, is probably more appropriate. The advantage of classical over ordinal scaling is that an analytical rather than an iterative solution is obtained, so one can be sure that the given configuration is the best possible (Chatfield and Collins, 1980, 187–210). Figures 9a and 9b present two ordinal scaling solutions for the reference witnesses. The map with the lowest stress value

is the best representation. These show that, apart from a reflection in figure 9a, comparable results are produced by classical and ordinal scaling for the reference witnesses at least (*cf.* fig. 1a).

The method is unsafe when the members of a witness class have large proportions of missing data. Two fragmentary witnesses which each exist for at least ten of the variation units may have anything down to one variation unit in common without stopping the analysis. Dissimilarities calculated from such small samples are likely to adversely affect the resultant maps. The Church Fathers and critical principles maps are likely to suffer from this weakness, although the 'combined' witness is safe as it exists for thirty-eight variation units.

No attempt has been made to quantify the uncertainties of the plotted points. It is possible that the maps would change significantly if plotted from more comprehensive data. As a first check, the apparatus of the UBS *Greek New Testament* (1993) could be subjected to a similar analysis for the entire Pauline corpus, thereby providing more variation units for each witness. It is especially important to establish more reliable locations for key witnesses such as Origen, and to investigate some of the apparent anomalies in the preceding analysis, such as the locations of P13, minuscule 424c, Ambrose and the Fayyumic version.

The first two dimensions presented in the maps are insufficient for the apprehension of the total textual situation, even with the minimum spanning tree diagrams. Typically, the purpose of applying a multivariate technique such as classical scaling is to reduce dimensionality. A good result is obtained if the first few dimensions explain the bulk of variation. Unfortunately, the present data require at least eight dimensions to explain eighty percent of the variation. (This is another reason why ordinal scaling would be a more appropriate technique.) Part of the difficulty in classifying New Testament manuscripts may be due to this high dimensionality. A corresponding number of tests are required for a sufficient classification. The axes extracted by the classical scaling procedure provide an efficient basis for classification.

The listed critical principles may not be reliable. Few scholars trust the 'prevalent' principle because of a suspicion that the copying history is anything but uniform. The strategy employed here has been to use a number of popular critical principles, any of which may be poor guides, and to look for consensus among them. This approach is based on a belief that the consensus of diverse witnesses constitutes reliable guidance. The critical principles maps show that, apart from the 'prevalent' criterion, the listed criteria congregate in a region corresponding to earlier times.

While this is encouraging, a more satisfactory approach would be to employ principles which have a demonstrable ability to distinguish between early and late readings. This, in turn, calls for more study of textual tendencies at different stages of transmission history, both by examination of scribal practice in the manuscripts and analysis of trends within their texts. As noted before, New Testament textual development was more to do with choosing between existing readings than creating new ones. Presumably, at any given stage, certain readings were more likely to be chosen than others, whether consciously (for a theological reason, perhaps) or unintentionally (because some kinds of mistakes are more likely than others). Those which were 'fittest' for their context had a higher probability of being selected. Readings which continued to be favoured over time would become relatively more frequent. Within this Darwinian framework, definite trends in the relative frequency of readings could allow us to extrapolate back to a more ancient text as well as provide us with hints of the prevailing conditions under which the texts were transmitted.

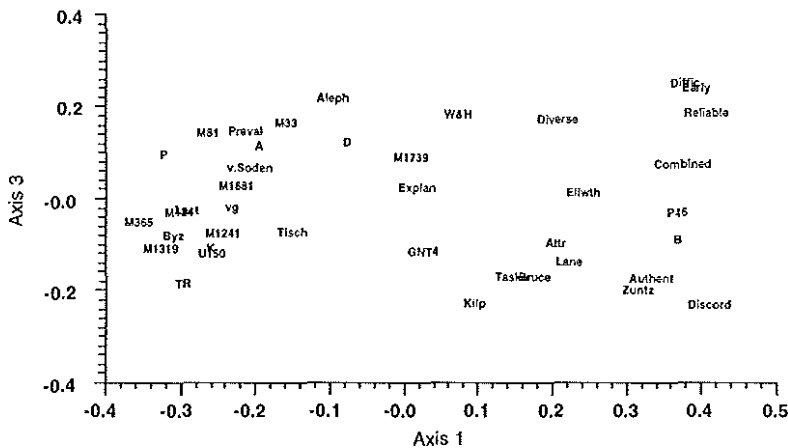


Fig. 10a.– Dimensions 1 and 3 of critical principles (excluding 'shorter')

The critical results may be biased towards influential editions and writers. Westcott and Hort's edition (W & H) has commanded respect among textual critics since its publication in 1881, and the current standard text (GNT4 = NA27) is not very far from it. Zuntz's opinions are often followed in the authors' commentaries. Therefore, the 'combined' witness may stand where it does because of Zuntz, and he may have

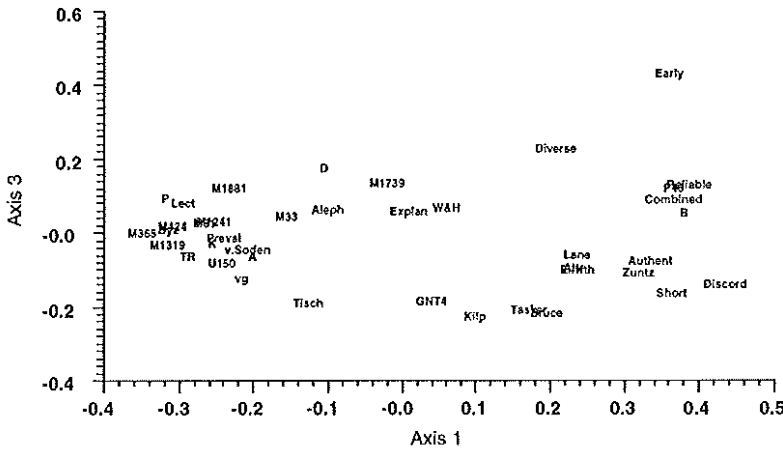


Fig. 10b.— Dimensions 1 and 3 of critical principles (excluding 'difficult')

been mesmerised by P46 and B. An independent application of reliable critical principles by suitably qualified experts is required to eliminate the possibility of influence by weighty witnesses, editions, and authors. This procedure has been called 'thorough-going eclecticism' and has been condemned because it does not take account of the witnesses, except to collect the range of possible readings. Such condemnation is actually commendation if 'thorough-going eclecticism' is able to provide an independent reference point by which to locate the most primitive texts.

The critical principles minimum spanning trees (fig. 7a and 8a) do not necessarily support the conclusion that P46, B, and the 'combined' witness are in close proximity. However, plots of the third dimension for the critical principles (fig. 10a and 10b) show that the conclusion is justified.

Classical scaling is not the only multivariate technique which can be applied to nominal data. Discriminant analysis is suited to allocating individuals (in this case, witnesses) to different populations and correspondence analysis can show which variables (in this case, readings) are the most important for classification. Hierarchical and non-hierarchical clustering diagrams identify grouping. Techniques such as Andrews diagrams, which represent witnesses as wave functions, are available for representing more than two dimensions (Chatfield and Collins, 1980, 49). It is also possible to superimpose minimum spanning trees on the maps, thereby further reducing the number of diagrams required.

6. Conclusion

Classical scaling provides a means of apprehending the broad outlines of the complicated New Testament textual situation for the Epistle to the Hebrews. It shows that the distribution of texts is more uniform than grouped. Axes extracted by the procedure could provide an efficient basis for future classification schemes. The high number of axes required to sufficiently characterise the data may explain why manuscript classification is difficult.

The text selected by the majority of critical principles on a reading by reading basis suggests that P46 and B are the most primitive texts to be found among the extant witnesses. At this point it is appropriate to recall that P46 is the oldest manuscript of Hebrews, and that B (Codex Vaticanus) has been widely regarded as the best New Testament manuscript since Westcott and Hort commended its text over a century ago.

The procedure shows promise, but further work is required to establish its reliability. In particular, a larger basis of variation units would provide more reliable locations for each witness. The technique may be readily extended to other parts of the New Testament and need not be restricted to textual variation alone. A similar analysis performed on orthographical variation may provide clues to manuscript provenance.

Note on the basic data

The data matrices and the classification of authors' opinions according to the listed criteria have not been included here because of their extent. However, they are available at the following URL:

<http://www.ulg.ac.be/cipl/rish/rish33/finneydata.html>
et <http://shemesh.scholar.emory.edu/scripts/test/TC/>

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