SOME THEORIES REGARDING ORDER IN THE SECOND TONARY OF MONTECASSINO 318

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Music 212: Chant Seminar
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Introduction

The manuscript Montecassino Archivio della Badia, 318 is a source containing two tonaries and many theoretical documents, including the *Musica enchiriadis*, the *Scolica enchiriadis*, treatises by Guido, and several smaller treatises, many not found in any other sources. This parchment manuscript comes to us from the second half of the eleventh century, not long after some of the theoretical sources in the manuscript are thought to have been written.[1] Although 300 pages long, most scholars believe the manuscript to be have been compiled by a single scribe.[2] The text and the notation is in the Beneventan script, with a diversity and abundance of liquescent neumes in the music. The first tonary, ff. 128-156, was described by Huglo as being very similar in content to many northern tonaries, which were becoming increasingly common toward the end of the 11th century.[3] Huglo described the second tonary, ff. 245-285, as being more representative of southern Italian practice, specifically the practice of Benevento and Montecassino. Huglo's assertion is supported in an article by Lance Brunner in *Early Music History* on the sequences in the second tonary of Montecassino 318 (hereafter referred to as 2tMC318).[4]

In examining 2tMC318, two questions might be asked by the reader: Why did the scribe create this tonary, and how did the scribe create it? I would not dare attempt to answer in large part either of these questions in such a short study as this, but instead, while acknowledging that a complete understanding of the motivations and processes of the scribe could never be attained, will start with some questions about how the scribe chose to order the chants of 2tMC318. By examining 2tMC318

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[1] Michel Huglo, *Les Tonaires,* (Paris: Société française de musicologie, 1971), p. 193.
[2] Paul Merkley, *Italian Tonaries*, (Ottawa: The Institute for Medieval Music , 1988), p. 120.
[3] Huglo, *Tonaires*, 193. See also Huglo, "Tonary" in *The New Grove Dictionary of Music and Musicians*, 20 vol. ed. Stanley Sadie, (London: Macmillan Publishers, 1980), vol. 19, p. 55.
[4] Lance W. Brunner, "A perspective on the South Italian Sequence: the Second Tonary of the Manuscript Montecassino 318," *Early Music History* 1 (1981), pp. 117-164.

and some coeval, or nearly coeval, practical musical sources from the same area patterns of order within the tonary will be observed. It is my hope that in delving into these questions a greater understanding of the working mind of the scribe of 2tMC318 can be uncovered.

In order to limit the scope of this investigation, I will be looking only at the antiphons in 2tMC318 and of those 393 antiphons will focus on the 139 antiphons of modes 1 and 2.[5] These antiphons will be compared to versions of them found in manuscripts Benevento 21, Montecassino 542, Benevento 19-20 (two volumes which will be treated by and large as one set in this study), and seven of the eight copies of the Ordinal of Montecassino.

Benevento 21 is an antiphoner which originally contained music for the office for the entire year, but is now missing some of the early music from Advent which would have come at the front of the manuscript. It was one of the six monastic antiphoners studied in the *Corpus antiphonalium officii* and parts of it have been published in facsimile in *Paléographie Musicale*.[6]

Montecassino 542 is also a monastic antiphoner. It contains the liturgical music from Advent, except where, again, some music has been lost at the beginning, until the end of Lent, after which the manuscript is incomplete. The contents of MC542 follow closely those of the Ordinal of Montecassino and will be available as part of the CANTUS database in January 1998.[7]

The two-volume manuscript Benevento 19 and 20 is unusual in that it presents all the music for both the office and the mass. As a secular (cathedral) manuscript, it contains a slightly different repertory from that of Ben21 and MC542. The manuscript can also be traced to the town of Benevento from its conception and thus will be useful in determining the provenance of other manuscripts including the origins of 2tMC318. An inventory of the vast contents of this manuscript is also available in the CANTUS database.[8]

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[5] The tables which accompany this paper list antiphons numbered from 1-400 total and 1-147 in modes 1 and 2. This discrepancy is because each entry was assigned a number early in the examination and some entries were later determined to be parts of other entries (e.g., number 9, "Misericordie sue" was the ending of antiphon 8) or hymns, which were often interspersed with the antiphons.

[6] René Jean Hesbert, editor, *Corpus antiphonalium officii*, (Rome: Herder, 1963). Thomas Forrest Kelly, editor, *Paléographie Musicale* 21, (Solemes: Abbaye Saint-Pierre, 1992), pp. 32-59.

[7] The CANTUS database inventories plainsong manuscripts and presents the results in a standardized and searchable format. It is accessible on-line at http://crocus.its.uwo.ca/cantus/ (recently moved). The index of MC542 was compiled by Katarina Livljanic.

[8] Text versions of these inventories can currently be found at gopher://vmsgopher.cua.edu/00gopher_root_music:[_cantus._text]_bene19.80 and gopher://vmsgopher.cua.edu/00gopher_root_music:[_cantus._text]_bene20.80, but given the volatile nature of the Internet (and the imminent demise of the gopher system) these sites may move in the near future. The compilation of Ben19 and 20 is unattributed.

The Ordinal of Montecassino survives in eight manuscripts of which seven have currently been edited and whose contents were available to me.[9] Although the ordinals do not contain musical notation, many of their antiphons are accompanied by numerals which indicate their mode. When studying modal ambiguities (chants which are classified into two or more different modes by different scribes) these extra sources will become especially useful.

Scribal Process

The tonary divides its chants into the eight modes which it identifies by number. The modes are then subdivided by genre of chant, with antiphons coming first, and responsories, introits, graduals, communions, and other chants following.[10] The subsection of each mode which contains the antiphons begins with a model antiphon, probably used to help a singer remember the mode, followed by a "Byzantine" intonation formula (e.g., *Noenoeane*), some theoretical information about the mode, and a psalm-tone recitation of the *Gloria Patri* ending with the first differentia of the mode attached to the end. The differentia, also called difference or variation formula, is used, according to theorists of the time, to flow from the end of the psalm into the antiphon. Antiphons which take this differentia follow and are listed with textual and in almost all cases musical incipit. It should be noted here that it was not the scribe's intention to list every antiphon he knew; he sometimes writes "et alii eorum simila" to indicate that other antiphons in the same melodic family would belong to this differentia group.[11] The differentia groups proceed very roughly from the first differentia in a mode having greater numbers of antiphons to the later differentiae having relatively fewer; beyond this, however, there seems little reason for the order of the differentiae within a mode.[12]

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[9] Forthcoming in Thomas Forrest Kelly, *The Montecassino Ordinal of the Late Eleventh Century*.

[10] See Brunner, 122, table 1 for the order of genres within the tonary as well as the distribution of chants of each genre by mode. As noted above, hymns were placed within the section containing antiphons, often coming at the end of a melodic family within a differentia.

[11] When speaking about the "scribe" in this paper, the word is used in two senses. First, the scribe as the person who compiled 2tMC318, particularly when talking about organizational structure, and second as the person who physically put the notes and text on the paper. This sense would be used in discussions on paleographical matters. Context will usually make clear which usage of the word scribe is intended. Also, I am using the masculine pronouns to refer to the scribes in this paper because we are reasonably certain that (excepting Ben19-20) the MSS were produced in monastic scriptoria.

[12] Regarding the order of differentiae within a mode, John of Afflighem writes in his treatise *De Musica*, from around 1100, "I find no reason for this but custom alone, nor have I discovered one by any written musician." *Hucbald, Guido and John on Music: Three Medieval Treatises*, translated by Warren Babb, edited by Claude V. Palisca, (New Haven: Yale University Press, 1978), p. 161.

Within a differentia grouping there is no immediately discernible ordering to the antiphons. This is in contrast to some tonaries, the most famous being D-Bas lit.5, where the chants within a differentia group are listed alphabetically.[13] There does seem to be an effort made to put antiphons with similar melodic incipits in succession. For example, the first three antiphons of mode 1 all begin D-DC while the next three begin DC-E; this will be explained later in this paper.[14] I believe that there is another principle which is guiding the order in which the scribe recorded the antiphons within a differentia: they are roughly in liturgical order.

In order to be systematic about finding the various differentia types and the melodic formulae within a differentia, the scribe probably needed to consult a practical source which contained all (or at least a large number) of these antiphons. If a scribe does have a practical manuscript on hand, many have argued, it would make sense that the scribe would leaf through that manuscript from cover to cover and write down antiphons as he sees them, and thus antiphons in tonaries would be preserved in the order in which they are found in a manuscript from the region whose antiphons the scribe is recording. In order to test whether this hypothesis is true, one must first locate manuscripts the scribe might have consulted. Non-extant sources similar to the three manuscripts, Ben21, MC542, and Ben19-20, might have been used in the process of creating 2tMC318.[15]

Correlation between order within a differentia and within a practical source

First, I will ask whether there is enough evidence to assert that the scribe of 2tMC318 did consult another manuscript in the process of writing the tonary. A cursory comparison of the ordering within a single differentia in 2tMC318 is inconclusive. For example, antiphons 16 through 21 in the tonary seem to indicate a correlation between the ordering of a practical source, Ben21, and the ordering within a differentia:[16]

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[13] "Tonary" in *New Grove*, 58.

[14] The notes of the gamut will be indicated in this paper with the following symbols:

Γ A B C D E F G a b♭ b c d e f g a'

[15] It is impossible for any of these manuscripts to have been the tonary compiler's exemplar, as they are at least fifty years younger than MC318.

[16] In table 1, the third through eighth columns record (3) the differentia type given in 2tMC318, (4) the feast the antiphon is found in Ben21 as named in CAO, (5) the feast number given in CAO, (6) the page on which the chant can be found in the tonary, (7) the differentia type given in Ben21, and (8) the folio in Ben21.

No.	Incipit	Diff 318[17]	Feast in Ben21	CAO fst	318 p.	Diff 21	21 f.
16.	Thomas qui dicitur	1z'(i)	Octava Paschae	82?	246	1x(v)	143v
17.	Letitia sempiterna	1z'(i)	De Sanctis T.P.	90.6	246	1x(v)	154v
18.	Qui operatus et	1z'(i)	S. Pauli	102	246	1x(iii)	200v
19.	Bonum certamen	1z'(i)	S. Pauli	102	246	1x(v)	201r
20.	Ne magnitudo reuelationem	1z'(i)	S. Pauli	102	246	1x(v)	201r
21.	Hec et uirgo sapiens	1z'(i)	Comm. Virginum	126	246	1x(v)	296r

Table 1

The final column, 21 f., indicates that these six antiphons with differentia 1z'(i) (the first differentia of the tonary) are in the same order in Ben21.[18] Based on this evidence one might feel that the hypothesis is confirmed. However, a look at antiphons 24 through 28 in 1y'(i), the second differentia group, shows why a quick look at the liturgical placement of chants in 2tMC318 prevents one from coming to such a conclusion:

No.	Incipit	Diff 318	Feast in Ben21	CAO fst	318 p.	Diff 21	21 f.
24.	Ut autem saturte (in ext.)	1y'(i)	Dom. IV Quadragesimae	64	246	1z(iii)	113v
25.	Iocundus homo	1y'(i)	S. Stephani	20	247	1z(iii)	028v
26.	O beata et benedicta	1y'(i)	De Trinitate	120.3	247	-	272r
27.	Erunt praua	1y'(i)	Dom. IV Adventus	15.2	247	1y'(i)	009r
28.	O crux ammirabilis	1y'(i)	Exalt. S. Crucis	110	247	1z(ii)	246r

Table 2

This comparison shows no correspondence between the tonary and the practical source.

One problem with trying to get an overview of the correlation between the tonary and the practical sources is that people have a tendency to notice patterns where none exist and to focus on the extreme cases, as I have done in the two examples above, and not give the proper weight to the unexceptional cases which are usually in the majority.

To reduce the element of subjectivity in this study, I ran a statistical analysis comparing the ordering within differentia groupings in modes 1 and 2 in the tonary to the order in which the same antiphons appear in Ben21. First I created an array containing the position of the chants ordinally in

[17] Differentiae in this paper will be identified by two systems: for modes 2-8 the differentiae will be designated by a arabic number giving the mode and a letter indicating a differentia (e.g., 2a). The order of the differentia-letters within a mode is arbitrary, though differentiae appearing in the tonary tend to have letters nearer the beginning of the alphabet. Because mode 1 has myriad similar differentiae, a different system has been used. Sigla for mode 1 begin with the modal number, 1, followed by a letter from the end of the alphabet indicting the differentia family. A differentia family is a group of differentiae with related contours but with slightly different notes or with different liquesence. If the differentia ends on a different note from most other differentiae in this family, this is indicated by an apostrophe following the letter. After this, enclosed in parentheses, is a roman numeral, also somewhat arbitrarily assigned, indicating a specific differentia within the family. For a list of differentia in modes 1 and 2 see appendix IV.

[18] Note that the forty-six folios which separate "Letitia sempiterna" from "Qui operatus et" are irrelevant to questions of ordering.

Ben21.[19] For example, for table 1, the array would be {1,2,3,4,5} since the chants are in the same order in the table as they are in the manuscript. However, for table 2, the array would be {3,2,5,1,4} since the first antiphon in table 2 would be the third antiphon of these five found in Benevento 21 if one started looking from the beginning, the second antiphon in table 2 would be the second in Ben21, the third would be the fifth, etc. Once these arrays are generated, a formula can be used to generate a number called the correlation coefficient (cc) which is a representation of how well ordered the antiphons in a given differentia are.[20]

The correlation coefficient varies between 1, meaning totally correlated, such as table 1, through 0, meaning no correlation, and -1 meaning an opposite correlation (in this case, a correlation of -1 would mean the scribe of 2tMC318 was flipping trough Ben21 *backwards*). However, excepting the three values -1,0,1, there is no definite meaning to the correlation coefficient. A coefficient of 0.6, for example, does not necessarily mean that the manuscripts are twice as correlated as a pair of manuscripts with a coefficient of 0.3. One could argue that this method only moves the subjective nature of the analysis later into the process: into interpreting the correlation coefficient.

To minimize subjectivity, I decided before running the analysis what boundary points of the coefficient I would accept as showing a correlation or lack thereof. I saw by inspection that the twenty antiphons of differentia 3a which were also found in Ben21 showed a correlation between their order in 2tMC318 and their order in the liturgy contained in Ben21.[21] I decided that if the first two modes of the tonary showed as good a correlation as these 20 antiphons of differentia 3a, that I would have shown a correlation between the order of antiphons within a differentia and the order of antiphons in

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[19] I apologize for the awkward term "position of the chant ordinally," by which I mean position of the chant only in relation to the other chants being studied. Normally, I would use the term "ordinal placement," but this term brings with it possible confusion with the Ordinal of Montecassino whose order was not studied.

[20] For the mathematically inclined, the formula for finding the correlation coefficient (r) is:

$$r = \frac{\sum (x-\bar{x})(y-\bar{y})}{\sqrt{\sum (x-\bar{x})^2 \sum (y-\bar{y})^2}}$$

where x is the position ordinally in 2tMC318 and y is the position of the chant ordinally in Ben21. (There are actually other formulas for finding the coefficient, but this is the formula used in this paper). If there are n chants and the positions in each manuscript range from 1 to n, the correlation coefficient can be found more simply by:

$$r = \frac{12\sum (x-\bar{x})(y-\bar{y})}{n(n^2-1)}$$

[21] It is valid to make such judgements for small amounts of data, like a single differentia or five isolated chants (as in tables 1 and 2). It is only when examining large amounts of possibly correlated data that statistical methods must be applied.

the liturgical year.[22] The correlation coefficient of differentia 3a was measured to be 0.68 (0.675 when carried to three decimals). The order of antiphons is shown in table 3, and a graphic demonstration of correlation is found in appendix II.[23]

No.	Incipit	318 diff	Ben21 f.
149.	Orietur in diebus	3a	18v
150.	His [hic] est discipulus	3a	31r
151.	Nonne deo subdi	3a	50r
152.	Hodie Christus natus est	3a	23v
153.	Tu solus altissimus	3a	52r
154.	Symeon iustus	3a	70v
155.	Fac benigne	3a	109v
156.	Ego sum pastor bonus	3a	147v
157.	Vado parare vobis	3a	156v
158.	Lignum vite crux	3a	-
159.	Tu puer propheta	3a	191v
160.	Cives mei ver<mes sunt>	3a	239r
161.	Placebo domino	3a	302r
162.	Te semper idem et intellegere confitemur.	3a	269v
163.	Spiritus est deus	3a	-
164.	Si indigito dei	3a	109v
165.	Dum esset rex	3a	223r
166.	Qui sequitur me	3a	115r
167.	O vera summa	3a	272v
168.	Mecum <decertet>	3a	66r
169.	Vix optinuit	3a	91r
170.	Pastor bonus	3a	147v
171.	Video ui. ... ignis alleluia	3a	-

Table 3[24]

Having established a limit which would prove a correlation, I needed to choose a limit below which would disprove a correlation. Again, I looked at differentia 3a. While the differentia as a whole seemed tightly correlated, the strongest evidence for correlation lay in the first six antiphons (the gray box in table 3). If these six antiphons were removed, the remaining 14 antiphons would be so loosely correlated as to be completely explainable by chance. The correlation coefficient for the last 14 antiphons of 3a was 0.06.

Further, I decided that if an examination of modes 1 and 2 revealed a correlation coefficient between these two limits, I would study antiphons of additional modes until either the correlation

[22] Since the cc only gives the correlation for a single differentia, to find the average cc for a mode or for the manuscript as a whole, one must multiply the cc's for each differentia by the number of chants in the differentia, sum these weighed cc's and divide by the total number of chants studied.

[23] I am grateful to Árni Ingólfsson for the page numbers of the 3a antiphons in the practical sources.

[24] Chants which do not appear in Ben21 (indicated by a dash in the final column of table 3) could not be studied.

coefficient of the tonary to Ben21 no longer lay between 0.06 and 0675, or the modes were exhausted, in which case this study would be inconclusive.

The correlation in modes 1 and 2 was 0.60, which was inconclusive, so modes 3 and 4 were studied as well. The results are given in appendix I. With modes 3 and 4 added to the study, the correlation between 2tMC318 and Ben21 was shown to be 0.68 (0.685 to 3 decimals), which meets my criteria for demonstrating a link between the sources.[25]

There are several explanations for why even if the scribe of the second tonary was going in order through a practical manuscript the correlation is not closer to 1. We have not discovered which manuscript the scribe was using as his source. Many manuscripts contained the chants in different order depending on how the manuscripts were organized. Antiphons for the feast days of saints, for example, might be found in different order in different manuscripts, since some manuscripts placed feasts of saints in large blocks after Easter and Epiphany and others placed them in smaller groups throughout the year. By creating a hypothetical manuscript in which the feasts came in different, but not unknown, positions throughout the year, one could gauge based on the change in correlation coefficient if such a manuscript were more similar (if the coefficient moved toward 1) or less similar to the manuscript the scribe actually used.[26]

A second explanation for why the correlation is not perfect involves the melodic groupings of antiphons. As was mentioned earlier, the scribe of 2tMC318 was also interested in grouping antiphons within a differentia according to melodic incipit.[27] A single differentia can have from one to over 25 melodic openings.[28] Although I did not examine the ordering of melodic incipit groups within a differentia to the extent I looked at liturgical order, three possible orderings for melodic groups present themselves. First, the melodic groups may be in a loose liturgical order. If this were not the

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[25] Another tonary for which a link has been shown between the ordering within a differentia and the ordering of the liturgical year is *D-W* Helmst. 1050 (catal. 1152). See "Tonary" in *New Grove*, 56.

[26] It was my intention at the start of this project to construct such a hypothetical manuscript, but as the project progressed I realized this would require a knowledge of the liturgical year far beyond my current understanding.

[27] The scribe mentions incipits as a means of organizing chants into differentia (and possibly within a differentia?) just after the modal antiphon of the first mode. He writes (translation by Kelly):

> Sed propter diversitates incipientium qualemcumque cantum primi toni inveniri potest, fit diversitas in finem versus ut sibi conveniant ita.
>
> But owing to the diversity of beginnings (which?) can be found in any chant of the first mode, there is a diversity at the end of verse so that they may match.

[28] Differentia with only a single melodic incipit type in the tonary (including 1z(ii), 1y'(ii), 1z(iii), and 1t(ii)) have high or perfect correlation coefficients. In fact, every differentia in modes 1-4 with only two or three antiphons in the tonary and Ben21 (usually indicating one or two melodic types) has a perfect (1.0) correlation coefficient.

case, it would be difficult to measure any sizable correlation coefficient for differentiae with more than a very few melodic incipit types. Instead, some of the larger differentiae, including 1z'(i), 1y'(i), and 3a, which have many incipit types, have high correlation coefficients. Secondly, the incipit groups with the most antiphons might come first. In this way, the grouping of melodic incipits would parallel the only demonstrated ordering of differentiae within a mode. This hypothesis is very difficult to prove because we do not know how many antiphons there are within each melodic incipit type. We can not know if a listing of three antiphons plus "*et alii eorum simila*" indicates there are more antiphons of that melodic type than a listing of two antiphons plus the designation. Finally, there could not be no logic to the ordering of melodic groups within a differentia. Like John of Affighem's description of the order of differentiae, the order of melodic incipits may just be traditional. The lack of order is suggested by the absence of pattern in the over thirty melodic families present in differentia 2a.[29]

One must be careful when comparing manuscripts based on correlation coefficients not to neglect other signs that may indicate two manuscripts are more related to one another than one might think. For example, the incidence of crossing over of mode between the two manuscripts can give an approximate distance between the manuscripts. Of the 95 mode 1 and 2 antiphons in 2tMC318 and Ben21, 14 of them are in different modes between the manuscripts (15% cross-over rate). Of the 31 mode 1 and 2 antiphons in 2tMC318 and MC542, 2 cross-over (6% cross-over). The cross-over between 2tMC318 and Ben19-20 by contrast is extremely low. Of the 60 mode 1 and 2 antiphons they share, there is no cross-over. In fact, in the entire 170 antiphon shared repertory, there is only 1 cross-over (0.6%). This is much more significant figure than knowing that Ben19-20's correlation coefficient for modes 1 and 2 of 0.48 makes it slightly farther from 2tMC318 than Ben21 on those criteria.

Ambitus considerations, positions of local antiphons

Another possible variable to consider in examining order in the second tonary is the ambitus of the antiphons. I wondered if the ambitus of the chant might decide to which differentia or even position within a differentia an antiphon was assigned. Although I was not surprised to discover that there was no pattern between the ambitus of a chant and its position within a mode or differentia, I did not expect to discover that on a larger scale there was little consistency in the use of ambitus to assign an antiphon to the authentic or plagal mode. Most of the theoretical sources of the time talk about

[29] Although I have doubts that it is merely coincidence, I am unable to come up with a explanation for why differentia 2a has both the largest number of different melodic groups and an extremely low correlation coefficient.

the range of a chant as determining whether it is authentic or plagal. Either type of chant was allowed by most theorists to descend to a fifth below the final. Most theorists write that the authentic mode is able to extend to an octave, or even a ninth or tenth, above the final, but the plagal is limited to the fifth above the final. I studied the antiphons which are listed as mode 1 or 2 in the tonary but appear as the other Dorian mode in one or more of the three notated practical sources or the seven edited Ordinal sources, and listed my findings in appendix III. I discovered that the scribe of 2tMC318 seems to pay little heed to the teachings of the theorists regarding chants for which there is disagreement among the practical sources whether they are plagal or authentic. Two chants which the scribe classifies as mode 2 extend to a c, a seventh above the final. By contrast, no chant with modal ambiguity between modes 1 and 2 that is classified as mode 1 by the scribe of the second tonary extends above a b♮. The bottom limit of antiphons is also similar in both the modes. Only one piece with modal ambiguity ever dropped below a C (In spiritu[m] humilitatis, mode 2a in 2tMC318, descended to an A). In writing about ambitus in all the sequences, not just those with modal ambiguity, Lance Brunner says, "Inconsistencies in modal assignments of the sequences in the tonary are also evident in classifications based on range. . . . There is clearly a general correspondence between ambitus and assignment to mode, but ambitus was not an ideal yardstick for parceling sequence melodies into neat theoretical packets of authentic and plagal."[30] There did not seem to be an easy answer as to why certain chants with extended ambitus were considered plagal. One might think that the scribe could be relying on incipit formulas to determine whether the mode was authentic or plagal. For example, a melody which begins D-a-b♭-a might always be considered mode 1 despite the range of the remainder of the piece. One flaw in this theory is that there are several musical incipit families which are found in both mode 1 and 2. D-DC-D is one such opening.

There are other possible ways of ordering the tonary which the scribe did not avail himself of. As was mentioned earlier, this tonary, in contrast to the first tonary of MC318, seems to record a practice local to this region of southern Italy. If the compiler of the tonary wanted to contrast the local practice against a more general northern practice, he may have given local antiphons privileged positions within a differentia, such as at the beginning or end. To test this theory, I examined the positions of antiphons which appear in fewer than 4 of the 11 sources other than Benevento 21 which were cataloged in the *Corpus antiphonalium officii*. Since Ben21 is the only manuscript studied in *CAO* which is local to this study, antiphons which appear in many other *CAO* sources could not have been

[30] Brunner, 152.

primarily of local interest. My study concluded that there is no relationship between the provenance of an antiphon and its position within a differentia group.

As with any investigation worth undertaking, this study left me with more questions to be answered than when I began. Answering the question of whether the liturgical order embodied in another manuscript was used to give order the second tonary of MC318 only leads to more questions about the nature of that missing manuscript. There are also still many questions to answer about the interaction of order by melodic incipit and order by position within the liturgical year. Additionally, the questions about ordering by ambitus and melody types in antiphons could be asked about responsories and graduals and other chants in the tonary. It is hoped that in seeking answers to those questions, we will be able to come closer to understanding the ordering principles in the second tonary of Montecassino 318.

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Appendix

Appendix I: Correlation coefficient calculations for Ben21 and 2tMC318 modes 1-4

MC318 order	Ben21 order	cor. coefficient	# of terms	weighed cc
1z'(i)				
1	1	0.94	12	11.33
2	2			
3	4			
4	7			
5	3			
6	5			
7	6			
8	8			
9	9			
10	10			
11	11			
12	12			
1y'(i)				
1	1	0.54	14	7.60
2	6			
3	4			
4	13			
5	2			
6	11			
7	3			
8	7			
9	8			
10	9			
11	5			
12	14			
13	12			
14	10			
1z(ii)				
1	1	1.00	3	3.00
2	2			
3	3			
1y'(ii)				
1	1	1.00	3	3.00
2	2			
3	3			
1z(iii)				
1	1	1.00	3	3.00
2	2			
3	3			

MC318 order	Ben21 order	cor. coefficient	# of terms	weighed cc
1t(i)				
1	1	1.00	2	2.00
2	2			
1t(ii)				
1	1	1.00	2	2.00
2	2			
1t(iii)				
1	2	0.40	4	1.60
2	3			
3	1			
4	4			
1t(iv)				
1	3	0.40	4	1.60
2	1			
3	2			
4	4			
1x(i)				
1	1	1.00	3	3.00
2	2			
3	3			
1w(i)				
1	1	0.80	4	3.20
2	3			
3	2			
4	4			
1x(ii)				
1	1	0.80	4	3.20
2	2			
3	4			
4	3			
2a				
1	1	0.23	32	7.51
2	3			
3	26			
4	17			
5	15			
6	5			
7	25			
8	11			
9	21			
10	8			

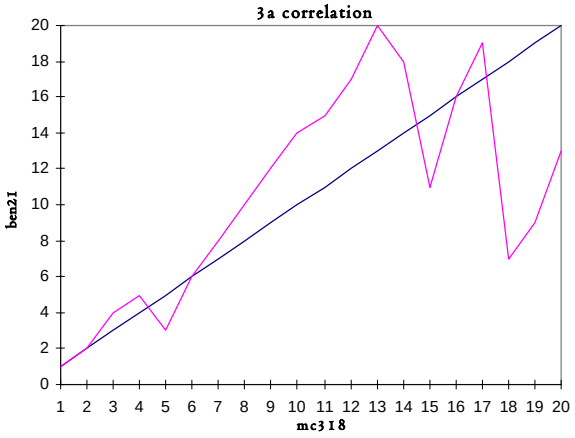
MC318 order	Ben21 order	cor. coefficient	# of terms	weighed cc
11	14			
12	19			
13	18			
14	29			
15	32			
16	16			
17	12			
18	30			
19	2			
20	9			
21	10			
22	6			
23	20			
24	7			
25	27			
26	23			
27	28			
28	24			
29	4			
30	22			
31	13			
32	31			
2b				
1	1	0.83	6	4.97
2	2			
3	4			
4	5			
5	3			
6	6			
2c				
1	1	1.00	2	2.00
2	2			
3a				
1	1	0.68	20	13.50
2	2			
3	4			
4	5			
5	3			
6	6			
7	8			
8	10			
9	12			
10	14			
11	15			
12	17			
13	20			
14	18			

MC318 order	Ben21 order	cor. coefficient	# of terms	weighed cc
15	11			
16	16			
17	19			
18	7			
19	9			
20	13			
3c				
1	1	1.00	4	4.00
2	2			
3	3			
4	4			
4a				
1	2	0.79	8	6.29
2	1			
3	6			
4	3			
5	4			
6	7			
7	5			
8	8			
4b				
1	1	0.81	8	6.48
2	2			
3	6			
4	3			
5	5			
6	4			
7	8			
8	7			
4c				
1	1	1.00	7	7.00
2	2			
3	3			
4	4			
5	5			
6	6			
7	7			
4d				
1	1	1.00	2	2.00
2	2			
4g				
1	1	0.80	4	3.20
2	2			

MC318 order	Ben21 order	cor. coefficient	# of terms	weighed cc
3	4			
4	3			
4h				
1	1	1.00	3	3.00
2	2			
3	3			
4I				
1	1	1.00	3	3.00
2	2			
3	3			
		totals	157	107.47
			antiphons	aggregate weighed cc
			average weighed cc	0.685

Appendix II: Correlation coefficient graph and calculation for differentia 3a

Antiphon	318pos	Ben21 pos	
Tu Bethleem terram	1	1	
Orietur in diebus	2	2	
His est discipulus	3	4	correlation
Nonne deo subdi	4	5	0.68
Hodie christus natus est	5	3	
Tu solus altissimus	6	6	
Symeon iustus	7	8	
Fac benigne	8	10	
Ego sum pastor bonus	9	12	
Vado parare vobis	10	14	
Tu puer propheta	11	15	
Cives mei ver	12	17	
Placebo domino	13	20	
Te semper idem et intellegere	14	18	
Si indigito dei	15	11	
Dum esset rex	16	16	
O vera summa	17	19	
Mecum <decertet>	18	7	
Vix optinuit	19	9	
Pastor bonus	20	13	



The straight line shows an ideal correlation. The crooked line shows the actual correlation for 3a.

Appendix III: Antiphons with conflicting modes which appear in 2tMC318 as mode 1 or 2

No.[31]	Incipit	ambitus[32]	ord maj	ord min	mc318	ben21	mc542	ben19-20	feast
1	Cum appropinquaret dominus		1	7 E. n.n. O	1z(iii)	1z(ii) [182v]	-	1y(iv) [20-127r]	190. dom22p8pent
2	Constantina Constanini	Ca [Da]	1	2 O	1y'(i)	1x(v) [192r]	-	1x(ii) [20-200r]	202. Iohannis et Pauli
3	Petrus autem		1	7 O	1x(i)	1v(i) [194v]	-	1z(viii) [19-74v 20-210v]	207. Petri et Pauli
4	Qui operatus est	Ca[DG] 2As	1	2 O	1z'(i)	1x(iii) [200v]	-	1x(iv) [20-213v]	212. Pauli
5	Ambulans dominus	Ca [Da] 5As	1	2 O[33]	2a	2a [265v]	-	-	292. Andree ad noct.
6	Similabo eum	Cb [Da] 3Bs	1 CDP	2 PR	1y'(i)	2a [277v]	-	-	276. fer4dedEccl
7	Domine si peccauerit	Ca [CG] 3As	1 E	2 OP	2a	1w(ii) [110r]	2a [155]	-	103. fer iij ebd2quad
8	Benedictus es	Db [Da]	1 NPR	2 O	1w(i)	1w(ii) [078r]	1x(ii) [120]	1w(ii) [19-198r]	090. Septuagesima
9	Venit lumen tuum		1 O other?	7 E	1t(i)	1w(ii) [041r]	1z(v) [039]	1w(ii) [19-165r]	047. Epiph
10	Alliga domine		1 O other?	3 E	1t(i)	1w(ii) [125v]	-	-	123. fer4ebdMaioris
11	Beatus Bartholomeus	Cb [Ca] 1B	1 N	2 CDEPR n.n. O	1y'(i)	2a [230r]	-	1x(ii) [20-266v]	251. Barth
12	A bimatu et infra[34]	Cg [Dg]	2	1 CEOPR	1x(ii)	1x(v) [034r]	1x(ii) [026]	1x(ii) [19-155v]	032. Innocentum
13	Usque modo non		2 CDEN	8 PR	2a	- [151v]	-	2a [20-042r]	155. dom4p8pasc
14	Laurentius ingressus est	Da [Dg] 3As	2 DENO	1 CPR	1x(ii)	1x(v) [222v]	-	1x(ii) [20-253v]	237. Laurentii
15	Bonum certamen	Da [Dg] 1A	2 ENR	1 CDOP	1z'(i)	1x(v) [201r]	-	1x(vi) [20-214v]	214. Pauli
16	Similabo eum	Cb [Da] 3Bs	2 N	1 CDP n.n. O	1y'(i)	2a[277v]	-	-	275. Ded eccl
17	Tribus miraculis	Ca [Da]	2 NO	1 CDEPR	2a	1x(v)[038v]	1x(ii) [040]	-	048. Epiph
18	Lapidabant Iudei	Ca[CG] 3As	2 O	1 PR n.n. E	2a	2a [028r]	2a [014]	2a [19-147v]	024. Steph
19	Domine mi rex		3	1 O	1t(iii)	3x [235v]	-	-	260. Decoll Jbapt
20	Hec est generatio		3 all? ER	1 P n.n. O	1t(iv)	3x [252r]	-	-	278. Omnium sanctorum
21	Descendibus illis		6 N	8 CD 1 EPR	1t(iv)	8x [219v]	-	-	233. Transfig
22	Ab ipso pueritie		7	1 O	1z'(i)	??[35] [090r]	1nodiff [106]	1x(ii) [19-088r]	085. Benedictus
23	Amauit eum dominus		7	6 R ad N.	2a	~~1w(ii)~~[36]	-	-	302. Com conf.atque pont

[31] Numbers 1-25 from list in Kelly *The Montecassino Ordinal*, 26-33 do not show modal conflict in the ordinal but are in the tonary. All numbers are for sorting purposes only.

[32] Range in Ben21 where available for pieces with mode 1 and 2 crossover. first two letters: lowest and highest note. bracketed letters: low and high notes used often.

[33] An earlier Mag. antiphon also with the incipit "Ambulans" is mode 7 in the tonary.

[34] According to the writer of the *Commemoratio brevis*, this chant is clearly in mode 2. (Bailey, 101).

[35] Ben 21 - scribal error (antiphon begins on D ends on C) makes assigning mode or diff. difficult.

[36] Ben 21 - different melody than mc318.

24	Amauit eum dominus		8	6 P 7 R	2a	1w(ii)	-	-	299. Com. unius mart.
25	Tres uideo uiros		8 CDN	1 OPR, 7 D	1t(iv)	-	-	-	058. Dom 1 p 8 Epiph
26	Gloria et honore deo		-	-	1z(ii)	2a [230r]	-	1y'(i) [20-142v]	CAO 120.3
27	Senex puerum portabat	Cb[DG] 2b's	-	-	1y'(ii)	2a [071r]	-	1y(v) [19-046r]	CAO 48
28	Nesciat sinistra	Cb[Da] 1b	-	-	1y'(ii)	2a [085r]	1x(ii) [131]	-	CAO 57
29	Descendtibus ... resurgat alleluia		-	-	1t(iv)	8x	-	-	CAO 102.16
30	In spiritu[m] humilitatis	Ab[CG] 2b's	-	-	2a	2a [098v]	1x(ii) [138]	2a [19-215v]	CAO 58
31	Filie Hierusalem	Cc [ca] 1c	-	-	2a	1x(ii) [154r]	-	-	CAO 90.6
32	Dixit Hiesus ministri	Cc [Ca] 2c's	-	-	2a	1x(v) [047r]	1x(ii) [056]	-	CAO 26
33	Estote ergo mi	Ca [Da]	-	-	2a	1x(v) [178r]	-	-	CAO 97.3
34	Ancilla dicit Pe.tro		-	-	2a	2a [125v]	1? [185]	-	CAO 71

Appendix IV: Comparison of Mode 1 and 2 Differentiae in MC318, Ben 21, MC542, Ben 19-20

(caps = liquesence, italics = oriscus)

sigla	MC318[37]	B21.melody	542.melody	B19-20.melody	Notes
1z'(i)	1a: a-a-g-f-ga-gf				
1y'(i)	1b: a-a-g-f-ga-gfede	a-a-g-f-ga-ggfede		a-a-g-f-ga-*g*fede	
1y'(iii)		a-a-g-f-g-gfede			
1z(ii)	1c: a-a-g-gf-ga-g	a-a-g-gf-ga-g	a-a-g-gf-ga-g	a-a-g-gf-ga-g	
1z(iv)				a-a-g-gf-ga-gg	
1y(ii)	1d: a-a-g-f-ga-gfed			a-a-g-f-ga-gfed	
1y(iv)				a-a-g-f-ga-gffed	
1y(v)				a-a-g-f-g-gfed	
1z(iii)	1e: a-a-g-f-ga-gg	a-a-g-f-ga-g	a-a-g-f-ga-g	a-a-g-f-ga-g	
1t(i)	1f: a-g-b-a-g-aag				a-g-b opening
1t(ii)	1g: a-g-b-a-g-ag				a-g-b opening
1t(iii)	1h: a-g-b-a-gb-a				a-g-b opening
1u(i)	1i: a-a-g-gf-fg-g	a-a-g-gf-fg-g	a-a-g-gf-fg-g		
1t(iv)	1j: a-g-b-a-ag-ga				a-g-b opening
1x(i)	1k: a-a-g-f-gf-D				
1x(iii)		a-a-g-f-gF-d			
1x(iv)				a-a-g-f-gf-dd	
1w(i)	1l: a-a-g-f-g-ga		a-a-g-f-g-ga	a-a-g-f-g-ga	
1w(ii)		a-a-g-f-g-a	a-a-g-f-g-a	a-a-g-f-g-a	
1w(iii)			a-a-g-f-*g*-a		
1w(iv)				ag-a-g-f-g-a	ag-a-g opening
1x(ii)	1m: a-a-g-f-gf-d	a-a-g-f-gf-d	a-a-g-f-gf-d	a-a-g-f-gf-d	see 1x(i)
1x(v)		a-a-g-f-g-d			

[37] Each manuscript originally had its own set of sigla which were later converted to the standard sigla shown in the first column. However, since the differentiae in MC318 come in a particular order, the original sigla given to this manuscript (1a, 1b, etc.) are also listed.

sigla	MC318[37]	B21.melody	542.melody	B19-20.melody	Notes
Ix(vi)				a-a-g-f-g-g-f-d	
Ix(vii)		a-a-b-a-gf-d			a-a-b opening
Iv(i)		a-a-b-a-g-a			a-a-b opening
Iz(v)			a-a-g-f-g-ag		
Iz(vi)			a-a-gf-gf-ga-g		
Iz(vii)			a-a-g-f-*g*-ag		
Iz(viii)				a-a-g-f-gf-gag	
2a	2a: f-f-e-ed-cd-d	f-f-e-ed-cd-d	f-f-e-ed-cd-d	f-f-e-ed-cd-d	
2b	2b: f-f-ed-fe-cd-d				
2c		f-f-ed-f-cd-d		f-f-ed-f-cd-d	
2d		f-f-ed-f-ddd-c			
2e		f-f-ed-cd-de			

Appendix V: Evidence for scribal prescription in 2tMC318: "Ab ipso pueritie," differentia families

As I was examining the order of 2tMC318, two aspects of the tonary struck me as pointing toward a scribe who, rather than simply describing the practice around him, was trying to change current practice. I shall examine the antiphon "Ab ipso pueritie" as evidence for scribal intervention in altering the melody of a chant and the differentiae 1t(i)-1t(iv) and 1z'(i) as evidence for scribal initiative in creating new differentiae.

First, I shall examine the antiphon "Ab ipso pueritie" whose melody is transcribed from the tonary and the three notated practical sources at the end of this appendix. That the scribe of the second tonary writes out the entire antiphon is unusual: there is only one other mode 1 or 2 antiphon which the scribe writes out in full. The practical sources give some indication why he might have. In Ben21 and MC542 the antiphon closes on a C final. This obviously creates problems for modal (and thus differentia) assignment if the final is the primary determinant of the mode.

To cope with such an unusual final, the scribe of Ben21 assigns an equally unusual differentia: G-G-a-G-GF-E. This differentia cannot, of course, be a mode 1 differentia because it does not start on the reciting tone, a. It also does not match the melodic contour of any of the mode 1 differentiae. (That is to say, no mode 1 differentia transposed down a tone resembles this differentia, with the possible exception of the unique 1v(i) differentia found only in Ben21, which proceeds a-a-b-a-G-a). However, an examination of the differentiae of the other modes reveals a resemblance between this differentia and some of the differentiae of the seventh mode. These differentiae begin on d, which is also a fifth above the final of that mode. The resemblance is particularly striking with the mode 7 differentia d-d-e-d-c-b, which is 7a in the first tonary of MC318 and 7b in the second.

Our suspicion that the scribe of Ben21 may be hearing this as a seventh mode antiphon is aided by the fact that five of the scribes of the Ordinal of Montecassino either assign this antiphon to mode 7 or give no number, while only the scribe of Ordinal *O* (Paris, Bibl. Mazarine MS 364) assigns it to mode 1.[38]

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[38] One might wonder if the scribe of Ben21 was borrowing a 7th mode differentia when he wrote the single 1v(i) [a-a-b-a-G-a] chant "Petrus autem . . . ab ecclesiam ad deum." There is a mode 7 differentia in the first tonary of MC318 which is similar to 1v(i) transposed up a fourth (7g: d-d-e-d-cd-d) but there is no mode 7 differentia in 2tMC318 which returns to the reciting tone at the end of the differentia. Looking at the practical sources, MC542 does not contain "Petrus autem," while Ben 19-20 (which contains the chant twice) gives it a more standard 1z differentia. The only one of the Ordinal sources which assigns this chant to mode 7 is, ironically, Ordinal *O*, the ordinal which was unwilling to assign "Ab ipso" to mode 7.

MC542 contains a version of this chant which is very similar to Ben21. Here when the scribe reaches the final C, he appears to have written in a differentia but then scraped it off and left the differentia blank, indicating perhaps he did not know how to end this antiphon. Based on an examination of the area of scraping and the residual ink on the page, it is conceivable that the differentia the scribe wrote originally was similar to Ben21's, but it is difficult to tell. Ben19's version of the chant also has a similar contour to Ben21 and MC542, but here the scribe ends the piece with ED-D-D rather than the ED-C-C of the other manuscripts. This allows the Ben19 scribe to use a standard 1x differentia after the antiphon.

By contrast, it seems that the scribe of 2tMC318 is trying to change local practice, as seen in these three manuscripts.[39] He transmits the contour of the line so that it has a middle section which dwells on D rather than the dwelling on E heard in the other three versions. This seems like a way to make the chant fit more squarely into a D mode. He, like the scribe of Ben19 records an ending that cadences on a D, to which he adds a 1z differentia.

In the assigning of differentiae to antiphons, the scribe of 2tMC318 also seems to be changing practice rather than recording practice. There is a set of differentiae which I have called the 1t group, all of which begin a-G-b-a. This differentia group seems to have no parallel in the extant sources of the area. Except the single 1v(i) differentia mentioned above, no other mode 1 differentia moves up on the third syllable, and only a single other mode 1 antiphon has a differentia which moves off a before the third syllable.[40] This differentia family does not just substitute for any differentia in the practical sources; it appears to be a replacement for the 1w differentiae. Of the 13 antiphons of Ben21 which acquire 1t differentiae in 2tMC318, 10 are 1w antiphons in Ben21, and the other 3 are from other modes (two mode 3 and one mode 8). Similarly, all 7 of the antiphons from Ben19-20 which are listed with 1t differentiae in 2tMC318 were 1w antiphons in the practical source. In MC542, 2 of the 4 antiphons are 1w's (the other two are 1z's).

Another conscious differentia change the scribe seems to be making is in changing a great number of 1x antiphons to 1z'(i), the only 1z antiphon to end on F. Except for the lone MC542 antiphon, which has a 1z(v) differentia, the 11 antiphons from Ben21 and the 13 antiphons from Ben19-20 which are 1z'(i) in 2tMC318 are all 1x in the practical sources.[41]

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[39] That practical sources from 50-100 years later survive with the chant in different forms indicates the scribe was unsuccessful.

[40] All the mode 1 differentiae are given in appendix IV.

[41] There are a number of cases where an antiphon will share a differentia from the same differentia group (such as 1x) across multiple manuscripts, but there seems to be no consistent sharing of identical differentia (such as 1x(i)) across manuscripts.

The discovery 1t or 1z' differentia in other sources (either currently known or not yet found) would argue against a prescriptive role for the second tonary.