A THEORETICAL ANALYSIS OF THE MODULATIONS IN THE KYRIE SECTIONS OF THE MASSES MI-MI BY JOHANNES OCKEGHEM AND MATTHEUS PIPELARE

Dr. Gaston G. Allaire

The following discusson on the sacred polyphony of the Renaissance is based on a strict theoretical application of the interlockings of hexachords expressing modal octaves, and a faithful observance of the modal divisions of the octaves as given by theorists quoted in my book, *The Theory of Hexachords, Solmization and the Modal System.*[1] A hexachordal and modal analysis of the complete Masses Mi-mi by Ockeghem and Pipelare would be beyond the scope and purpose of this article, but their Kyrie sections are well suited to illustrate a new approach to the analysis of polyphony.[2]

1) Musicological Studies and Documents 24 (American Institute of Musicology, 1972); readers who might consult this work for modal notions are informed that Table X (p. 72) should read: "THH HYPODORIAN, HYPOPHRYGIAN, HYPOLYDIAN, AND HYPOIONIAN MODES etc..." and Table XI (p. 73) "THE IONIAN AND THE DORIAN MODES etc..."

2) This paper discusses only the structural integration of the modes and the hexachord system; how the singers managed to sing the music belongs to the performance practice of Renaissance modal polyphony, and should

In the Kyrie section of his Mass, Ockeghem[3] seems to have wanted to attract the listener's attention by contrasting modulations and time signatures. The whole section is in itself a work of art standing on its own merit as a monument of modal polyphony, and for that reason it should not be considered nor analyzed as pre-Baroque or pre-tonal music.

In Kyrie I, four modal groups[4] are involved: Two are in regular position,[5] the superimposed Aeolian-Hypoaeolian (Fig. 1)

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be examined in another paper.

3) Kyrie I, Christe, and Kyrie II of Missa Mi-mi are transcriptions from *Ockeghem, Collected Works*, ed. Dragan Plamenac (AMS, 1966) Vol. I, No. 9, p. 1~3.

The ♯'s and ♭'s above the staves in Plamenac's edition are omitted in Ex. 2, but the signs required by the analysis presented here are inserted above the notes; ♯'s in parenthesis in some cadences of the music examples of this paper are leading tones in cadences with suspension those signs and raised iones have nothing to do with the hexachord system, for they are pure chromaticism while the hexachords are diatonic successions of notes.

The ♯'s facing the notes g and c in mm. 7 and 8 of Plamenac's edition are omitted here because they are not found in the two other sources of rhe same Mass in the Rome codices and because they do not affect the relation between the hexachords and the modes involved; hypothetically they may have played a function in the performance practice of music before 1600.

4) The expression "modal group" is used because generally an authentic mode or part of it in one voice or more is used above or below its plagal counterpart, and vice versa, in the other voice or voices. It often happens that a modal group is not complete, that only one or the other, the authentic or the plagal octave is used; sometimes a modme aode can be identified only through a single modal interval and the hexachord expressing the modal group. Finally it must be noted that a mode arithmetically divided will easily modulate to another mode harmonically divided provided that the two are expressed by the same hexachordally divided octave, this is confirmed by Freigius (Johann Thann Thomas) in *Hoc tst libellus ostendens*)Basel, 1582), showing a table of the most common modulatory octaves on p. 175.

5) A mode is said to be in regular position when only the basic hexachords of the medieval gamut, the *Durum* (G-Hex.) and the *Natvrale* (C-Hex.), are needed to express it. When a mode is transposed it is said to be in an irregular position; in the preface to the last volume of the Masses

and the Ionian-Hypoionian(Fig. 2). Two are in irregular position,

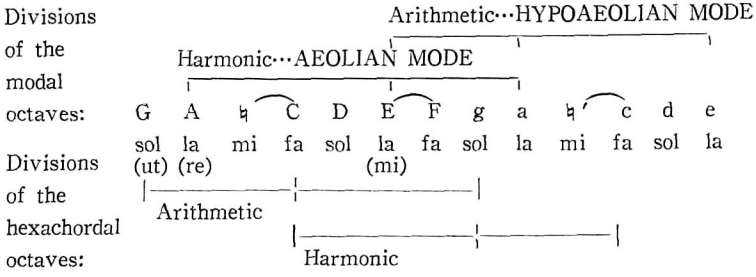


Fig. 1 Structure of the Aeolian and the Hypoaeolian modes in regular position

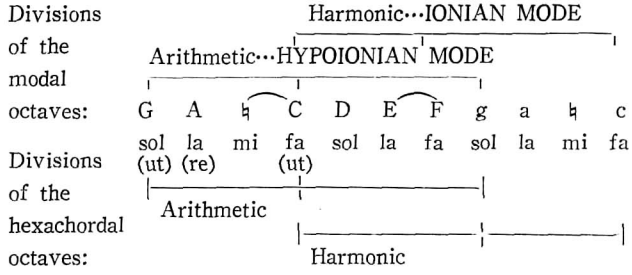


Fig. 2 Structure of the Ionian and the Hypoionian modes in regular position

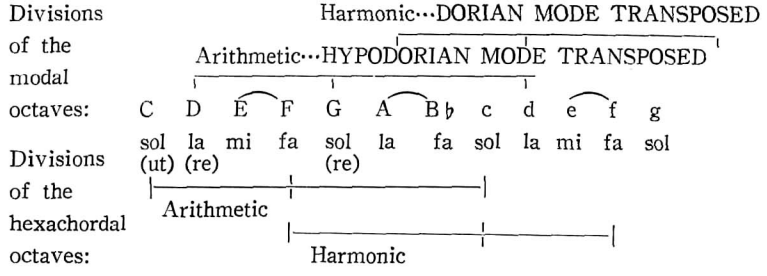


Fig. 3 Structure of the Dorian and Hypodorian modes transposed once soft

by Claudin de Sermisy (*CMM*-52, VI AIM, 1986) I unintentionally used the word "accidental" instead of "irregular" probably because Bermudo in his *Declaracion de Instrumentos* (1555) wrote of the "Natural and Accidental" positions of the modes in the second book (Ch. xxiij, fol. xxijro).

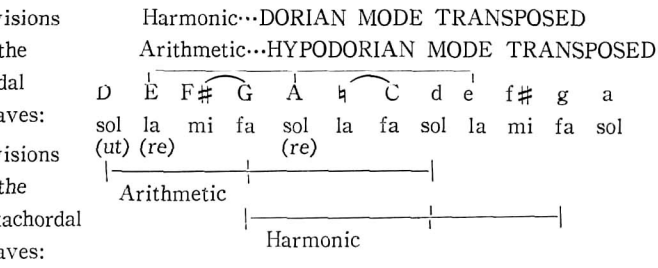


Fig. 4 Structure of the Dorian and the Hypodorian modes transposed once hard

the superimposed Dorian-Hypodorian transposed once on the soft side of the hexachords(Fig. 3) and the Dorian-Hypodrian transposed once on the hard side of the hexachords(Fig. 4). The first two are expressed through a scale obtained by the interlockings of the G-and C-Hexachords, the third by a relatively softer scale obtained by the interlockings of the C-and F-Hexachords, and the fourth by a relatively harder scale obtained by the interlockings of the G-and D-Hexachords.[6] The first two groups are governed by the hexachordal octave G-g divided arithmetically under the octave C-c divided harmonically, the third group by the hexachordal octave C-c divided arithmetically under the octave F-f divided harmonically, while the fourth group is governed by the hexachordal octave G-g divided harmonically under the octave D-d divided arithmetically; this is illustrated

6) Allaire, *The Theory of Hexachords*, etc··· p. 60 quotes a solmization table from Bernard Bogentantz' *Rudimenta utriusque cantus* (1535) showing to scales at its center, one hard scale starting on *F*-UT

G A ♮ C D E F g a ♮ c d e f g etc···
ut re mi fa sol la fa sol la mi fa sol la fa sol

to express the modes in regular position, and one soft scale starting on F-UT

F G A ♭ C D E f g a ♭′ c d e f′ etc···
ut re mi fa sol la mi fa sol la fa sol la mi fa

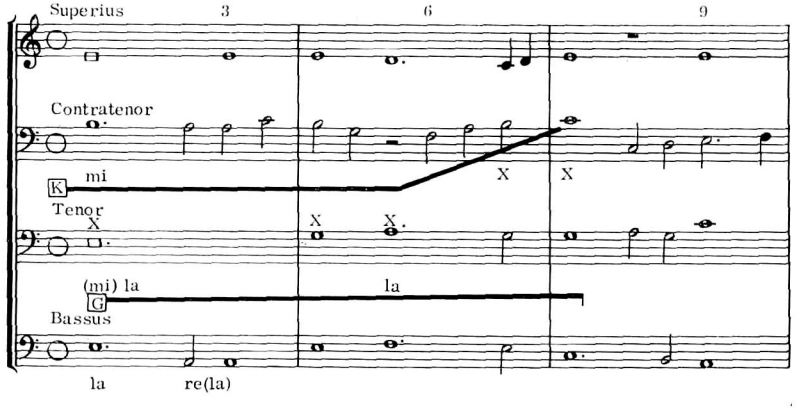
to express the modes in their first irregular position on the soft side of the hexachords.

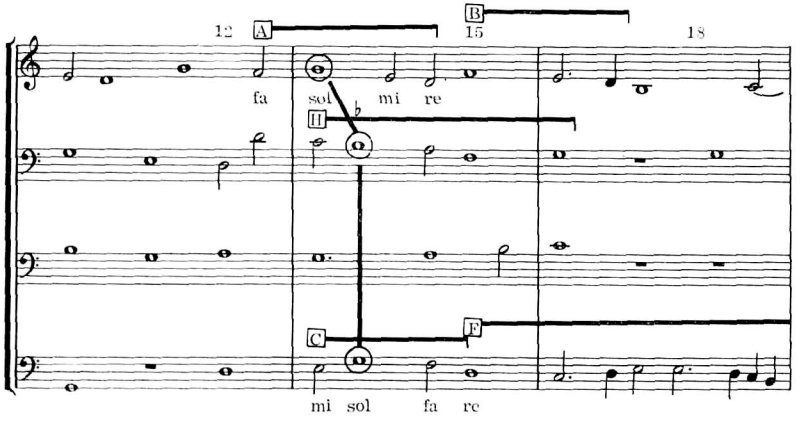
by the following music example and figures[7] of the modal

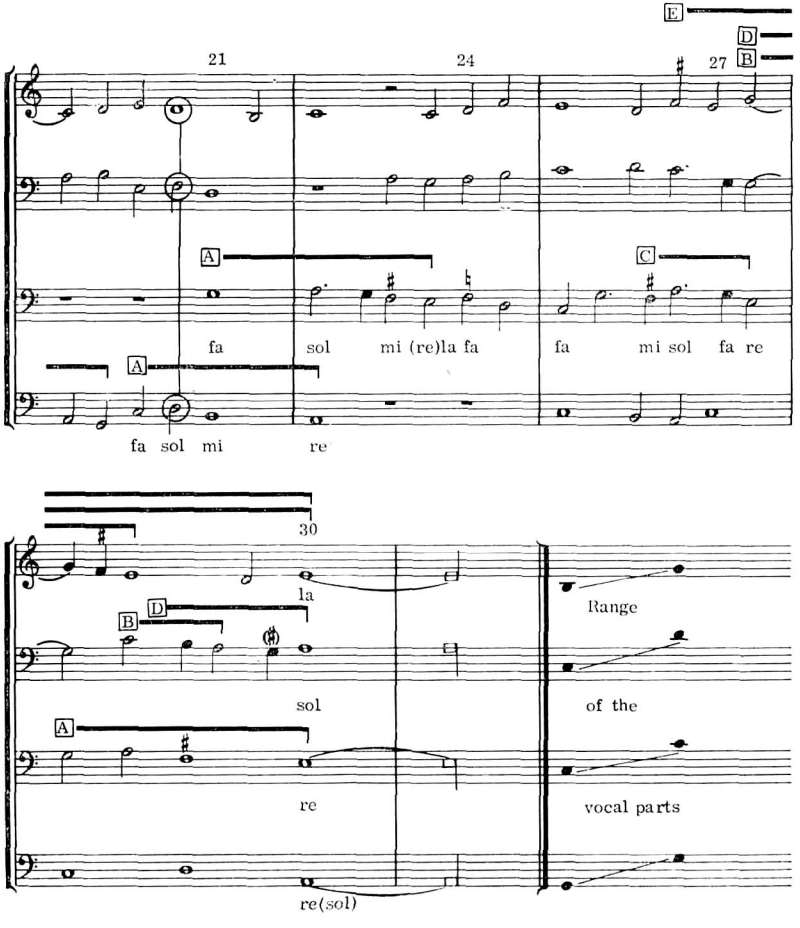
Ex.1 Hexachordal octaves of the modes

In regular position In first irregular position hard In first irregular position soft

Ex.2 Ockeghem's Kyrie I of Missa Mi-mi and its motives







groups.

Because of the scarcity of ♯'s and ♭'s in the hexachords

7) In the figures showing the structure of the different modes, the solmization syllables In parenthesis are after an early monophonic type of solmization by G-UT and C-UT (see *Harvard Dictionary of Music* under "Guidonian hand"), while the syllables not in parenthesis are after the relatively hard scale starting on G-UT which is the counterpart of the relatively soft scale starting on F-UT as is shown in fn. 6.

expressing the modal transpositions[8] (also called modulations), it is likely that at some time before the first rehearsal, a choirmaster had to conduct a thorough theoretical analysis of the polyphonic piece of music to be learned in regard to the melodic range of the vocal parts, the hexachords and the modes involved, the hexachordal and modal intervals used, the cadences, etc... even though some of the singers under his direction may have been composers in their own right, and able to conduct a perfunctory analysis immediately before starting to sing.

Without a vocal score, but with a four part choirbook or four part books, this is how we may tentatively illustrate the analytical approach of the choirmaster. First, he looked at the beginning of the tenor part, as this voice was recognized to have been the most important for modal identification, and saw at the outset

8) Modulatory movements from mode in regular position to mode in first irregular positions on the hard or the soft side of the hexachords were commonly used by Ockeghem, Pipelare, Josquin, Claudin, and their contemporaries, as a hexachordal-modal analysis of some of their works shows; however, it is as difficult to detect modulations in their works, as it is easy to imagine nonexistent modal transpositions.

The whole repertory of sacred polyphony of the Renaissance shows few ♭ signs outside the key signature that may have been wanted by the composers to clarify some modulations. The ♯, ♮, ♭ and other signs seen elsewhere than in the key signatures, were occasionnaly inserted to guide the singing of some insufficiently trained singers in hexachordal and modal analysis; these signs belong to the performance practice of sacred modal polyphony.

9) In Allaire, *op. cit.*, p. 70, a table of the modes quoted from *Doctrine de tonis seu modis* by Hoffmannus (1582) illustrates as principal modal intervals the fourth, the fifth, and the octave; also on p. 73, a quotation from the *Dodecachordon* by Glarean (1547), translation by Miller In Musicological Studies and Documents 6 (American Institute of Musicology), shows that other intervals were used to identify certain modes. Nevertheless, it is to be expected that some ambiguous passages may be difficult to analyze satisfactorily and give rise to ambivalent modal interpretations, such may be the case with modes sharing the same division of the hexachordal octave, for example the Hypodorian and the Aeolian, the Hypoionian and the Mixolydian, etc...

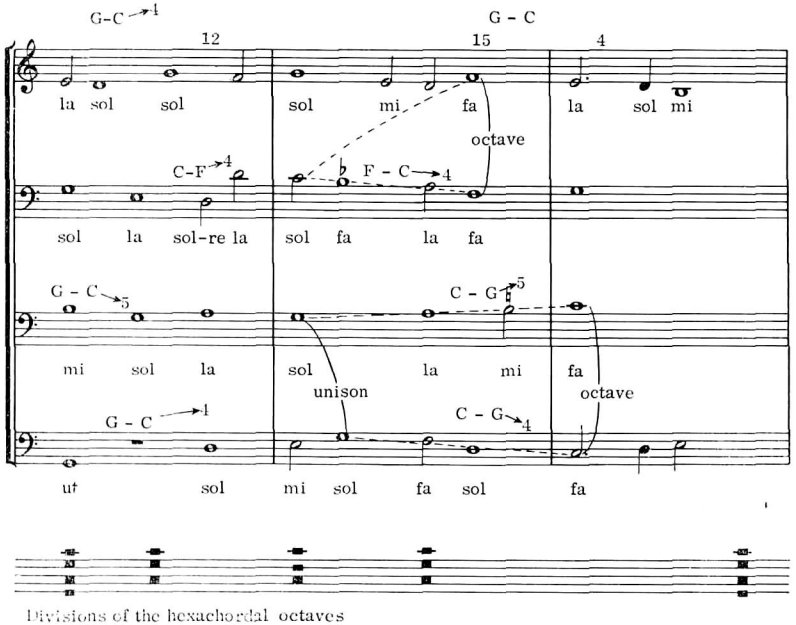
of it the prominent ascending fourth A-a.[10] In terms of modal functions, especially above a bass voice singing the descending fifth E-A, either octave A-a was Aeolian-Hypoaeolian, re-la(mi)-la, or transposed Dorian-Hypodorian on the hard side of the hexachords, re-la(re)-sol. But a tenor voice moving to the ascending fourth g-c while the bass voice climbs from the G-Hexachord into the C-Hexachord, forming a harmonic divsion of the hexachordal octave G-g, makes it evident that the beginning of the first Kyrie is in the Aeolian-Hypoaeolian modes in regular position. From there the choirmaster moved to the final cadence where in the last notes of the four vocal parts he saw two superimposed octaves a fifth apart. This implied the D-Hexachord above the G-Hexachord confirmed by the harmonic division of the hexachordal octave g-g' between the two upper voices, confirmed in turn by the arithmetic division of the modal octave A-a between the two lower voices formed by the harmonic division of the hexachordal octave G-g. Thus we can say that the beginning and the end of Kyrie I of Missa Mi-mi by Ockeghem have the octave A-a in common, the first one divided harmonically (Aeolian) is expressed by the arithmetically divided hexachordal octave G-g, while the second one divided harmonically also (Dorian transposed on the hard side of the hexachords) is expressed by the harmonically divided hexachordal octave G-g.

At this point, the most important modes being ascertained, our choirmaster went back to the beginning of the Kyrie in order to examine the course followed by the individual vocal parts. Going

10) The musical alphabet used in this analysis covers the superimposed octaves of Ockeghem's Kyrie section from second G below middle C to high a' above:
G A ♮ C D E F g a ♮ c d e f g' a'

from part to part he noticed, in the contratenor, the harmonic division of the octave C-c at semibreve 7 leading by the ascending leap of a fourth to the full F-Hexachord starting on the last half of semibreve 12. This upward move is confirmed by a similar one in the bass voice, as can be seen in the following music example in which the ascending and descending movements by a fourth or a fifth from one hexachord to another is indicated by an arrow.

Ex. 3

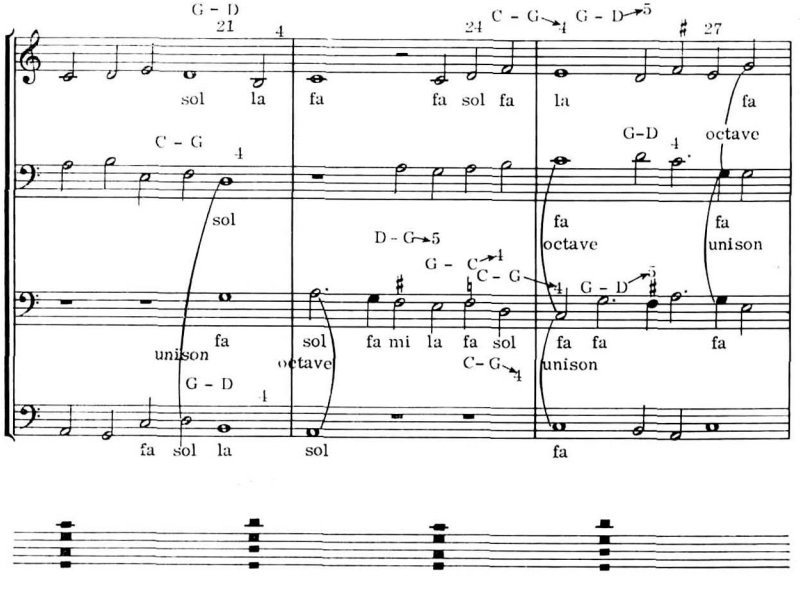


Divisions of the hexachordal octaves

The note g as unison between the tenor and the bass voices at semibreve 13 marks an Ionian cadence, but also a move towards the arithmetically divided octave G-g of the Aeolian mode in regular position at semibreve 19. After the downward movement of a fourth from hexachord G to D, on semibreve 21, the tenor calls a modulation to the Hypodorian mode transposed once on

the hard side of the hexachords, a modulation confirmed by the same descent from hexachord C to G in the contratenor, and a similar step from hexachord G to D in the top voice. This short modulation is immediately cancelled at semibreve 24 by intervals characteristic of the arithmetic division of the octave G-g. But, the return to the Aeolian in regular position is short-lived as the Dorian-Hypodorian modes transposed once hard take over at semibreve 26 with the harmonic divison of the octave G-g especially visible in the two upper voices. This last succession of modulations is illustrated in the next music example.

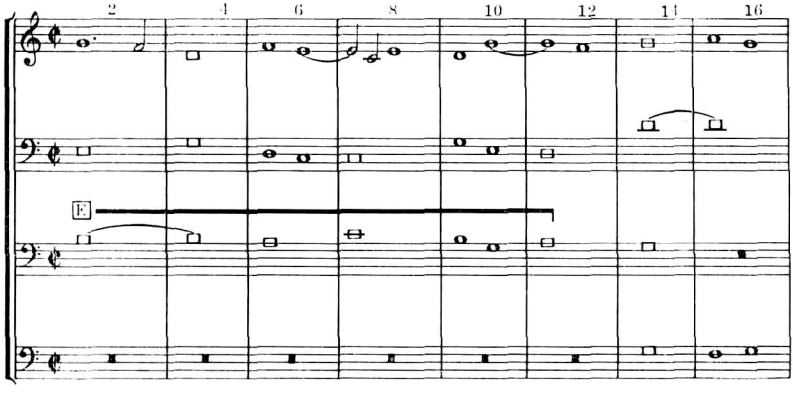
Ex. 4



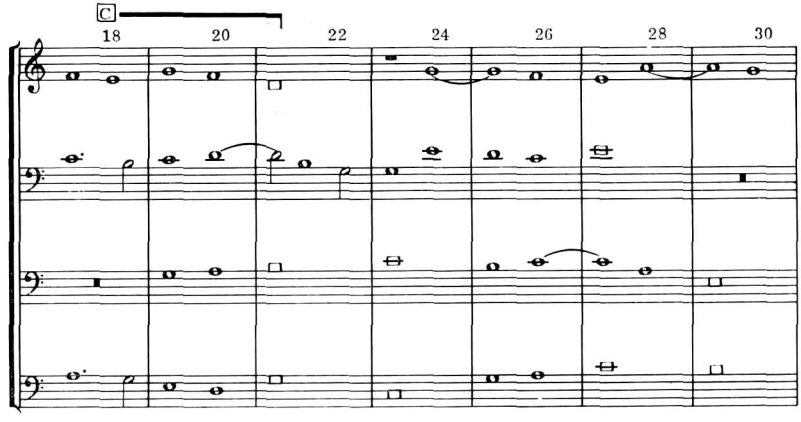
The above hexachordal-moal analysis is confirmed by the following motivic analysis: Two motives, [A] and [B], are presented in the upper voice from semibreve 12 to 15, but from semibreve 20 to 22, motive [A] is transposed an eleventh lower in the bass voice while it is presented, in imitation, at the lower seventh in

the tenor voice from semibreve 21 to 24; it must be noticed how Ockeghem kept exactly the same superimposed intervals between the encircled notes of the motive [A] at semibreve 13½ and those of its transposition on the hard side of the hexachords at semibreve 20½. A secondary motive, [C] at semibreve 13 in the bassus, appears transposed a second higher in the tenor at semibreve 26, but is rhythmically different. In the last measures of the upper voice, motive [B] is extended to form motive [D] which are transposed a fifth lower in the penultimate measure of the contra-tenor, while at the same time the tenor voice sings the [A] motive in its transposed version; it is remarkable how Ockeghem piled up his two first motives in this measure. Fianlly, some motives of Kyrie I can be seen in other parts of the Kyrie section, and in other works: Motive [E] returns in the tenor voice at the beginning of the Christe while motives [F] and [A] appear at the end of Kyrie II in the superius, motives [G] and [H] are found in Ockeghem's setting a4 of the chanson *Petite camusette*[11] (Ex. 10)

Ex. 5 Christe



11) Transcription from the music examples in Otto Johannes Gombosi, *Jacob Obrecht eine Stil2ritische Studie... Notenanhang*, No. 6, p. 8 (Leipzig, 1925).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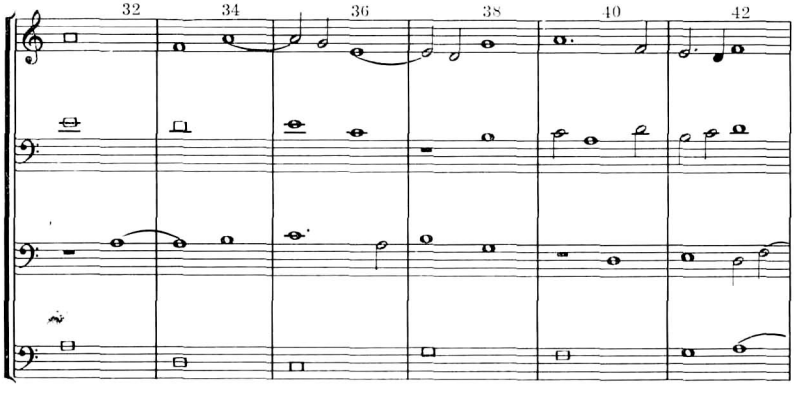
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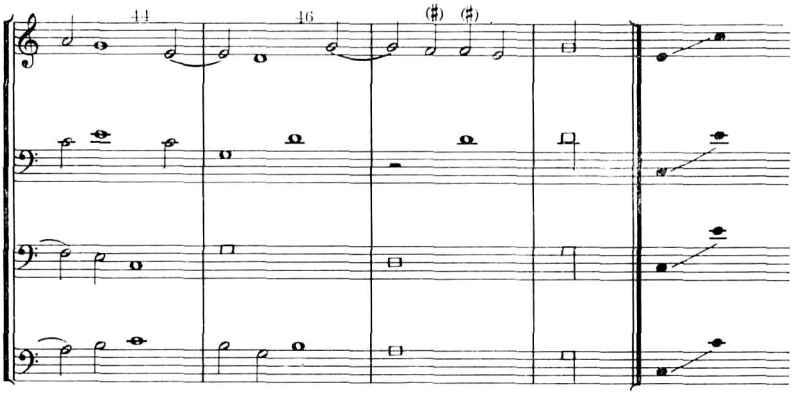
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while motive [K], composed of notes from the tenor and the contra-tenor vocal parts, seems to have been used by Pipelare at the beginning of Kyrie I of his Mass Mi-mi (Ex. 13).

The Christe of Missa Mi-mi by Ockeghem features only groups of modes in their regular position, the Mixolydian-Hypomixolydian (Fig. 5) in modulation with the Dorian-Hypodorian (Fig. 6), the Ionian-Hypoionian (Fig. 2), and the Aeolian-Hypoaeolian (Fig. 1).

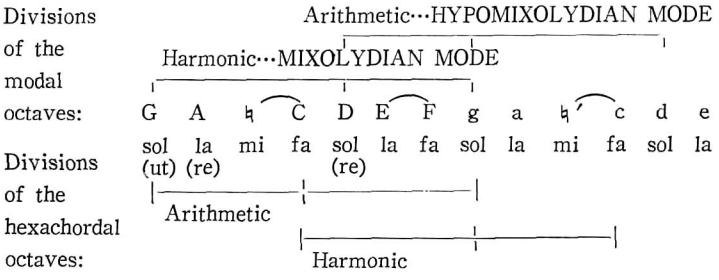


Fig. 5 Structure of the Mixolydian and the Hypomixolydian modes in regular position

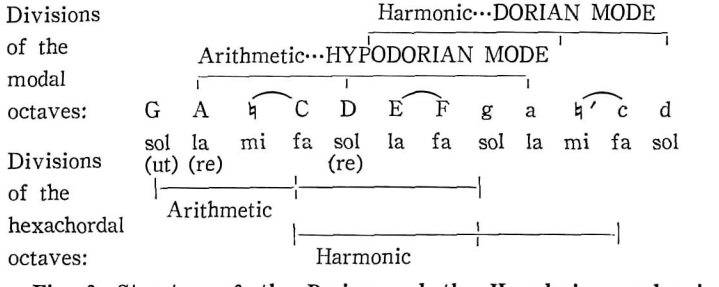
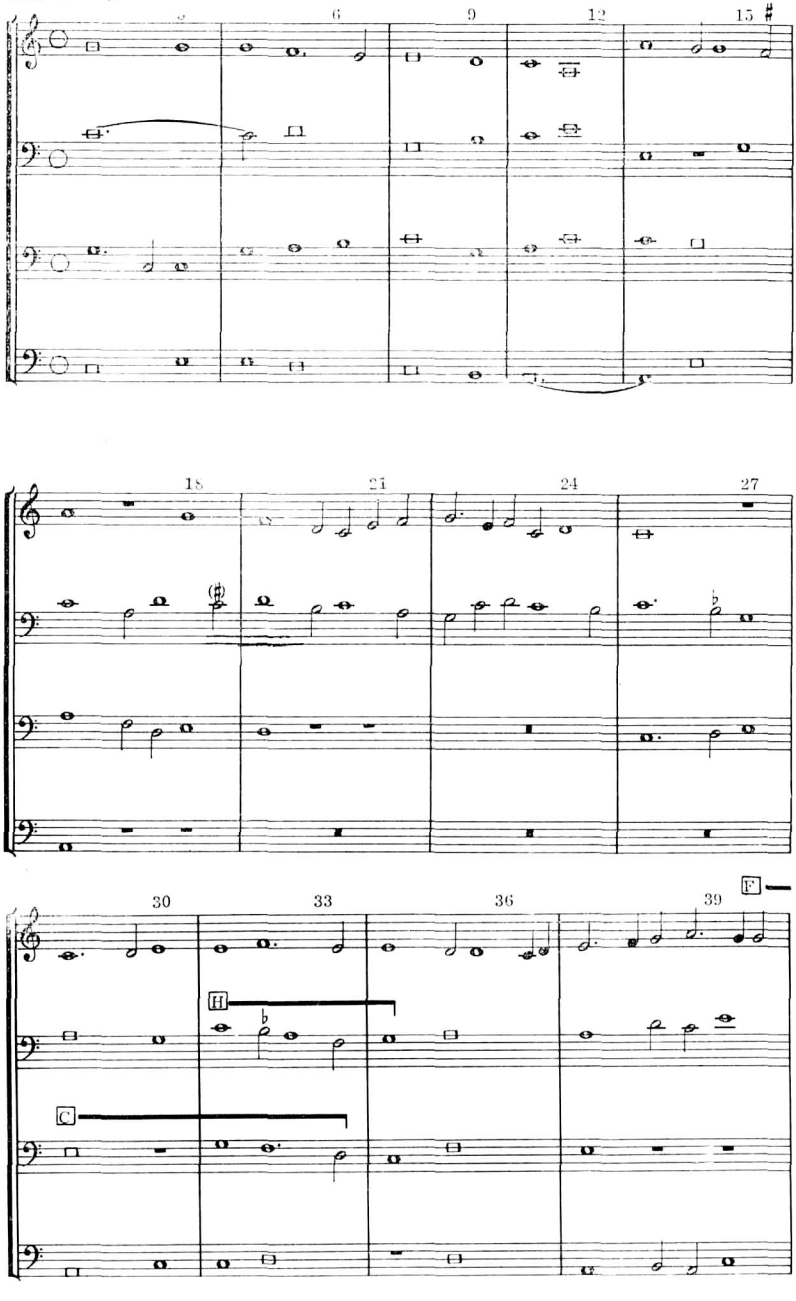
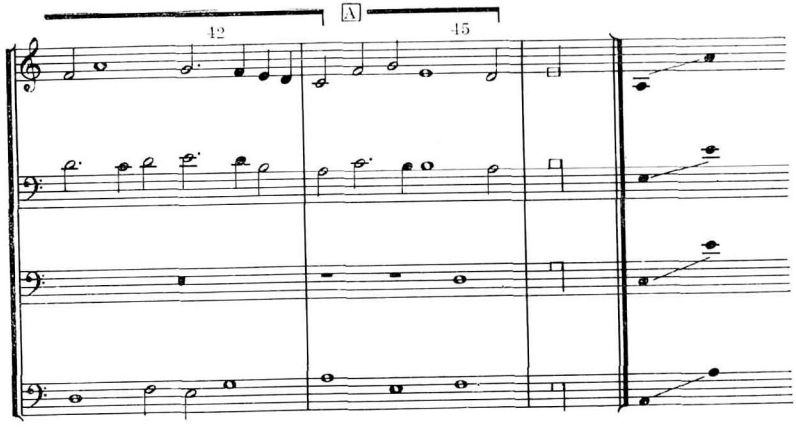


Fig. 6 Structure of the Dorian and the Hypodorian modes in regular position

This second part of the Kyrie section opens up with the [E] motive (♮′ a c ♮′ g a) in the tenor, a reminiscence of the last measures of the upper voice in Kyrie I (f ♯ a g f ♯ e d e), it is followed by motive [C] in the superius at semibreve 18 and short modulatory passages in Dorian-Hypodorian and the Ionian-Hypoionian

Ex. 6 Kyrie II

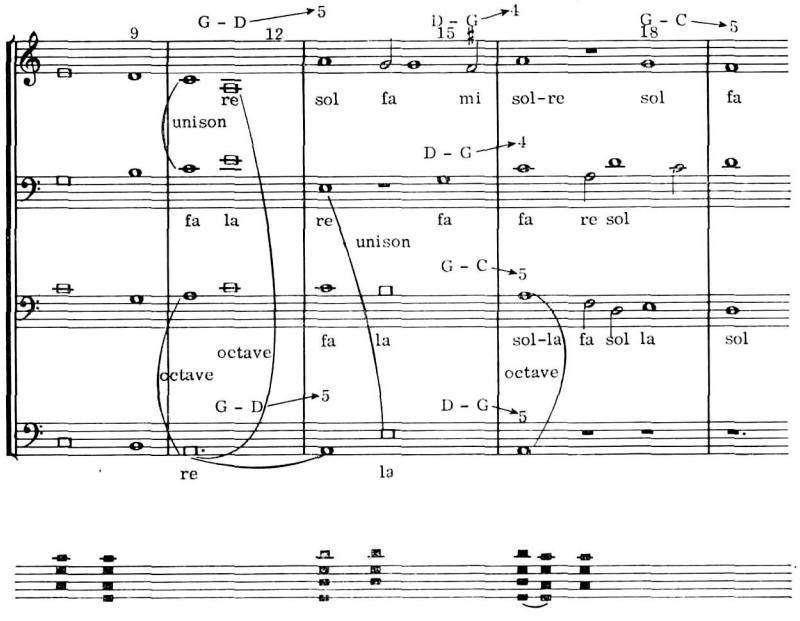




before coming to a cadence on the final of the Aeolian mode in the top voice at semibreve 31. The next passage, from semibreve 32 to 44, exhibits the characteristic intervals of the Dorian-Hypodorian modes, but the final cadence of the piece takes place on the final of the Mixolydian mode in the superius, the tenor and the bassus.

In Kyrie II five modal groups are found; The Aeolian-Hypoaeolian (Fig. 1), the Ionian-Hypoionian (Fig. 2), and the Dorian-Hypodorian (Fig. 6) in regular position, the Dorian-Hypodorian transposed once on the hard side of the hexachords (Fig. 4) and the Dorian-Hypodorian transposed once on the soft side of the hexachords (Fig. 3). The first three measures of the tenor show the ascending Ionian octave sung over the descending Aeolian fifth E-A (la(mi)-la) in the bass voice, this interval is transformed into the fifth (sol(re)-la) of the Dorian mode transposed once on the hard side of the hexachords in the next three measures. We take note that the passage from octave $\overset{a}{A}$ to unison E to octave $\overset{a}{A}$ again indicate a modulation by an ascending fifth followed by a modulation by a descending fifth to a Dorian cadence in regular position in the contratenor and the tenor on semibreve 19.

Ex. 7

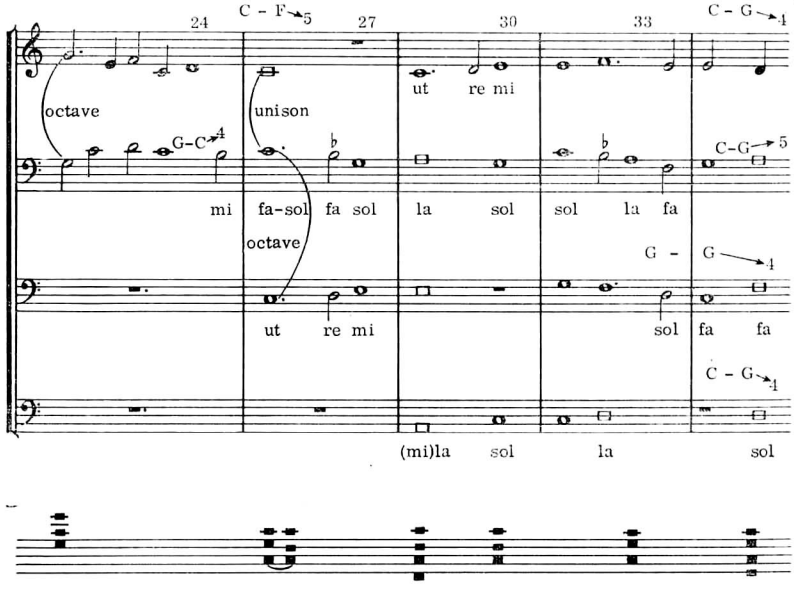


The next passage covering the complete Hypoionian octave in the upper voices leads to a Ionian cadence on a unison above an octave on semibreve 25. This Ionian cadence marks a modulation by a descending fifth to the Dorian-Hypodorian group of modes transposed on the soft side of the hexachords.

This last modulation leads back to the Aeolian-Hypoaeolian modes in regular position with cadences on the confinal E and e in the lowest and highest voices at the end of Kyrie II. In terms of motives, Kyrie II shows its relationship with Kyrie I by ending with motive F in the upper voice at semibreve 39, followed by motive A in the penultimate measure.

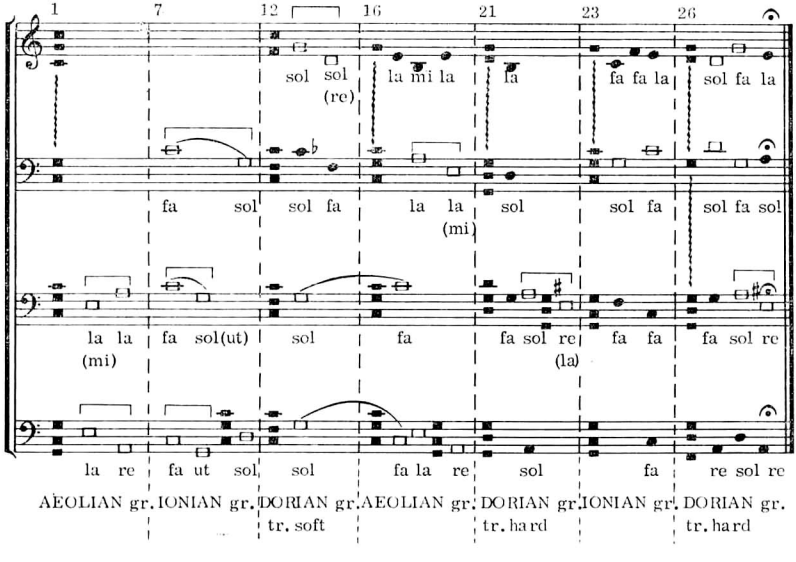
As can be seen from the following modal summary, the Aeolian-

Ex. 8

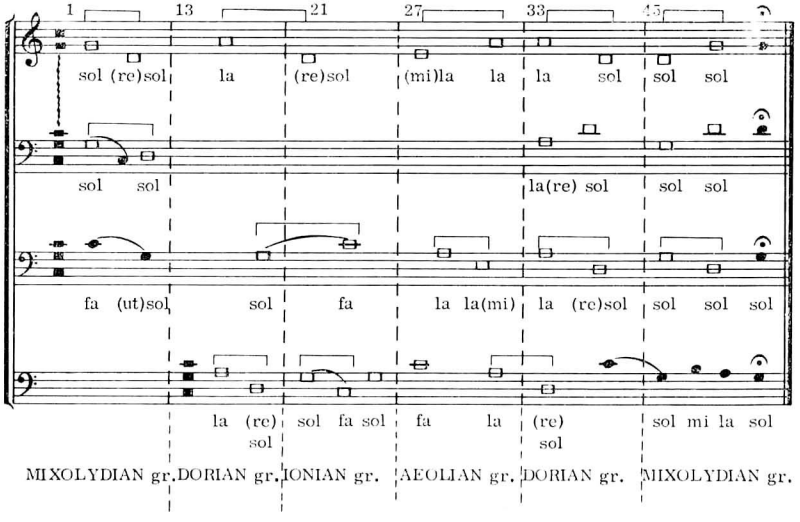


Ex. 9 Analytical Summary of Modulations in the Kyrie Section of Missa Mi-mi by Johannes Ockeghem

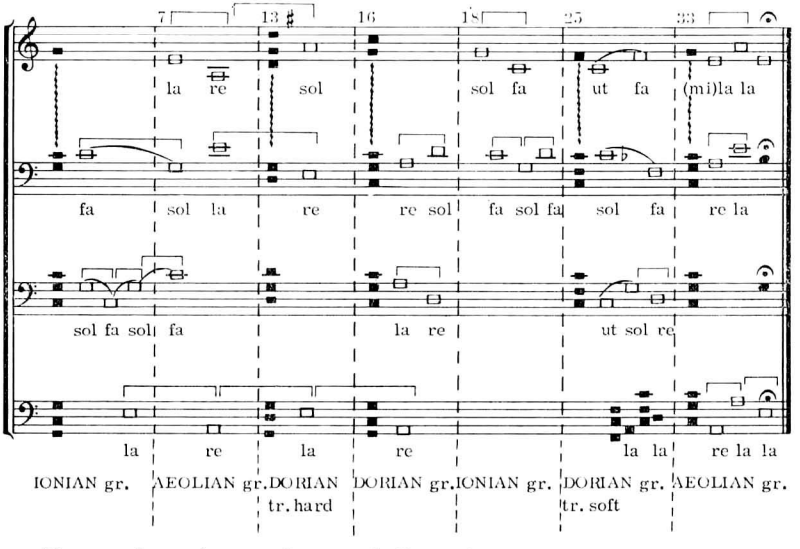
Kyrie I



Christe



Kyrie II



Figures above the grand staves indicate the number of semibreves from the beginning of the subsection.

Brackets indicate modal fourths, fifths and octaves.

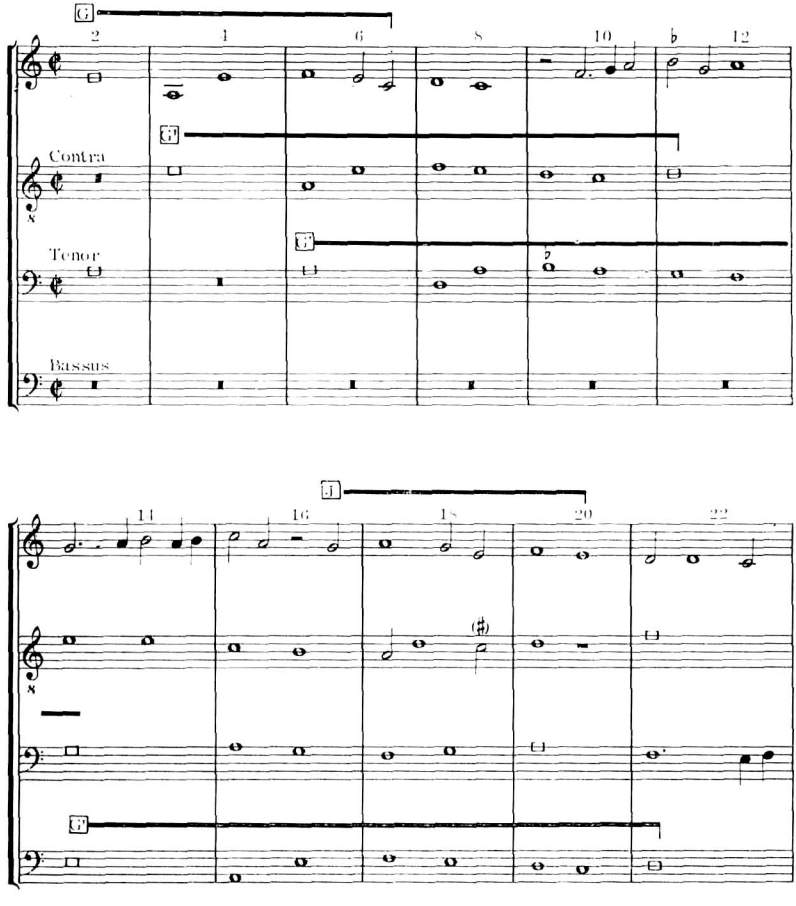
Curved lines indicate hexachordal fourths and fifths.

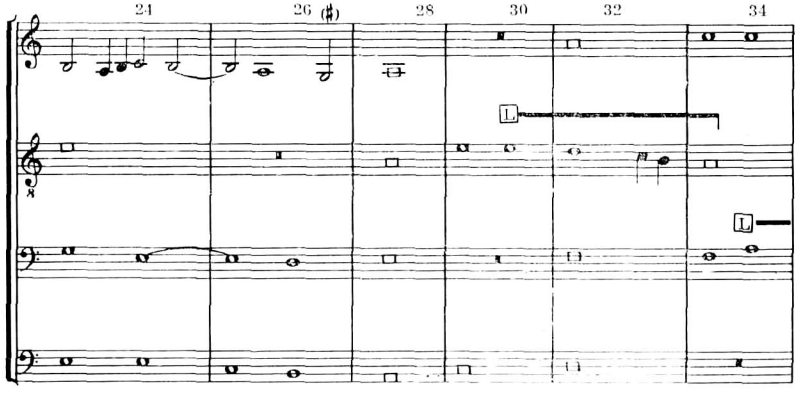
Black notes indicate important notes.

The abbreviations gr. and tr. stand for "group" and "transposed".

Hypoaelian modes dominate Ockeghem's Kyrie section of Missa Mi-mi, but with modulations to other modes of the same family-group (Dorian-Hypodorian) and to modes of the same hexachordal divisions (Ionian-Hypionian, Mixolydian-Hypomixolydian). This Kyrie section forms a "musical triptych" in which a rather sedate Christe in binary meter is framed between two modulatory Kyrie in ternary meter.

Ex. 10 Chanson *Petite camusette* by Ockeghem

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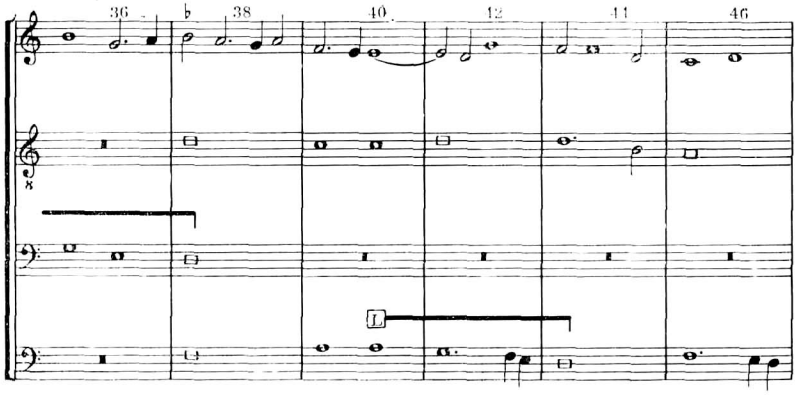
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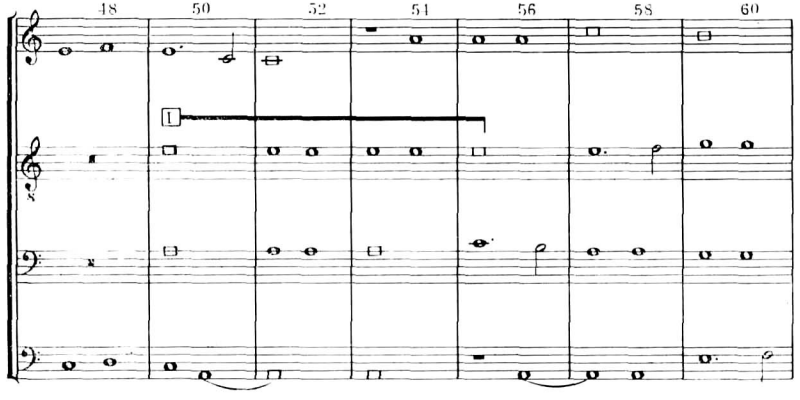
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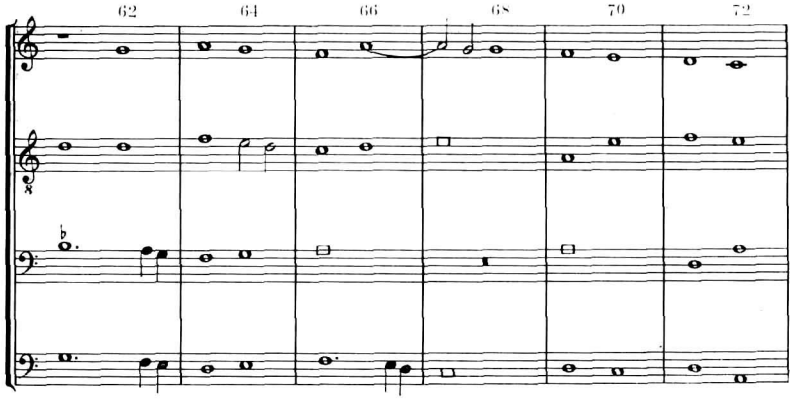
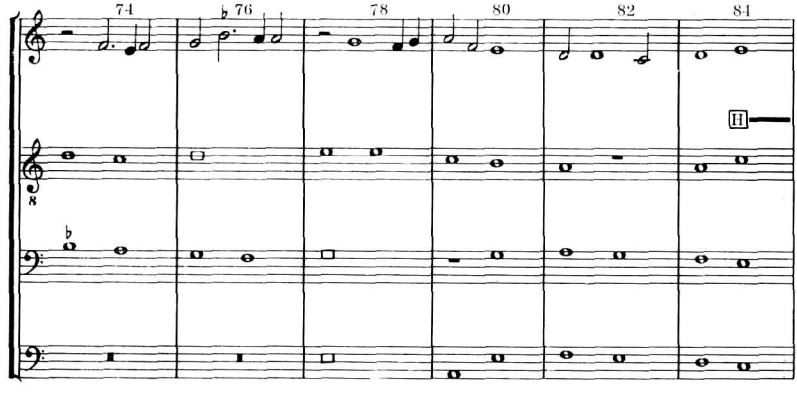
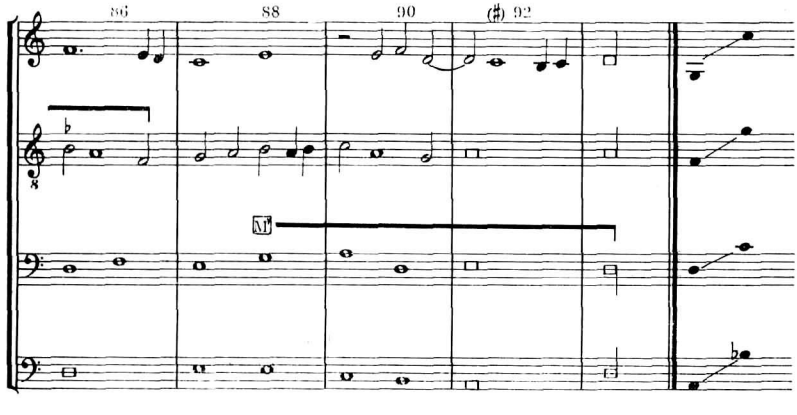
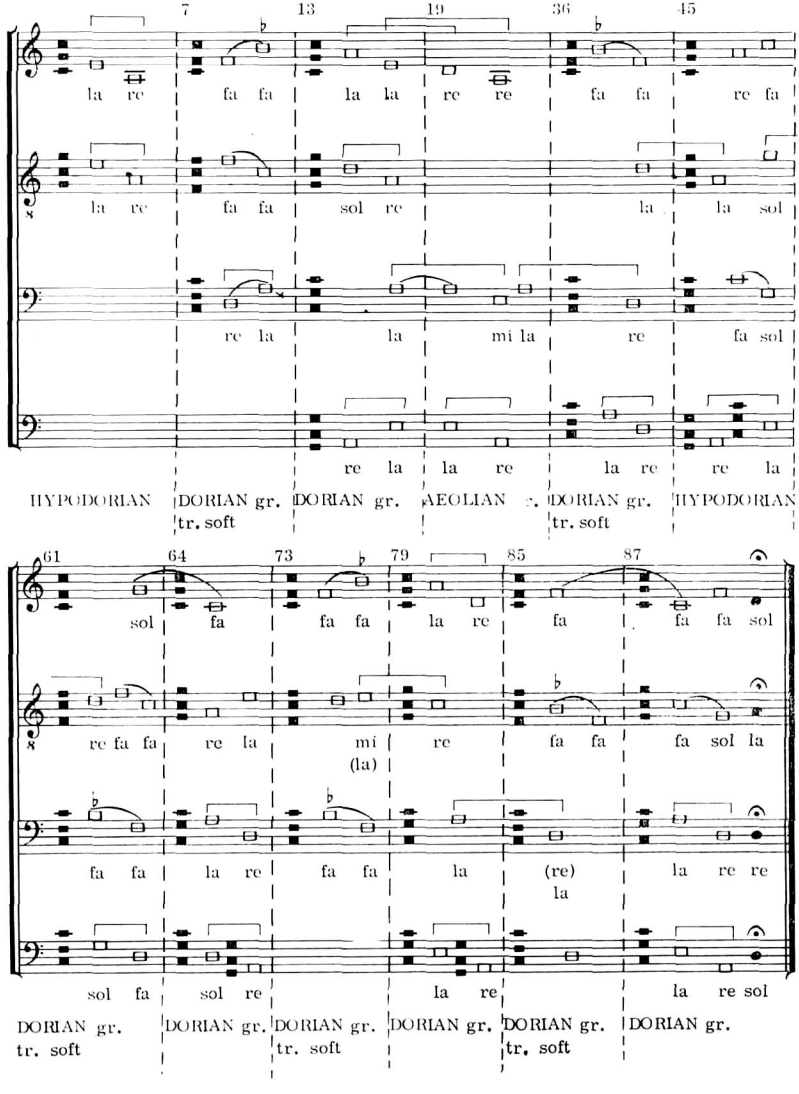

62
64
66
68
70
72


74
76
78
80
82
84
H


86
88
90
92
M

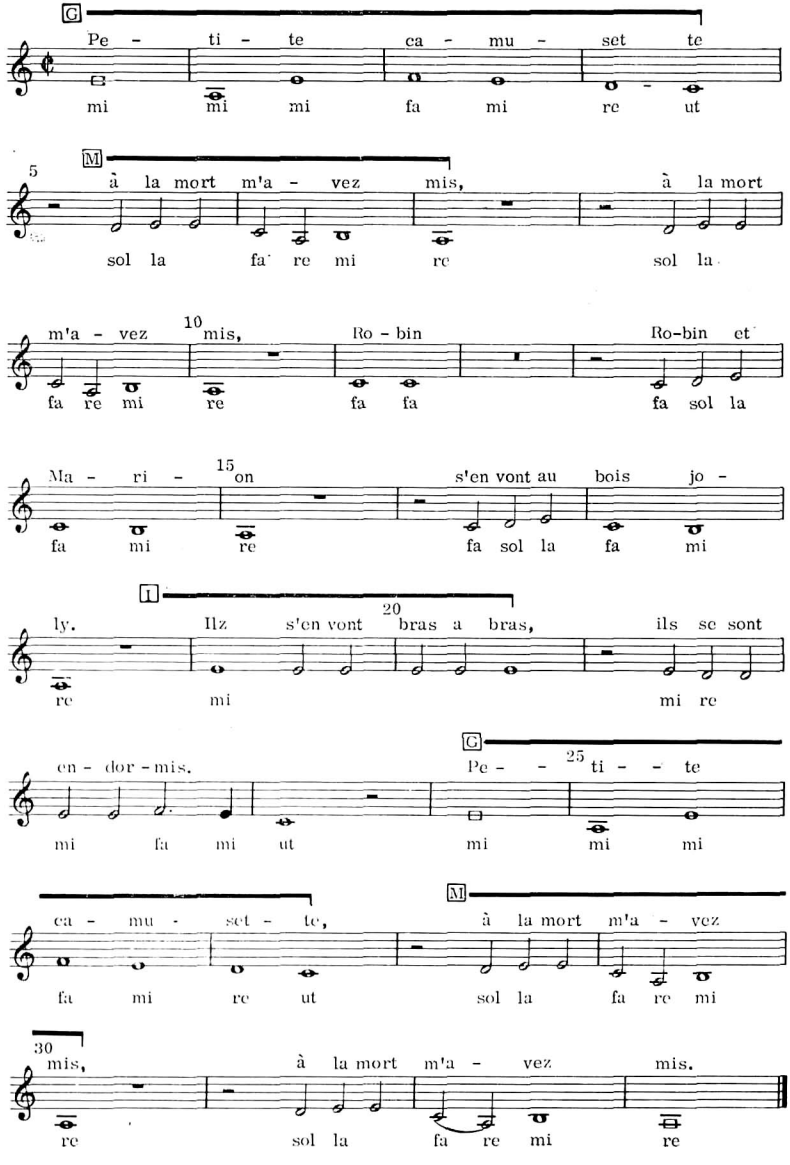
The source for Ockeghem's Mass Mi-mi may be his own polyphonic setting a4 of the monophonic chanson *Petite camusette*,[11] although he did not borrow much from it except motive [G] at the

Ex.11 Analytical Summary of Modulations in *Petite camusette* a4 by Ockeghem



beginning, and motive H at the end. In addition to the opening motive, Ockeghem's setting has motive I which can be found in

Ex.12 Chanson *Petite camusette*



the chanson and the setting a6 by Josquin[12] (see Appendix), and motive [J] which may have been borrowed by Pipelare in the first Kyrie of his Mass Mi-mi (see Ex. 15).

The monophonic chanson *Petite camusette*,[13] as it appears in the tenor part of Josquin's setting a6, shows at its outset the descending fifth e-a carrying the syllables of solmization mi-mi which have been the trademark of the Masses Mi-mi by Ockeghem, Pipelare and Orto.[14] However, the syllables mi-mi belong to the type of solmization by the three ut's (G-ut, C-ut, and F-ut) used primarily to teach plainchant and melodic music reading; as late as 1554, Maximilian Guilliaud gives rules for proper solmization by the three .ut's:

> In order to ascend from the hexachord naturale
> into the durum, and from the hexachord molle
> into the naturale one must sing *re* after *sol* etc…[15]

In monophonic songs mi-mi was possible for the descending fifth e-a or ♮-E before ascending back to the note e or ♮ without any problem, but in polyphonic music it was not so, except in a modulation, because the syllable mi must appear only once in a hard or a soft octave. Hence, in the gamut starting on the note G in polyphony, the note ♮ is the mi of the two hexachordal

12) Transcription from *Werken van Josquin des Pres*, ed. Albert Smijers (Amsterdam: Vereniging voor Nederlandsche Musiekgeschiedenis 1921~1967), Bundel II (1924), No. 17, p. 43.

13) In this chanson we can see that in monophonic melodies the fifth e-a could be mi-mi on the soft side of the hexachords, but re-la (or la-re) on the hard side.

14) Of Orto's Mass Mi-mi in modern notation, only the first Kyrie is readily available for analysis in Pirro, *Histoire de la musique de la fin du XIVe siècle à la fin du XVIe siècle*, (Paris, 1940) p. 219~220; its discussion would simply confirm the theoretical and modal analyzes already presented.

15) Allaire, *Op. cit.*, p. 48.

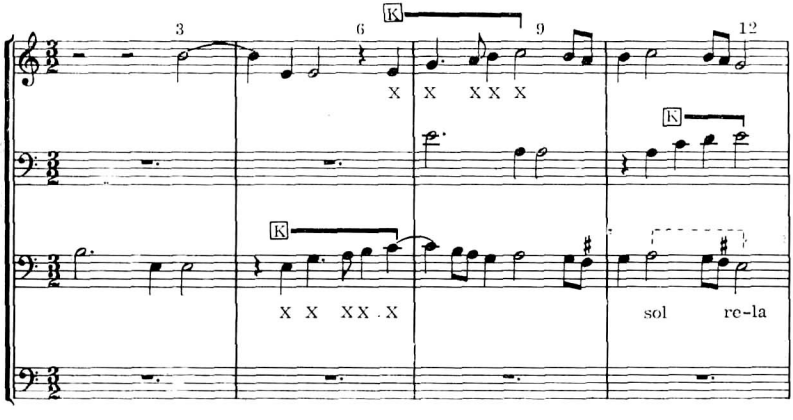
octaves possible in that scale(see fn. 4) and if the syllable mi was heard on another note than ♮ it meant that a mode was in an irregular position on the soft or the hard side of the hexachords. The modal and hexachordal intervals read and sung by a singer, and the ones he heard sung by the other singers were more important to him, when singing a liturgical latin text, than syllables of solmization; although the knowledge of those intervals had been acquired by the means of solmization. When discussing solmization Spangen berg wrote about it:

> "…that which is proper to beginners, since one must do it in order to learn how to dispense with it"[16]

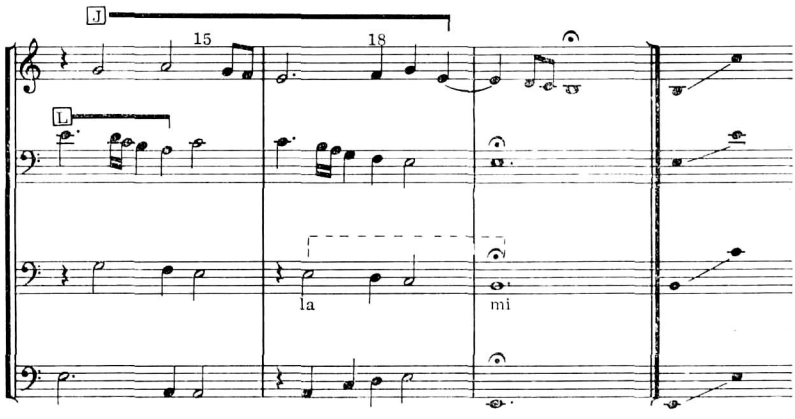
Therefore, no one sang mi-mi or la-mi at the beginning of the first Kyrie of Ockeghem's and Pipelare's Masses, and the title mi-mi is misleading; in fact, it should have been *Missa* super

Ex. 13 The **Kyrie Section of Missa Mi-mi by Mattheus Pipelare**

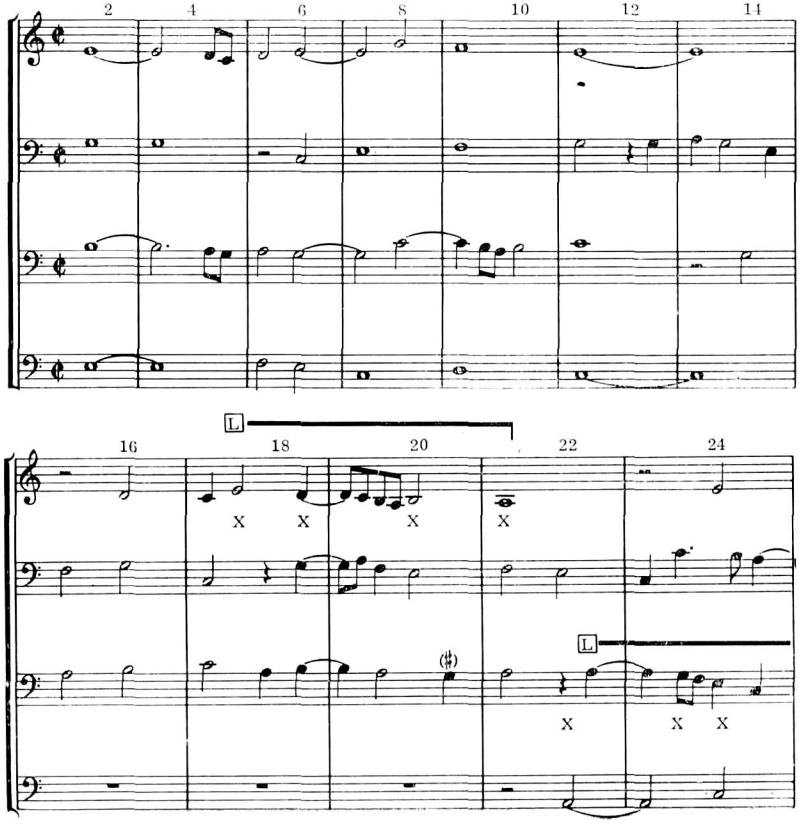
Kyrie I

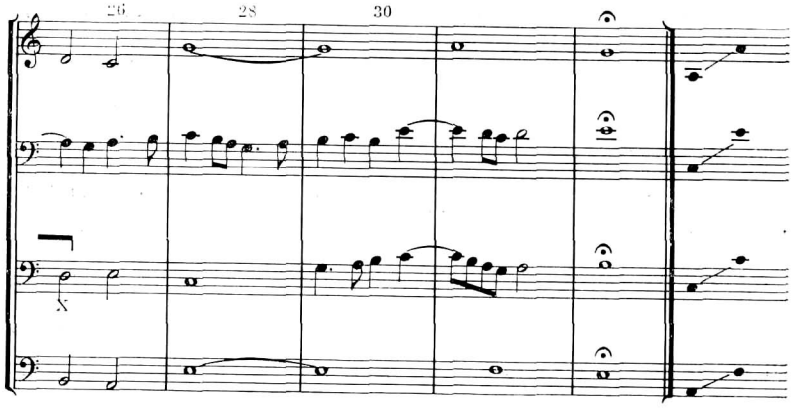


16) *Ibid.*, p. 63.

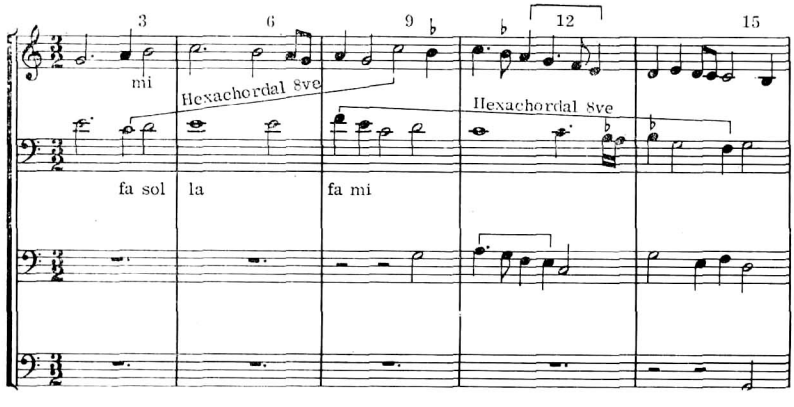


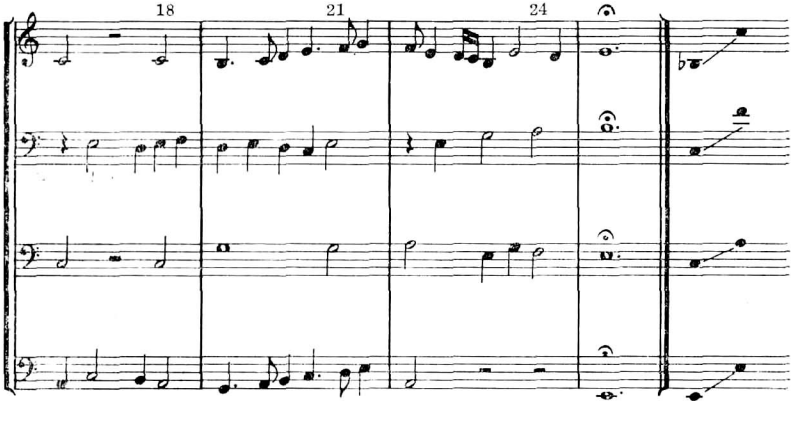
Kyrie




26
28
30

Kyrie II


3
6
9
12
15
mi
Hexachordal 8ve
Hexachordal 8ve
fa sol
la
fa mi


18
21
24

Petite camusette... Indeed at a time when church authorities were criticizing polyphonic composers for using secular and frivolous songs as basis for their Masses, the syllables mi-mi looked quite innocent compared with *Petite camusette*.

In the first Kyrie of the Mass Mi-mi by Mattheus Pipelare[17] the music shares three modal groups: The Phrygian-Hypophrygian in regular position (Fig. 7), the Dorian-Hypodorian in their first irregular position on the hard side of the hexachords (Fig. 4), and the Aeolian-Hypoaeolian in regular position (Fig. 1). In this Kyrie the tenor has all the characteristic intervals that identify the modulations of the piece. After the opening Phrygian fifth it modulates to the Dorian-Hypodorian group of modes transposed once hard; it was evident to the trained singer that the arithmetic division of the hexachordal octave G-g, through which the Phrygian-Hypophrygian modes are expressed, was changed to the harmonic division of the same octave in order to express the Dorian-Hypodorian modes in their first irregular hard position.

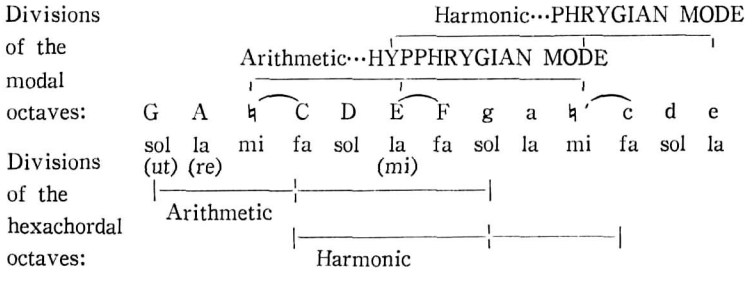
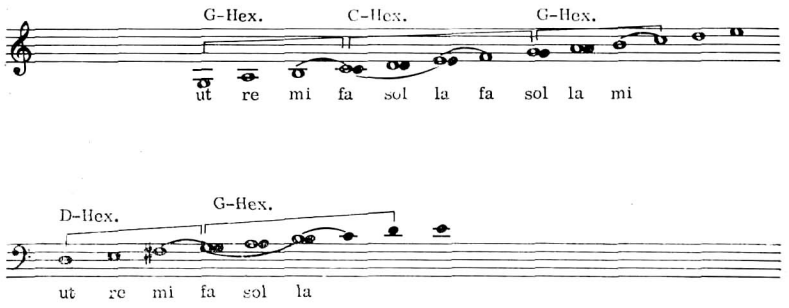


Fig. 7 Structure of the Phrygian and the Hypophrygian modes in regular position

17) Transcription from *Opera Omnia*, ed. Ronald Cross, CMM-34, Vol. III, p. 51~51 (American Institute of Musicology, 1967).

Ex. 14



This was evident to the singer because the note ♮′ which he had sung as mi became the la of an octave a fourth lower when the top voice sang the note ♮″ as mi. This modulation was confirmed to the singer by the last modal fourth in his part, la-mi (E-♮), which belongs to the arithmetic division of the hexachordal octave G-g while his other modal fourth, sol-re (a-E) in the fourth bar, belongs to the arithmetic division of the hexachordal octave D-d. A similar theoretical reasoning applies to the opening measures of Josquin's setting of *Petite camusette* a6 in the Appendix; Renaissance singers seem to have had an auditory knowledge of the interrelations between the different modal and hexchordal intervals, unisons and octaves, which may have helped them to dispense with the notated ♮ and ♭ signs.

Pipelare must have been acquainted with the setting of the chanson and the Mass Mi-mi by Ockeghem, as motive [J] appears to be an amplified version of the same motive in the setting of *Petite camusette* (Ex. 13), while motive [K] (it is interesting to speculate) may have been extracted from the tenor and the contratenor parts of the first Kyrie of the Mass (Ex. 2); it was common practice for composers of the time to present the same material under two different aspects (see fn. 12)... In Ockeghem's the

solmization syllables would have been la sol la mi fa for a motive in Hypoaeolian, in Pipelare's la fa sol la fa for a motive in Hypodorian transposed once hard.

As in Ockeghem's Mass, Pipelare's Christe shows only modes in regular position; it starts in Phrygian-Hypophrygian(Fig. 7) leading to a cadence in Ionian in the tenor at semibreve 11. The Aeolian-Hypoaeolian modes follow with a cadence of the final in the tenor at semibreve 21, and a mixture of Ionian-Hypoionian with Aeolian intervals leading to an ending in Phrygian-Hypophrygian. A motive, [L], may have been derived from Ockeghem's *Petite camusette.*

After starting the last Kyrie in the Phrygian octave covering the two upper voices, Pipelare moved temporarily to the Phrygian mode in its irregular position on the flat side of the hexachords, leading to an Ionian cadence in the top voice at semibreve 16. This is followed by the Phrygian-Hypophrygian modes in regular position until the last cadence on the Hypophrygian confinal in the contratenor and the Phrygian final in the three other voices.

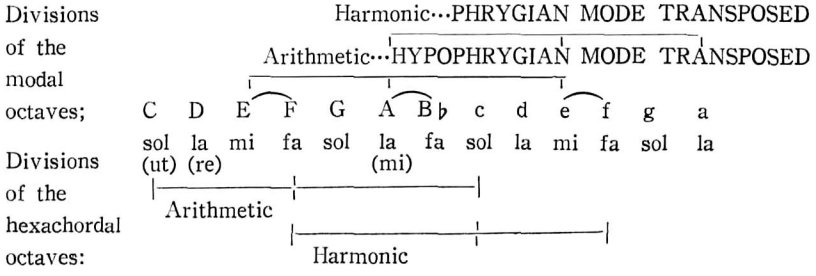
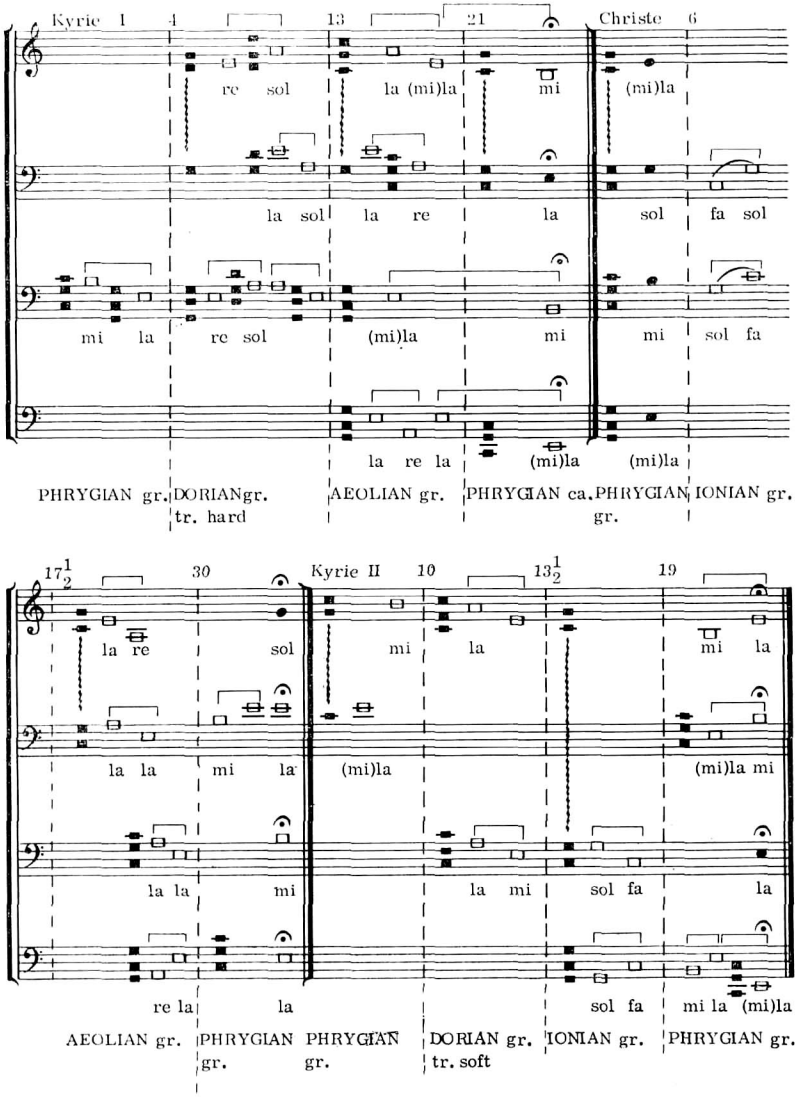


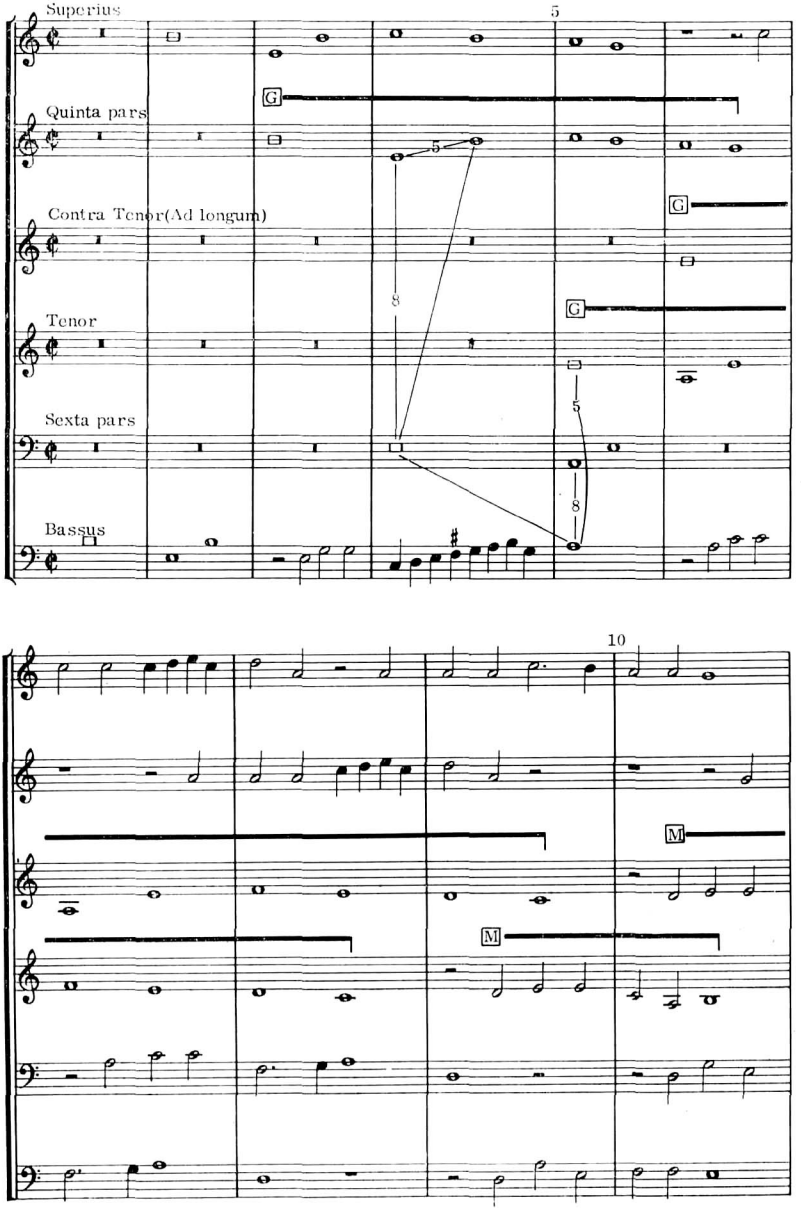
Fig. 8 Structure of the Phrygian and the Hypophrygian modes transposed once soft

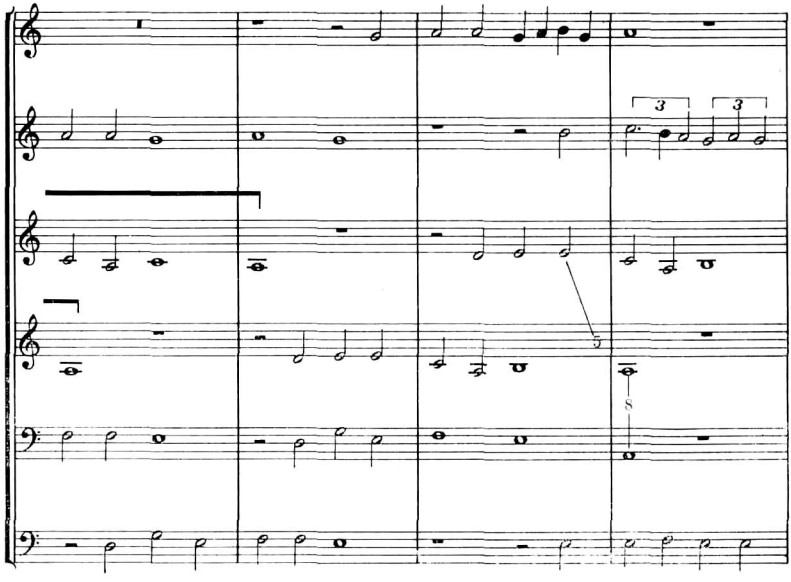
Ex. 15 Analytical Summary of Modulations in the Kyrie Section of Missa Mi-mi by Mattheus Pipelare

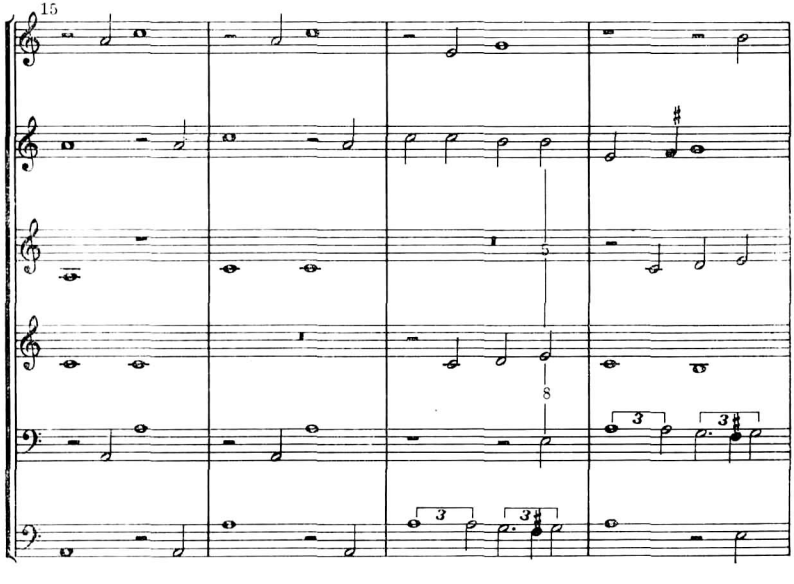


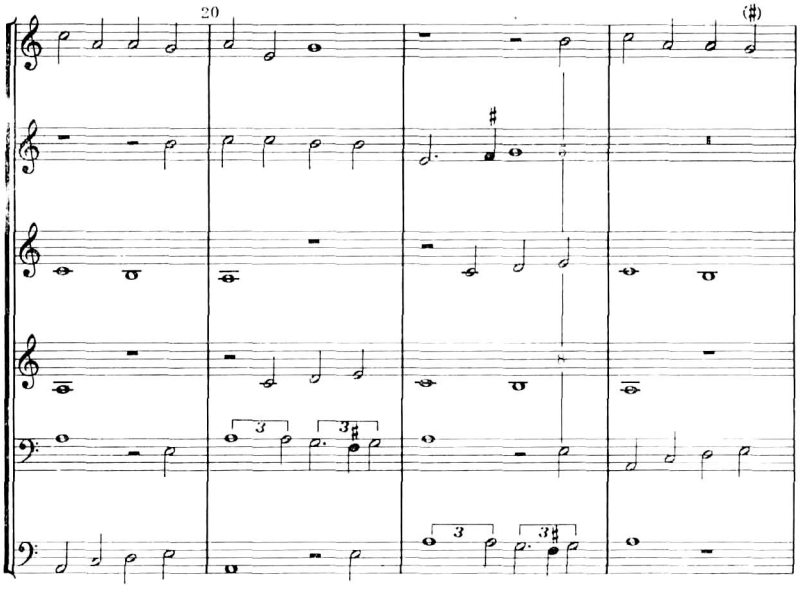
APPENDIX

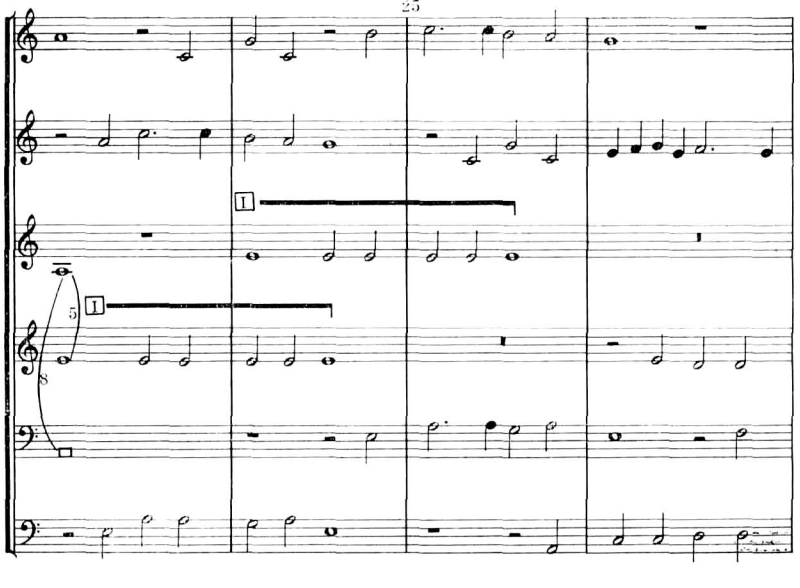
Chanson *Petite Camusette* a^6 Josquin des Prés

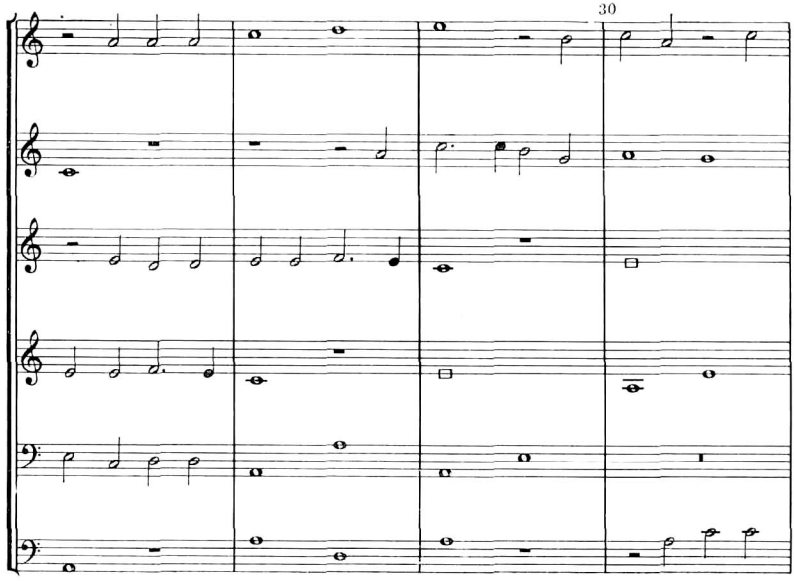


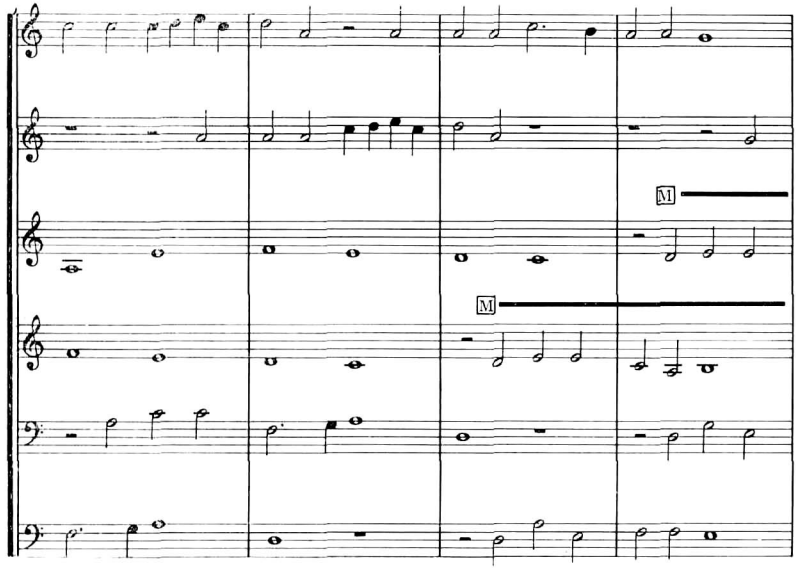


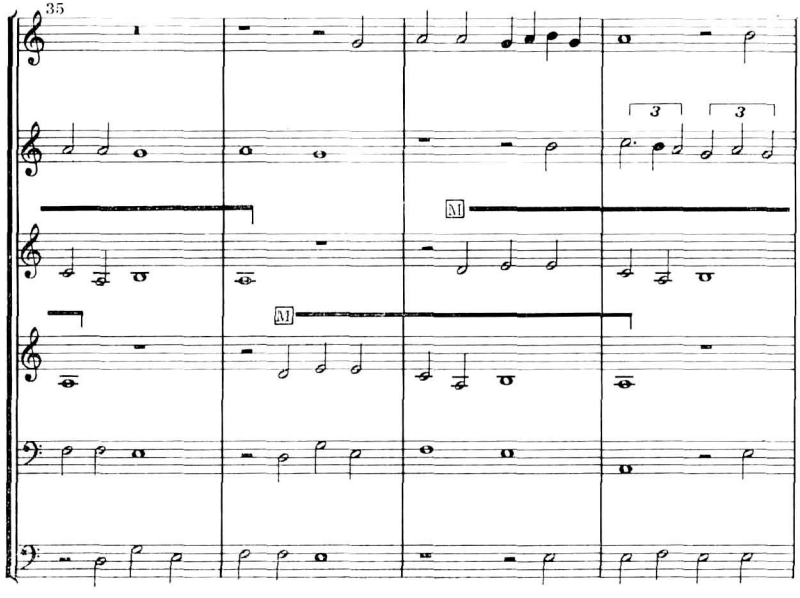


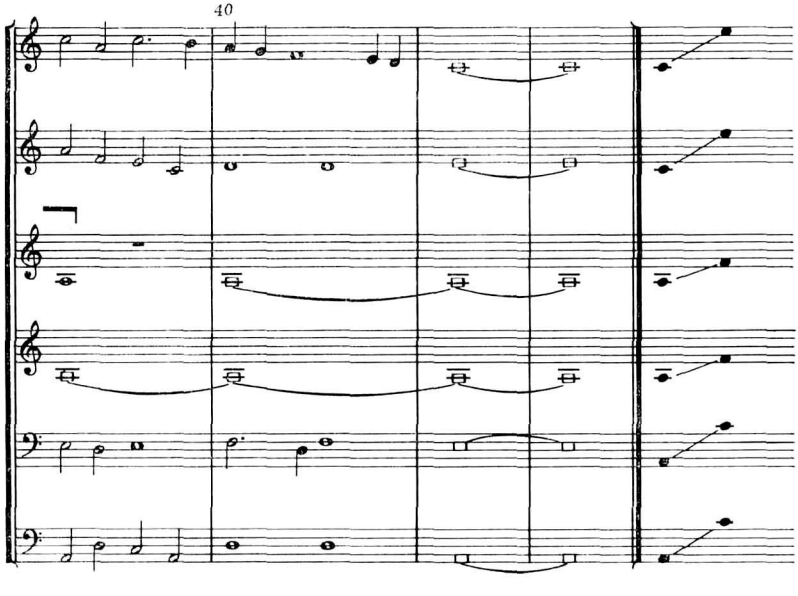

20
(♯)
3
3♯
3
3♯


25
1
5
1
8


30


M
M


35
3
3
M
M


40

〈요 약〉

Johannes Ockeghem(요하네스 옥케겜)과 Mattheus Pipelare(마티우스 파이프래어)의 미사 미—미 中 Kyrie(기리에) 부분의 전조에 대한 이론적 분석

Dr. Gaston G. Allaire

르네쌍스(Renaissance) 성악 다성음악(vocal polyphony)을 통하여 선법적(modal) 그리고 6音음계적(hexachordal) 음정들의 변위(displacements)에 의한 전조(modulation) 과정을 분석하고 있다. Ockeghem과 Pipelare의 2 Kyrie 부분과 다성적 샹쏭(polyphonic chanson) *Petite camusette*에서의 각기 다른 선율동기(melodic motive)들의 移度(transposition)와 선법의 변화는 전조의 구조적 분석을 확증하고 있다. 뿐만 아니라 Ockeghem의 탁월한 대위적(contrapuntal) 기교 역시 잘 나타나 있다.

E. L.