JOHN DUNSTABLE AND LEONEL POWER: A STYLISTIC COMPARISON

Beverley Gaye Smith

SUMMARY

This thesis is an attempt to define and compare the styles of two English composers active early in the fifteenth century - John Dunstable and Leonel Power. The two are commonly confused in the surviving manuscript sources of their music and to date there has been no reliable method for the determination of authorship in cases of conflicting attribution.

Part One of the investigation consists of an analysis of works which bear uncontradicted ascriptions. The information is used to set up a database for each of the composers. The analysis is largely computer-aided and covers aspects of form, pitch, range, chord structure, melodic structure, speed, text setting and cadence progressions.

Part Two compares a variety of uncertain works against the databases and in each case employs the statistical method of Discriminant Analysis to calculate which of the two composers is more likely to be responsible for the composition. In all of the six pieces with ascriptions to both men, the results indicate the likely author to a probability of over 1.00. The data are also used to assess many anonymous pieces and mass pairs.

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INTRODUCTION

ABBREVIATIONS USED

MUSICAL EDITIONS

MB8 Musica Britannica volume 8
John Dunstable Complete Works
(first edition London, 1953)
Editor Manfred F. Bukofzer
(revised edition London, 1970)
Revisers Margaret Bent,
Ian Bent and Brian Trowell

CMM50 Corpus Mensurabilis Musicae volume 50
The Complete Works of Leonel Power
Editor Charles Hamm
Volume i Motets
(American Institute of Musicology, 1969)
Volume ii Mass movements (in preparation)

CMM46 Corpus Mensurabilis Musicae volume 46
The Old Hall Manuscript
Editors Andrew Hughes and Margaret Bent
(American Institute of Musicology, 1973)

ACM Antico Church Music
Leonel Power Missa super Alma Redemptoris
Editor Gareth Curtis
(Newton Abbot, 1982)

CMM1 Corpus Mensurabilis Musicae volume 1
The Complete Works of Guillaume Dufay
Editor Heinrich Besseler
(American Institute of Musicology, 1964)

DTO Denkmäler der Tonkunst in Österreich
(various volumes)

BOOKS AND PERIODICALS

ActaMus	Acta Musicologica
AMW	Archiv für Musikwissenschaft
EM	Early Music
EMH	Early Music History
Galpin	The Galpin Society Journal
Grove	The New Grove Dictionary of Music and Musicians
IR	International Review
JAMS	Journal of the American Musicological Society
JMT	Journal of Music Theory
MDisc	Musica Disciplina
M&L	Music and Letters
MQ	The Music Quarterly
MR	The Music Review
PMA	Proceedings of the Musical Association
PRMA	Proceedings of the Royal Musical Association

MANUSCRIPTS

Ao	Aosta, Biblioteca del Seminario Maggiore, A'D19. See Guillaume De Van: 'A Recently Discovered Source of Early Fifteenth Century Polyphonic Music' in MDisc, vol.2 (1948), pp.5-74.
BL	Bologna, Civico Museo Bibliografico Musicale Q15. See Guillaume De Van: 'Inventory of Manuscript Bologna Liceo Musicale, Q15 (olim 37)' in MDisc, vol.2 (1948), pp.231-257.
BM	British Library, Add.31922.
BU	Bologna, Biblioteca Universitaria 2216. See Heinrich Besseler: 'The Manuscript Bologna Biblioteca Universitaria 2216' in MDisc, vol.6 (1952), pp.39-65.
Bux	Munich, Staatsbibliothek, mus.3725.
Ca	Cambrai, Bibl. Municipale, 11. See Heinrich Besseler: 'Studien zur Musik des Mittelalters' in AMW, vol.7 (1925), p.224.
Cant	Canterbury Cathedral Library, Add. 128. See Nicholas Sandon: 'Fragments of Mediaeval Polyphony at Caterbury Cathedral' in MDisc, vol.30 (1976), p.42.
Emm	Cambridge, Emmanuel College, 300.
FM	Florence, Biblioteca Nazionale Magliab.XIX, 112 bis. See Heinrich Besseler: 'Studien zur Muzik des Mittelalters' in AMW, vol.7 (1925), p.238.
Harv	Harvard, Houghton Library, Inc. 8948. See Edward Kovarik: 'A Newly-discovered Dunstable Fragment' in JAMS, vol.21 (1968), pp.21-33.

Linc	Oxford, Bodleian Library, Lincoln College Latin 89. See Ann-Marie Seaman and Richard Rastall: 'The Music of Oxford, Bodleian Library MS Lincoln College Latin 89', in RMA Research Chronicle, vol.13 (1976), pp.95-101.
MilB	Milan, Biblioteca Nazionale Braidense, cod.AD.XIV.49. See Nanie Bridgeman: 'Un Manuscrit Milanais' in Revista Italiana di Musicologia, vol.1 (1967), pp.237-241.
ModB	Modena, Biblioteca Estense A.M.5,24 (∝.X.I,II). See Charles Hamm and Ann Besser Scott: 'A Study and Inventory of the Manuscript Modena, Biblioteca Estense, ∝.X.I,II (ModB)' in MDisc, vol.26 (1972), pp.101-143.
MuEm	Munich, Bayerische Staatsbibliothek mus.3232a.
MuL	Munich, Staatsbibliothek mus.3224. See Heinrich Besseler: 'Studien zur Muzik des Mittelalters' in AMW, vol.7 (1925), p.235.
OH	London, British Library Add.57950 (Old Hall). See Andrew Hughes and Margaret Bent: 'The Old Hall Manuscript: An Inventory' in MDisc, vol.21 (1967), pp.130-147.
OS	Oxford, Bodleian Library, Selden B26.
Pemb	Cambridge, Pembroke College 314.
Ritson	London, British Library, Reference Division, Add. 5665. See Hugh Benham: '"Salve Regina" (Power or Dunstable): a Simplified Version' in M&L, vol.59 (1978), pp.28-32.
Tr87-92	Trent, Museo Provinciale d'Arte 87 to 92. See DTO vols.14-15 (1900, reprinted 1959), pp.58-65.
Tr93	Trent, Archivio Capitolare 93. See DTO vol.61 (1924, reprinted 1960), pp.VI-X

AIMS OF THE STUDY

During the fourteenth century, the seeds of a great social movement had been sown, that of Humanism, which was to dominate the Renaissance period of European history. The essence of this movement was a shift of emphasis away from the supreme power of the Church and towards man as the centre of society, bringing long-established religious ideals into question. A rift between the serious and popular aspects of life began to deepen; sacred and secular music started to separate in function. The Arts in general were no longer regarded solely as aids to worship but as sources of pleasurable experience. Sacred music itself responded to the spirit of the times and became designed more to appeal to the senses than ever before.

An important sequel to this movement was that in the early fifteenth century increased recognition was given to music and musicians by the ruling monarchs. At least one King Henry was a composer in his own right.[1] Henry IV expanded the Chapel Royal and took a keen interest in music.[2] With Henry V, musicians were recorded separately from secretaries for the first time. The little notated music which has survived from prior to this era was largely anonymous, but now more attributions to named

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[1] For the argument in favour of Henry V see Margaret Bent: 'Sources of the Old Hall Music' in PRMA, vol.94 (1967-8), pp.23-35.

[2] Brian Trowell: 'King Henry IV, Recorder-Player' in Galpin, vol.10 (1957), p.83.

composers began to be recorded, those in the Old Hall manuscript (OH) being among the earliest English examples. This development allows historians a first glimpse of personal compositional styles.

The whole subject of the evolution of composer individuality is a complex one.[3] The growing interest in the composer as a creative individual did not always necessarily coincide with the formation of individual styles. In fact, the known output of early composers is often impossible to separate stylistically from the whole, relatively narrow body of contemporary music with which it shares the same fundamental characteristics. To some extent this is also true of the fifteenth century, yet just enough differentiation of style might exist for modern analytical methods to break through the curtain of anonymity. Our modern preoccupation with composer identity motivates the search for authenticity and the tools now exist to allow the process of unravelling the associated problems to begin.

The raw materials of the present study, taken from English music of the first decades of the fifteenth century, are found sometimes in insular sources but due to the loss of much material, presumably during the Reformation, mostly survive only on the Continent, especially in northern Italy. False and contradictory attributions abound in this corpus, probably the more so

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[3] See for example Ludwig Finsher: 'Die "Entstehung des Komponisten": Zum Problem Komponisten-Individualitat und Individualstil in der Musik des 14.Jahrhunderts' in IR, vol.6 (1975), pp.29-44.

because the music was copied 'second hand'. Sometimes it seems that the new habit of naming a composer was, in itself, more important than the accuracy of the attribution. Though much work has been devoted to studies of the manuscripts and transcription of their contents, the full potential of analysis in addressing problems of authorship has not yet been realized.

Trowell and Hughes have conducted excellent surveys of English music in their PhD theses,[4,5] and Bent has produced a comprehensive study of one composer, John Dunstable,[6] but these authors have stressed the need for further investigation. When discussing the problem of the conflicting ascription of music in different manuscripts, Hughes suggested that more analysis should be undertaken of the respective styles of different composers. Bent has stated:

> How can we know whether an ascription is correct? We are largely at the mercy of general impressions and detailed case histories of individual pieces for judgements about the reliability of manuscripts.[7]

The relative accuracy of different manuscripts has sometimes been the only criterion for allocating authorship in disputed cases, for example by Bukofzer in the commentary to the collected edition of *Dunstable's*

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[4] Brian Trowell: 'Music under the Later Plantagenets' (diss. University of Cambridge, 1960).

[5] Andrew Hughes: 'English Sacred Music (Excluding Carols) in Insular Sources, 1400-ca.1450' (diss. University of Oxford, 1963).

[6] Margaret Bent: Dunstaple (London, 1981).

[7] Ibid., p.7.

works (MB8). However, this policy is questionable, especially as manuscript accuracy is difficult to assess, making the arguments to some extent circular. Much more satisfactory would be an allocation on a stylistic basis, though to date not enough data have been available to make this possible. To quote again from Bent:

> Just how little we know about (his) style ..... can be seen when we try to answer a question such as: Is this work an authentic composition of Dunstaple? ..... We do not know enough even to distinguish the work of one English composer from another on grounds of style, although the general features of 'Englishness' can be safely described and distinguished from foreign work.*

She bypasses the problem of correctness of ascription and treats most of the music in the collected edition as being by Dunstable, though many of these works bear conflicting or dubious attributions. This present study takes up the problem highlighted by this scholar and others. Its primary aim is the detection of personal compositional traits.

Though over thirty English composers are named in contemporary manuscripts, the majority are linked with too few works to provide enough material for a meaningful statistical analysis of their styles. More music has survived which is attributed to John Dunstable and Leonel Power than to any of the other composers, and a substantial number of conflicting ascriptions concern these two men. Their styles will therefore be the central theme of this thesis.

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* Ibid., p.9.

The project has been approached in two stages. Part One is an attempt to define and contrast the styles of the two composers through an analysis of their surviving music. Part Two uses the information thus obtained to assess many other pieces whose authorship is, for some reason, dubious. Few of the areas to be investigated are novel. In fact, as many ideas as possible have been gleaned from suggestions by other writers for possible forms of analysis. These are explored in greater detail to ascertain their value and a summary of the worth of each particular technique is given; some methods prove useful, others not. On occasion, a line of enquiry sheds light on related topics, such as chronology and the development of style.

The central task of separating Leonel and Dunstable is not an easy one; the number of investigations which yield no useful information certainly outweighs the number of successful ones, although it has been considered necessary to report on all the methods employed, successful or not, as this may be of help to future workers. A topic which has been studied for many months and concerns a large body of data might yield only minute differences between the composers. Those differences which are extracted are often obscure or concern trivial aspects of composition. This is a measure of the closeness of the two styles. Often, a computer will be used to gain the necessary accuracy to separate such outwardly similar groups of compositions. A second, but important, aim of the thesis is therefore an assessment of

the role which the computer can play in musical analysis. No apology is made for this method of research, which is now gaining acceptance in musical circles, and its validity will be discussed in detail later.

In the past, several computer-aided studies have been performed on early music subjects.* Most of these have been experimental in nature and/or limited in scope. Often, a promising line of investigation has not been followed to fruition. The present study aims to be a larger and more detailed computer-aided investigation of a single corpus of music than has been conducted previously.

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* See, for example, Frederick Crane and Judith Fiehler: 'Numerical Methods of Comparing Musical Styles' in The Computer and Music, ed. Harry B. Lincoln, (1970), pp.209-222; John W. Reid: 'Testing for Authenticity in the Works of Dufay' in MR, vol.45 (1984), pp.163-178 and John Morehen: 'Byrd's Manuscript Motets: a new perspective' in Byrd Studies, ed. Alan Brown and Richard Turbet, (Cambridge, 1992).

HISTORICAL BACKGROUND

The importance of English music in the early fifteenth century and its reputed influence on Continental style is well known. Most accounts of this period in musical history begin with a description of the various references to Dunstable by Tinctoris, Martin le Franc and John of Wheathampstead which testify to his prominent position. It is surely not necessary to reproduce these again. Suffice it to say that this composer was highly regarded by his contemporaries.

The name of Dunstable is reasonably well known today, not only due to this high regard, but also because of the large quantity of his music which has survived. However, the features most admired and copied by Dufay, Binchois and others were present in the music of the English school in general and were evident in the OH manuscript, which predates Dunstable. This musical source attributes more pieces to the composer Leonel (Power) than to any other single person. Therefore, his name also is becoming increasingly recognized and associated with this historical period.

Such references as remain, however, are of little help in tracing the careers of these men. Most composers of the time remain enigmatic figures. The few known facts have been descibed by other writers.[10] Here, therefore,

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[10] Roger Bowers: 'Some Observations on the Life and Career of Lionel Power' in PRMA, vol.102 (1975-76), pp.103-127; Margaret Bent: Dunstaple, (London,1981), pp.1-4; Margaret Bent 'Dunstable, John' in Grove, vol.5 (1980), p.720 and

the main points will be recounted only briefly for the sake of completeness and in order that a few personal observations can be made.

The first observation concerns Dunstable's name. In an age prior to standardization of spelling, it appears variously in the manuscripts as Dunstable, Dunstaple, Dunstabell, Dumstable etc. It is this writer's opinion that Bent is too pedantic in her insistence upon 'Dunstaple' in preference to the more traditional 'Dunstable', especially as at least seven other variants are recorded, and despite the fact that the Bedfordshire town where the composer's family name most probably originated has become 'Dunstable' in modern usage. Even her reasoning is in error in one respect. It is true, as she claims, that more than twice as many musical attributions use the spelling 'Dunstaple' as use 'Dunstable' but she fails to note that 80% of the former are in the same manuscript - ModB. It is logical to expect a single document to be more consistent in this respect than would be diverse sources, and this is borne out by the facts. Actually, more than twice as many manuscripts use 'Dunstable' as use 'Dunstaple'. Of course, the argument is further complicated by the fact that certain sources may be direct copies of others, and this could extend down to the details of spelling. Insular sources do favour 'Dunstable' and presumably these were closer to the composer himself than were foreign ones. Unfortunately,

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Margaret Bent: 'Power, Leonel' in Grove, vol.15 (1980), pp.174-175.

there is no evidence to suggest that any autograph copy exists, and even if it did, no reason to believe that the composer himself would have always spelled his name in the same way. The most sensible procedure seems to be to continue the traditional spelling, especially as the argument is of no direct consequence to the study of the music.

It is almost certain that a grave in St. Stephen's Church, Walbrook contains his remains. The original epitaph was destroyed in the Great Fire of London, 1666, but luckily the text had been recorded. Bent gives a translation. If the wording has been transmitted correctly, we have a date of 24th December, 1453 for Dunstable's death.

On the other hand, a precise date of birth is impossible to ascertain. His earliest surviving pieces may have been composed as early as 1410 on the evidence which has been used to date the manuscripts in which they are recorded. For example, a study of OH shows that the portion containing his four-part motet Veni Sancte Spiritus was completed by about 1420 or shortly afterwards.[11] Not enough information is yet available to date any works on a stylistic basis, and unlike many motets of his Continental contemporary, Dufay, Dunstable's show little evidence of having been composed for specific occasions. Howlett has suggested that the motet Albanus roseo rutilat to St. Alban could have been composed

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[11] Margaret Bent: 'Sources ....', pp.21-26 and Roger Bowers: Op. Cit., pp.109-110.

for the Duke of Bedford's visit to St. Alban's Abbey on the 17th June, 1426 (the saint's feast day).[12] The evidence is not solid, however. At best, then, Dunstable's birth can be placed at around 1390.

Much evidence has always pointed to a connection with the Duke of Bedford and it has often been assumed that Dunstable travelled with him to France. Recently, since the preparation of Bent's book, new evidence has been put forward by Wathey to show that he may have owned lands in Normandy.[13]

Considering the lack of information concerning Dunstable in contemporary writings, his posthumous fame was immense. By the sixteenth century, he had become a legendary figure and was even credited with the distinction of having been the inventor of counterpoint. This myth prevailed well after his music had been forgotten and even coloured his reputation amongst historians well into the present century. Bukofzer has discussed the origin and transmission of the legend.[14] The one-time belief that the composer had written a musical treatise has also now been discredited.

If the importance of Dunstable has been overestimated then it is equally true that, at least until very recently, that of Leonel has been overlooked. His

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[12] D.R. Howlett: 'A Possible Date for a Dunstable Motet' in MR, vol.36 (1975), pp.81-84.

[13] Andrew Wathey: 'Dunstable in France' in M&L, vol.67 (1986), pp.1-31.

[14] Manfred F. Bukofzer: 'John Dunstable: A Quincentenary Report' in MQ, vol.40 (1954), pp.32-35.

compositions demonstrate a high level of skill and his output appears to have been almost as great as Dunstable's. Also, he is known to have written a musical treatise on the art of discant.

There are quite a few references indicating that Leonel's profession was that of choirmaster and that he was a layman rather than a member of the clergy. The earliest of these places him in 1419 in the household chapel of Thomas, Duke of Clarence, with whom he probably travelled to France. Following the Duke's death in 1421, there is no record of his employment elsewhere for the next fifteen years. Bowers presumes that he would have continued to work in aristocratic households, and even speculates that he may have moved into the service of Clarence's brother, John, Duke of Bedford, in which case he may have come into contact with Dunstable. In 1423 he was admitted to the fraternity of Christ Church, Canterbury, and from 1438 onwards was employed there, probably as Master of the Lady Chapel choir. He died on 5th June, 1445.

The spelling of his name to be used here, Leonel, is that most often used in the musical manuscripts and is adopted out of convenience because a discussion of these attributions is central to the thesis. Archival sources often use the English form Lionel. Bowers can offer no explanation for the fact that the composer is usually referred to by his first name,[15] though a clue might

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[15] Roger Bowers: op. cit., p.103.

actually be held in a later discussion in his article.[14] It seems that in the Duke of Clarence's service were two other men of the surname Power. One, a singer, first name Richard, may not have joined the chapel until a later date, but it is possible that a Thomas might have been in service at the time when Leonel's first compositions were copied into OH. The use of a first name could simply have originated to avoid confusion between these individuals. This theory, however, is put forward with caution as the present writer has not had access to the relevant archive sources.

Bent puts Leonel's birthdate between about 1370 and 1385 on stylistic grounds while Bowers suggests the narrower period of 1375 to 1380 on the available biographical evidence. It is almost certain that he was an older man than Dunstable because of his compositions in the descant style and the fact that his music is amply represented in the original layer of OH.

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[14] Ibid., p.108.

SCOPE OF THE STUDY

The first stage of this investigation (Part One) of necessity concerns only music whose composer is known with a fair degree of certainty. Ideally, two or more uncontradicted ascriptions to a work would be desirable to provide a high degree of assurance of authorship, but, of the forty-three individual compositions with uncontradicted ascriptions to Dunstable, only ten have these in more than one source. The picture is even more disappointing in the case of Leonel who has only three out of thirty-eight compositions assigned to him on more than one occasion. All works with uncontradicted attributions will therefore be treated initially as being by the named composer.

It must be accepted that some of these attributions may be erroneous. Twenty-two pieces credited to Dunstable bear a composer's name in more than one manuscript; in over half (twelve) of these cases, the names conflict. Assuming that either attribution might be the correct one, this indicates that in up to 25% of cases a single attribution could be wrong. However, it is likely that the error is not so great in the compositions chosen for study in this thesis. Almost a quarter of those in Dunstable's group have more than one ascription and many others appear in ModB, a manuscript generally regarded as reliable. Although very few of those in Leonel's group have a second attribution, this is offset by the fact that many appear in OH. Because this is an insular source it

is probably more trustworthy than foreign manuscripts copied at some removes from the composer's originals.

Of the music mentioned above, only three pieces (with attributions to Dunstable) are secular works. These are omitted from the main part of the study, mainly because two of the three bear conflicting attributions. Also, they are all atypical pieces and there is no known secular music by Leonel for comparison. They will be considered briefly in Part Two, along with all the pieces of unknown authorship. This second stage in the investigation will compare these works with the database of results obtained in Part One.

Some pieces have been paired, for various reasons, with ascribed works but bear no attribution themselves. These will be considered to be of doubtful authorship. In an age abounding in musical plagiarism, similar compositions cannot be assumed to have a common author. In fact, the greater the resemblance between a paraphrase and its model, surely the more easily the paraphrase could have been constructed by another hand. All such possible pairings will be reserved for discussion in Part Two.

THE MUSIC

All of the music to be considered in the first part of this study has at least one uncontradicted attribution to either Leonel or Dunstable. A listing appears in Tables 1-2. The numbering adopted is that used in the two main anthologies, CMM50 and MB8. To save space in tables of results, pieces are often identified only by the first word of text in the top voice and by a number. In Leonel, the numbers refer to volume one in the case of motets and volume two in the case of mass music, though at the present date this latter volume has still not been published.

The analyses have been conducted, where possible, on the transcriptions as they appear in CMM50i and MB8. The mass movements of Leonel have been taken from CMM46 or from ACM. All musical examples and quoted bar numbers are as they appear in these volumes.

CMM50i contains a disappointing lack of commentary. Also, a major omission in its layout is that of designations for voices in duet sections. Sometimes it is possible to deduce which voices are involved, sometimes not. Where possible the original manuscripts have been consulted. Any wrong allocation is unlikely to affect the analyses significantly.

Correctness of transcription in these modern collected editions will be assumed as it is beyond the scope of this project to check all the music against its manuscript sources. Minor errors in transcription would,

in any case, have little effect on the statistical evaluation of a large corpus of material.

Terms such as 'tenor' and 'contra' to describe voice parts can sometimes be misleading. In this corpus of material the cantus firmus (c.f.) can appear in different voice positions or the music can be freely composed without reference to a c.f. For the sake of clarity, therefore, the parts will usually be identified by Roman numerals, I being the highest voice, II the next highest and so on.

The positioning of the voices in the collected editions (based on the original manuscripts) is almost always a function of their pitches. Occasionally, the range of a voice gives the impression that it has been wrongly placed. Usually in these cases the ordering is correct when the average pitches of voices and their rates of movement are considered. These matters are dealt with more fully in Part One.

Sections of music for duetting voices are often analysed separately in the following chapters. Where duets are referred to, very short sections of less than four bars are usually not included (an exception being in the study of cadences) as they are too short to give meaningful results. Analyses of fully-voiced music, however, do not include these sections either.

Two pieces must be mentioned particularly as regards their duets. In Crux fidelis (MB8 no.39) the duet from b.72-106 is given in one source (ModB) to voice II rather than voice III. As the range and average pitch is closer

to that of voice III, the duet will be regarded as involving that voice.

Sub Tuam Protectionem (MB8 no.51) survives in two versions, one having a duet between voices I and III at bb.54-78, the other being fully scored at this point. There is reason to suspect that the version with duet is the original form (see pp.355-359 for a full discussion) and it is on this basis that the analyses will be performed.

Table 1 Dunstable Works with Unconflicting Attributions

MB8 1	KYRIE	Tr87 no.101 f.126 Dumstable
MB8 2	GLORIA	Pemb ff.1v-2 Dunstabell
MB8 4	GLORIA	Ao no.68 ff.78v-80 J. Dunstapell (partly cut off) Index Dunstable
MB8 5	CREDO	Ao no.94 ff.135v-8 Dunstapell
MB8 6	SANCTUS	Ao no.104 ff.152v-4 Anglicus Index Dunstapell
MB8 7	GLORIA	MuEm no.153 ff.78v-9 Tr92 no.1461 ff.106v-7 Jo. Dunstaple Tr90 no.916 ff.140v-1 Tr93 no.1726 ff.170v-1
MB8 8	CREDO	BL no.24 ff.23v-4 Johannes Dunstaple Anglicus Tr92 no.1462 ff.107v-8v Dumstaple
MB8 9	GLORIA	Tr92 no.1426 ff.69v-71 Jo. Dunstaple Ao no.149 ff.198v-201 Harv (frag)
MB8 11	GLORIA a4	Ao no.171 ff.234v-6 Dunstapell
MB8 13	SANCTUS	Tr87 no.122 ff.138-9 Jo. Dumstable Ao no.98 ff.145v-6v Jo. Dunstapell
MB8 14	AGNUS	Tr92 no.1556 ff.207v-8 Dunstable Index Dunstabl Tr87 no.16 ff.23-23v Tr87 no.123 ff.139v-40 Anglicus

Table 1 (cont.)

MB8 15	GLORIA Jesu Christe Fili Dei	Tr92	no.1519 ff.159v-62 Dunstaple Index Dumstable
MB8 16	CREDO Jesu Christe Fili Dei	Tr92	no.1520 ff.162v-5 Dunstable Index Dunsta
MB8 17	CREDO Da gaudiorum premia	Ao	no.166 ff.226v-8 Dunstapell Index Dunstable
MB8 23	ALBANUS ROSEO RUTILAT Isorhythmic	ModB	ff.88v-9 Dunstaple
MB8 24	AVE REGINA Isorhythmic	ModB	ff.85v-6 Dunstaple
MB8 25	CHRISTE SANCTORUM Isorhythmic	ModB	ff.95v-6 Dunstaple
MB8 26	DIES DIGNUS Isorhythmic	ModB	ff.92v-3 Dunstaple
MB8 27	GAUDE FELIX Isorhythmic	ModB	ff.129v-31 Dunstaple
MB8 28	GAUDE VIRGO Isorhythmic a4	ModB	ff.113v-4v Dunstaple
MB8 29	PRECO PREHEMINENCIE Isorhythmic a4	ModB Tr92 Camb	ff.127v-9 Dunstaple no.1538 ff.184v-6 (frag.)
MB8 30	SALVE SCEMA Isorhythmic a4	ModB	ff.123v-5 Dunstaple

Table 1 (cont.)

MB8 31	SPECIALIS VIRGO Isorhythmic a4	ModB f.81 Dunstaple Tr92 no.1500 ff.137v-8
MB8 32	VENI SANCTE SPIRITUS Isorhythmic a4	OH no.63 ff.55v-6 ModB ff.106v-8 Dunstaple Tr92 no.1537 ff.182v-4 Jo. Dumstable Ao no.194 ff.274v-5 and 276v-7 Jo. Dunstabell MuL no.8 pp.5-6 (frag.)
MB8 33	VENI SANCTE SPIRITUS Isorhythmic a4	ModB ff.131v-2 Dunstaple Tr92 no.1543 ff.192v-3 Dunstable
MB8 34	(textless)	BM ff.36v-7 Dunstable
MB8 35	AVE MARIS	FM no.10 f.9 Dumstaple
MB8 36	MAGNIFICAT	ModB ff.33-4v Dunstaple
MB8 37	AVE REGINA	ModB ff.102v-3 Dunstaple Tr92 no.1449 ff.96v-7 FM no.25 ff.27v-9
MB8 38	REGINA CELI	BL no.280 ff.276v-7 Dunstaple Ao no.143 ff.191v-3 Dunstaple (cut off) FM no.33 ff.44v-7 MuL no.9 pp.7-8 f.42v frag.)
MB8 39	CRUX FIDELIS	ModB ff.97v-8 Dunstaple Tr92 no.1504 ff.139v-40v Jo. Dunstaple
MB8 43	GLORIA SANCTORUM	ModB ff.112v-3 Dunstaple

Table 1 (cont.)

MB8 44	QUAM PULCRA	BL no.291 ff.284v-5 Dunstable BU no.63 pp.84-5 ff.42v-3 Pemb f.4 MuEm no.122 ff.63v-4 ModB ff.81v-2 Dunstaple Ao no.138 ff.188v-9 Dunstapell (faded) Tr92 no.1465 ff.110v-11 Dunstable (cut off)
MB8 45	SALVE REGINA	ModB ff.91v-2 Dunstaple
MB8 46	SALVE REGINA	ModB ff.82v-4 Dunstaple (frag.) Tr87 no.24 ff.34v-6 Dunstable
MB8 47	SANCTA DEI	ModB ff.89v-90v Dunstaple
MB8 48	SANCTA MARIA	ModB f.115 Dunstaple Tr92 no.1542 ff.190v-1
MB8 49	SANCTA MARIA	Ao no.148 ff.197v-8 Tr87 no.104 ff.128v-9 Tr92 no.1502 ff.138v-9 Tr90 no.1051 ff.340v-1 ModB f.136v Dunstaple (frag.)
MB8 50	SPECIOSA FACTA ES	ModB f.100Av Dunstaple Tr92 no.1535 ff.180v-1
MB8 51	SUB TUAM PROTECTIONEM	BL no.290 ff.283v-4 Dunstable Ao no.160 ff.217v-8v ModB ff.115v-6 Dunstaple Tr92 no.1463 ff.108v-9
MB8 52	GAUDE VIRGO	ModB ff.84v-5 Dunstaple
MB8 53	O CRUX GLORIOSA	ModB ff.119v-20 Dunstaple Tr92 no.1523 ff.168v-9 Dumstable

Table 2 Leonel Works with Unconflicting Attributions

CMM50i 1	BEATA PROGENIES	OH no.49 f.38 Leonel
CMM50i 2	AVE REGINA	OH no.43 f.36 Leonel
CMM50i 5	BEATA VISCERA	Ao no.5 f.10v Leonell (index Leonel)
CMM50i 7	AVE REGINA a4	Tr92 no.1525 ff.171v-2 BL no.281 ff.277v-8 Leonel Ao no.146 ff.195v-6 Tr92 no.1491 ff.132v-3 OS ff.5v-6
CMM50i 10	SALVE REGINA	BL no.240 ff.243v-5 Leonell Polbero (or Powero)
CMM50i 12	GLORIOSE VIRGINIS a4	ModB ff.74 Leonel FM ff.34v-5 Leonel
CMM50i 14	SALVE SANCTA	ModB f.109v Leonel Tr92 no.1456 f.102v (text Virgo prudentissima)
CMM50i 18	ANIMA MEA	BU no.64 p.86 f.43v Leonel (two-part) ModB ff.117v-8 Leonel FM ff.32v-4 MuEm ff.150v-1 Leonellus (text insertion)
CMM50i 19	REGINA CELI	Tr90 no.1136 ff.458v-9 Leonell Anglicus Tr92 no.1507 ff.142v-3
CMM50i 23	MATER ORA FILIUM	ModB f.110 Leonel Tr92 no.1505 ff.140v-1 Tr92 no.1536 ff.181v-2
CMM50i 24	IBO MICHI	ModB ff.98v-9 Leonel

Table 2 (cont.)

CMM50i 25	ANIMA MEA	ModB	ff.110v-11	Leonel	
CMM50i 26	QUAM PULCRA	ModB	ff.111v-2	Leonel	
CMM50ii 1	SANCTUS	OH	no.96	f.81v	Leonel
CMM50ii 2	SANCTUS	OH	no.99	ff.83-83v	Leonel
CMM50ii 3	SANCTUS	OH	no.109	f.88v	Leonel
CMM50ii 4	AGNUS	OH	no.133	f.104v	Leonel
CMM50ii 5	AGNUS	OH	no.137	ff.105v-6	Leonel
CMM50ii 6	AGNUS	OH	no.138	f.106	Leonel
CMM50ii 7a	SANCTUS a4	OH	no.118	ff.96v-7	Leonel
CMM50ii 7b	AGNUS a4	OH	no.141	ff.107v-8	Leonel
CMM50ii 8a	GLORIA a4/5	OH	no.21	ff.16v-7	Leonel
CMM50ii 9	GLORIA a4	OH	no.23	ff.18v-9	Leonel
CMM50ii 10	GLORIA	OH	no.25	ff.20v-1	Leonel
CMM50ii 11a	CREDO	OH	no.84	ff.71v-2	Leonel
CMM50ii 13	CREDO	OH	no.81	ff.68v-9	Leonel
CMM50ii 14	CREDO	OH	no.83	ff.70v-1	Lyonel
		BL	no.86	ff.109v-10	de Anglia
CMM50ii 15a	SANCTUS	OH	no.115	ff.93v-4	Leonel

Table 2 (cont.)

CMM50ii	16	GLORIA	OH no.22 ff.17v-8 Lyonel
CMM50ii	18a	GLORIA (Alma redemptoris)	Tr87 no.3 ff.3v-4 Ao no.162 ff.219v-21 Leonell (index Leonel) Tr93 no.1712 ff.142v-4 Tr90 no.902 ff.112v-4
CMM50ii	18b	CREDO (Alma redemptoris)	Tr87 no.4 ff.4v-6 Ao no.163 ff.221v-3 Index Leonel
CMM50ii	19	CREDO	OH no.73 f.61v Lyonel Ao no.173 ff.238v-40
CMM50ii	20	SANCTUS	OH no.116 ff.94v-5 Leonel Ao no.184 ff.257v-8 Tr87 no.79 ff.105-5v
CMM50ii	21	SANCTUS a4	OH no.117 ff.95v-6 Leonel

THE USE OF COMPUTERS

VALIDITY

Despite the advance in computer technology over recent decades and its increasing use in many spheres of research, musicians remain, in general, wary of the medium. It is true that in the field of composition computers have found a niche, but they are rarely used by the historian. Rarely have such workers had the background of mathematical and/or scientific training which has previously been necessary to understand the possibilities of computer technology and then to convert ideas into working programmes. It has always been possible to employ a third party as programmer, but this distances the musician somewhat and makes it difficult for him to control the process. Another problem has been access to sufficient computer time for programmes to be developed. The increased power of modern computers and the advent of the personal computer (PC) have now made these problems a thing of the past. In an increasingly computer-literate society, the user-friendly PC has opened up almost unlimited possibilities for the analysis of music. It is the belief of this author that historical research will eventually be dominated by the computer.

Many have doubted the value of computer analysis. For example, in a discussion of modality, Geoffrey Nutting states:

> No doubt one could devise tabulations .... and instruct computers to report in these terms on a

> large corpus of material, but the value of such procedures is questionable..... It is therefore sensible to respect "intuition" (i.e. the verdict of the incredibly complex computer in our heads).[17]

This view underestimates the potential of computing and overestimates the power of the human mind.

Over twenty years ago Mendel experimented with computer analysis.[18] However, he remained sceptical about the value of this approach. Later, he concluded that there are two types of characteristics in music - those which can be measured by computer and those which can't, and that the computer will never be able to produce 'artistic' descriptions.[19] His second category includes subjective descriptions such as 'lively', 'sad', 'expressive', 'flowing' etc. The present writer has always felt uneasy with such descriptions. They occasionally sound impressive but often have no precise meaning and give us no idea, in the absence of a score, of how the music actually sounds. These terms very often describe not the music but the emotions of the listener. Any which do describe the music CAN be measured. No matter how poetical we wax, there is nothing in music which cannot ultimately be described in terms of pitch,

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[17] Geoffrey Nutting: 'Between Anachronism and Obscurity: Analysis of Renaissance Music' in MR, vol.35 (1974), pp.185-216.

[18] Arthur Mendel: 'Some Preliminary Attempts at Computer-Assisted Style Analysis in Music' in Computers and the Humanities, vol.4 (1969), pp.41-52.

[19] Arthur Mendel: 'Towards Objective Criteria for Establishing Chronology and Authenticity: What help can the Computer Give?' in Proceedings of the Josquin des Prez Festival Conference, (New York, 1971), pp.297-308.

duration, loudness and timbre. We might not want to describe music in this way but this doesn't mean that it isn't possible to do so.

The music to be considered in this thesis is an ideal subject for computer analysis. It only requires encoding for pitch and duration (the only two of the above parameters transmitted in the sources). The compositions are reasonably short and consist of a standard 3 or 4 voices. That the corpus is quite uniform in style is one reason why differentiating composer styles has hitherto been difficult, but it is this same fact which makes computer analysis easy - it is so much easier to compare like with like than to compare the diverse styles which exist in later music.

If all other arguments in favour of computer analysis fail, it is worth considering that we have failed to answer certain questions concerning individual composer style and authenticity by traditional means, so we can't do any worse if we try other avenues.

ENCODING METHODS

The present author had had no previous experience with computers before embarking upon this project and was self-taught in their use, so progress was initially slow and took much determined effort. However, the end results are proof that worthwhile objectives can be achieved with the medium.

The programmes were all developed and run on a home computer with only a small memory capacity. The tasks possible within the capabilities of the equipment were therefore limited. Much time was spent modifying programmes which were too big to run. Recently, much more powerful PCs have appeared which would make a similar study far easier and capable of more depth. However, as the programming had already been written for one machine, it was not thought practical to switch systems mid-stream.

The following description of computer encoding is included for those interested. It is not necessary to read this section in order to understand the remainder of the thesis as the analyses and results are all explained in musical terms. The system was developed without contact with or reference to any previous studies and was therefore designed from scratch. The system has served its purpose well and without problems and has an advantage over the encoding methods used in some studies in that it is easily readable without translation.

A BBC model B computer with 32K of total memory was used. All programming was done in the language BBC basic. Each composition was encoded in the form of files which were stored on 5.25 inch floppy disks. Separate files were produced for each voice of a composition and another encoding all voices simultaneously.

It was decided that letters be used, rather than numbers, to denote pitches. This was to make typing in of the files easy and also to aid readability, making any errors easy to spot. For analysis purposes, the computer

can be programmed to convert these letter names into numerical values as necessary. Pitches were denoted as follows:

FF, GG, A-G, a-g, a'-g' with c=middle C.

Sharps and flats were recorded as '#' or 'b' after the letter name and included as they appeared in the main text of the editions (but not editorial musica ficta indications). Rests were denoted either as 'R' or 'r' to avoid frequent shift changes in the process of typing.

Durations were indicated as multiples of a minim length (which is usually a quaver in modern transcription). The minim was initially chosen for ease of typing as it produces fewer fractional or very large values than would other standards. Also, it is more appropriate, being a fixed duration note (the breve,for example, can be various lengths depending upon its context). Notes smaller than a minim were denoted by fractions given to two decimal places. Sometimes the values are complicated when mensurations clash and triplets abound, for example in Leonel's middle period mass movements. In these compositions, voice I is often notated in doubled values compared to the other voices. Here, the encoded values are fractions of a notated semibreve. In CMM46, some of Leonel's pieces in perfect prolation are transcribed with a breve equal to a modern minim, resulting in the need for large numbers of triplets. These have been encoded treating the breve as a

dotted minim to correspond with the treatment of similar pieces in CMM50i.

Single voices were encoded thus: for example the beginning of Dunstable's Kyrie MB8 no.1, voice I:

/f4 a'1 bb'1 /g2 bb'4 etc.

'/' signifies the beginning of a bar in the edition. This has no significance in the analyses and is there only to make locating sections of code simpler.

A computer programme was written to combine the separate voice files into a single 'harmony' file. Each new chord formed by the entry (or dropping out) of one or more voices was encoded separately. The lowest part appears first, voices being separated by commas. Voices not entering with a new note but holding the previous one are prefixed 'h'. The beginning of the same Kyrie becomes:

```
/F,c,f,2
hF,d,hf,1
hF,e,hf,1
hF,f,a',1
hF,hf,bb',1
/bb,d,g,2
hbb,r,bb',2
d,f,hbb',2      etc.
```

The process of typing in and saving all the information onto computer discs in itself took several months. For the 114 compositions to be studied, over 100,000 notes and 60,000 chords needed to be encoded, recorded and checked.

Mendel admitted to having problems with errors in his coding and no doubt the same difficulty has plagued more recent workers. It has been relatively easy in the present study to detect errors. As the BBC computer has built-in sound capabilities, a programme was written to read the coding and play it back. Most errors in pitch were therefore picked up at the single voice stage. Any errors in duration escaping detection here were picked up when the voices were combined as they simply wouldn't finish together. The BBC is capable of playing on three channels simultaneously, so the full harmony could also be checked. This proved to be a good way of hearing and getting to know unrecorded music. Unfortunately, four-part music could only be listened to three voices at a time.

PART ONE

GENERAL STRUCTURE AND STYLE

English music surviving from the early fifteenth century is mainly sacred in function. It consists of settings of mass movements and other texts, mainly antiphons. This latter group of pieces will be referred to here under the wider heading of 'motets'. A three-part texture is the norm, with occasional pieces in four parts.

It became evident early in the study that the results of analyses were affected by the type of composition. Two categories, those of English descant and isorhythm, are particularly noteworthy. Both styles have often been discussed so only a brief description need be given here.

ENGLISH DESCANT

The term 'descant' is confusing in that it has been used for different purposes. It is essentially a method of harmonizing a plainsong in a note-against-note, as opposed to melismatic, style. It has been used to describe both improvisatory techniques and composed music, some of which will be discussed in this thesis. The main features of the composed style of the late fourteenth century are:

i) Employment of a cantus firmus chant, usually in the middle voice of three, often transposed up by a fifth or some other interval. The plainsong is unornamented and moves in uniform long note

values.

ii) Largely homorhythmic writing with voices equal in character and with little decoration.

iii) Different voice ranges with little overlapping of parts.

iv) No changes in mensuration and often in perfect prolation.

v) No resting of parts.

vi) No contrasting duet sections.

vii) Quite short compositions.

The pure style was falling out of use by the fifteenth century, although examples survive by Leonel. It has been suggested that such pieces may have been composed early in his career and, although no firm datings are possible, this is likely because of their inclusion in the Old Hall manuscript which has a largely fourteenth-century repertory. His simplest use of the form is seen in the Sanctus, CMM50ii no.1. More often, he expands its boundaries by making the rhythm more adventurous, ornamenting the plainsong and putting it into the highest voice or by employing changes in mensuration and texture. It would perhaps be a misuse of the term descant to include all these more advanced pieces under the heading. Hamm classed all Leonel's (presumably) early plainsong harmonizations together in the collected edition, calling them Group I.

ISORHYTHM

In a complete contrast to the descant style, isorhythm is based on the Continental practice of employing voices of unequal character, though often crossing in pitch. Here the disparity is rather extreme with a very slow-moving tenor. This voice is based on a repeated talea (fixed rhythmic pattern) and often a color (fixed melodic pattern) and so in reality can be not only isorhythmic but also isomelic. Fourteenth-century English examples exhibit a variety of forms, some quite irregular, but in Dunstable the technique was refined and contained within fairly strict outlines. Generally his isorhythmic works consist of three sections where the tenor is stated in progressive diminution in the ratio of either 3:2:1 or 6:4:3, each containing two statements of a talea, the second combined with a different color. The upper voices sometimes also employ rhythmic repeats.

Leonel wrote little (surviving) isorhythmic music and when he did employ the technique it was not in the 'classical' form described above. Taken alongside the fact that Dunstable did not compose in simple descant, this means that there is quite a disparity in their general styles; 33% of Leonel's and 30% of Dunstable's three-part compositions are quite distinct. However, it is perhaps no coincidence that none of the compositions of disputed authorship is in either of these categories. Therefore, although the two styles will sometimes be

analysed in this thesis as being interesting in their own right, data on them are not admissible in comparisons intended to allocate the disputed compositions between the two composers. Unless otherwise stated, and to save much repetition, the measurements and comparisons to be made in the following chapters are based on those pieces which fall in the common ground and not on those in the descant and the classical isorhythmic styles.

Hamm actually classified Leonel's music into three groups which Bowers has tentatively linked to the three phases of his professional career.[20] The speculation that he could have been in the same company as Dunstable during his middle period is interesting as it is amongst pieces in his second style group that confusion over authorship between the two men exists. It is also within this group of compositions that his style most resembles that of Dunstable.

Hamm's third group consists of a small number of slightly more experimental pieces which could possibly have been written during the composer's employment at Canterbury. This would have been a period of isolation from outside influence which would once again preclude confusion with Dunstable. These works have nevertheless been included in the comparison calculations as no datings can be certain and they are not altogether removed from the style of the second group, usually giving similar test results. To exclude them would seriously diminish the

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[20] op. cit. p.123.

amount of material included for analysis compared with that by Dunstable and the statistical comparisons between the two would be less profitable.

It is difficult to draw conclusions about compositions written for four voices as few of these survive, making statistical analysis not very meaningful. Also, all but one of Dunstable's four-part pieces are isorhythmic and so not directly comparable with those of Leonel. None of the works with conflicting attribution is in four parts so, although a cursory glance will be cast on these pieces, they will also not be included in the measurements and comparisons unless expressly stated.

PITCH AND RANGE

Several topics will be considered in this chapter including the range of whole compositions and individual voices, average voice pitches, the distances between voices and the clef combinations appearing in the original manuscripts. All this information for the pieces in the database is contained in Appendix 1.

Although measurement of intervallic distance in terms of a semitone is normally the most accurate method, this is inappropriate in the present study for two main reasons. First, the music with which we are dealing is not essentially chromatic. Contemporary theoretical treatises suggest that it was visualized primarily in terms of the diatonic scale. Secondly, uncertainty may arise in the treatment of chromatic alteration of notes as there is still no complete understanding of the processes involved in the musica ficta of the period. Ranges are therefore described in terms of the number of scale notes they include without the unnecessary complication of defining interval species (major, minor etc.). A unison is described as an interval of 1. Distances between voices are sometimes negative, indicating that they are in the 'wrong' pitch order.

Bent has recently suggested a new interpretation of the contemporary rules for musica ficta. She believes that the melodic inflections which they produced during the course of a piece might sometimes have led to alterations in the sung pitch of the remaining passages,

causing a shift in the total pitch of the music.[21] Such instability would be difficult to take account of here, so all measurements quoted are in terms of the notated pitch.

It might seem unnecessary to employ a computer to measure range. However, in the circumstances of the music already being encoded, this seemed the logical option and had the advantage of accuracy. The difference between the two composers is small and only one or two errors could affect the conclusions of the testing. CMM46 does give ranges for voices at the beginning of each composition. Whilst being accurate enough to be of use to performers, it was discovered during the course of the present study that these ranges are often slightly wrong. This illustrates the ease with which mistakes of observation might be made in very simple matters.

Table 3 summarizes the voice ranges in three-part compositions. Leonel's descant compositions have quite narrow voice ranges. The most common span covered is an octave and none exceeds a ninth. Excluding the descant pieces, there is little difference in the average range for voices composed by Dunstable and Leonel. For both, the most common span is a tenth. Leonel, however, shows less variation in range, all but one of his voices falling within the limits of an octave and an eleventh.[22] Ranges outside these limits would favour Dunstable as composer.

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[21] Margaret Bent: 'Diatonic Ficta' in EMH, vol.4 (1984), pp.1-48.

[22] The exception is in the mass on Alma redemptoris which shows other features anomalous to Leonel's style and is investigated in this respect in Part Two.

Table 3 Voice ranges in three-part compositions

		Leonel		Dunstable	
	Interval	No.	%	No.	%
Descant	8	8	89		
voice I	9	1	11		
Descant	4	1	11		
voice II	6	1	11		
	7	2	22		
	8	4	44		
	9	1	11		
Descant	7	1	11		
voice III	8	2	22		
	9	6	67		
Non-descant	9	4	22	4	11
voice I	10	11	61	22	59
	11	2	11	9	24
	12			1	3
	13	1	6	1	3
Non-descant	9	3	17	4	11
voice II	10	12	67	22	59
	11	3	17	10	27
	14			1	3
Non-descant	6			2	5
voice III	7			4	11
	8	2	11	5	14
	9	8	44	12	32
	10	6	33	13	35
	11	2	11	1	3

Table 4 Voice ranges in four-part compositions

		Leonel		Dunstable	
	Interval	No.	%	No.	%
voice I	8	2	29	2	40
	9	4	57	1	20
	10	1	14	2	40
voice II	9	6	86	4	80
	10	1	14		
	11			1	20
voice III	9	5	71	2	40
	10	2	29	3	60
voice IV	4			1	20
	5			1	20
	6			2	40
	8	3	43		
	9	4	57	1	20

Compositions in four parts have, on average, slightly smaller voice ranges than those in three, the most common being a ninth as can be seen from Table 4. Dunstable's music again exhibits a wider variation of ranges, although this is mostly due to the fact that all but one of his four-part works are isorhythmic and have narrow tenors based on only a fragment of plainsong.

Dunstable most often uses an overall range of two octaves for whole three-part compositions whilst Leonel favours one degree less (Table 5). Any piece employing over two octaves is more likely to be by Dunstable. Surprisingly, the overall range is smaller for pieces in four voices than for those in three. This is only in part due to the narrower individual voice ranges and mostly caused by a greater overlapping of pitch in four-part textures.

Assuming that each line was intended to be sung by more than one voice at a time, some duet sections of the period might have been intended for soloists. Some are actually marked with the indication 'unus' or 'duo'. If solo rendition was intended, duet sections might be more virtuosic in nature than the remainder of the music. A comparison of the ranges of duet passages and fully-voiced sections of music has been carried out to test this hypothesis. In fact, no overall increase in range can be detected; the two-part portions exhibit a slightly smaller mean range and a larger spread of values, as would be expected from any sampling of brief sections of a piece. Many duets are quite short and often happen

Table 5 Total ranges of compositions

	Interval	Leonel No.	Leonel %	Dunstable No.	Dunstable %
Three-part descant	13	2	22		
	14	4	44		
	15	3	33		
Three-part non-descant	13	6	33	3	11
	14	9	50	12	30
	15	3	17	17	46
	16			4	11
	19			1	3
Four-part	13	5	71		
	14	1	14	2	40
	15			2	40
	16	1	14	1	20

Table 6 Clef combinations

	Leonel descant	Leonel non-descant	Dunstable
Three-part			
C1-C2-C4	1		
C1-C3-C3		10	13
C1-C3-C4	2		2
C1-C3-C5	3		
C1-C4-C4			2
C2-C3-C5	2		
C2-C4-C4		2	12
C2-C4-C5	1	1	1
C2-C5-C5			1
C3-C4-C5		2	
C3-C5-C5		2	4
C3-C5-C6			1
C4-C6-C6		1	
Four-part			
C1-C1-C3-C3		4	1
C1-C1-C4-C3		1	
C1-C2-C3-C3			1
C1-C2-C4-C4			1
C2-C2-C4-C3			1
C2-C2-C4-C4		1	
C2-C3-C4-C5			1
C3-C3-C5-C5		1	

mid-phrase. These are unlikely to be sung effectively by reduced forces. Others are more lengthy, structural in nature, often comprising a separate section of the work and are sometimes indicated as duets in the manuscripts. It is more likely that these could have been performed by soloists. However, their ranges merely approximate more closely to those of the full sections than do those of the transient duets.

A by-product of these calculations produced an interesting difference between the two composers' handling of duets. Where they do vary, the ranges of duets are usually only one scalic degree larger or smaller than full sections of the same piece. When all the duetting voices are taken into account, those of a composition by Dunstable are more likely to be narrower, and those of one by Leonel to be wider in range:

	narrower		equal		wider	
	no.	%	no.	%	no.	%
Dunstable non-iso	9	53	5	29	3	18
Leonel non-descant	3	21	3	21	8	57

The pitch of duet sections is often shifted slightly. Upper voices tend to shift lower and lower voices higher. This is unlikely to imply increased virtuosity but rather functions to bring the duetting voices closer together. The two composers show no great difference in this respect.

Distances between voices could be calculated in many ways. It was decided to make two calculations based upon

the distance between the lowest notes and also the highest notes in each pair of voices. These distances can be compared with the clefs employed.

Clef combinations give a rough idea of voice spacing without the need for time-consuming calculation. Table 6 shows those to be found in the works of Dunstable and Leonel. The few F-clefs which appear have been converted into the corresponding C-clefs to make comparisons easier. Any changes in clef during the course of a piece are not dealt with as the modern editions do not make note of them.

Hughes has speculated that different arrangements of clefs may imply certain transpositions or even key signatures,[23] a theory which would be difficult to prove. However, Dunstable's Gloria and Credo, MB8 nos.15-16, are interesting. They are copied consecutively in Tr92 and based on the same tenor (Jesu Christe Fili Dei), so are obviously intended to form a pair. The Gloria has a clef arrangement C3-C5-C5 and the Credo with noticeably higher tessituras in voices I and II has an arrangement C2-C4-C4. Related mass movements of the period, some of which are discussed in Part Two, tend to have the same or similar ranges. The top two voices in the Gloria have a one flat signature while those in the Credo do not, though Bukofzer supplied an editorial key signature for the latter to make the movements correspond. The cantus firmus in voice III,

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[23] Andrew Hughes: 'English Sacred Music (Excluding Carols) in Insular Sources, 1400-c1450' (diss. University of Oxford, 1963), p.450.

however, is untransposed and at the same pitch in both cases. It seems unlikely that the chant would have been sung transposed in one movement and not in the other. There is also support for the differences in key signature as the music stands, at least in voice II; the lower range of this voice in the Gloria means that it sometimes supplies a low B underneath the chant which necessarily needs to be flattened, whereas the situation does not arise in the Credo. Arguments can therefore be formulated both for and against transposition in this case.

Leonel's early pieces usually employ a different clef in each voice, reflecting the separate ranges of the parts in the descant style. In non-descant music, over 80% of the three-part works of both composers employ clefs a fifth apart in voices I and II and the same clef in voices II and III eg. C1-C3-C3. (Leonel is just as consistent in using a C1-C1-C3-C3 type pattern in his four-part works, though Dunstable is more variable.) The most common distances between the lowest notes of voices fit this scheme perfectly; a fifth between the top two and unison between the bottom two (Table 7).

Distances between the highest notes are more variable (Table 9). The most common distance between voices I and II is still a fifth but between voices II and III is a second or third. This is a consequence of the fact that voice III usually has a narrower range than the other voices, but it is interesting that this does not so often influence the position of the lowest note. Highest pitches are less fixed than the lowest and this extends to

Table 7 Distances between the lowest notes of voice ranges in three-part compositions

Interval	-4	-3	-2	1	2	3	4	5	6	7	8	9
Leo descant												
I+II					1	3	5					
II+III						1	3	4	1			
Leo non-desc												
I+II					1	1	3	11	2			
II+III			2	14	2							
Dun non-iso												
I+II						1	5	15	5	1		1
II+III	1			19	6	2						
Dun iso												
I+II						1		5	3			
II+III			5	3	1							
Interval	-4	-3	-2	1	2	3	4	5	6	7	8	9

Table 8 Distances between the lowest notes of voice ranges in four-part compositions

Interval	-5	-4	-3	-2	1	2	3	4	5	6	7
Leo											
I+II				1	5	1					
II+III								1	4	1	
III+IV		1			6						
Dun											
I+II					1	1		1	1	1	
II+III						1	1		3		
III+IV	1	1		1	1	1					
Interval	-5	-4	-3	-2	1	2	3	4	5	6	7

Table 9 Distances between the highest notes of voice ranges in three-part compositions

Interval	-4	-3	-2	1	2	3	4	5	6	7
Leo descant										
I+II						1	5	2	1	
II+III				1	2	1	4	1		
Leo non-desc										
I+II							8	7	3	
II+III			1	9	6	1	1			
Dun non-iso										
I+II							6	14	4	4
II+III			1	7	12	4	3	1		
Dun iso										
I+II							2	5	2	
II+III	1				1	5	1	1		
Interval	-4	-3	-2	1	2	3	4	5	6	7

Table 10 Distances between the highest notes of voice ranges in four-part compositions

Interval	-3	-2	1	2	3	4	5	6	7
Leo									
I+II		2	5						
II+III						1	4	1	
III+IV		1	2	4					
Dun									
I+II			1	1		2	1		
II+III			1		1	1	1	1	
III+IV	1	1		1		1	1		
Interval	-3	-2	1	2	3	4	5	6	7

the frequency of their appearances. In voices II and III, there is often a nominal 'lowest' pitch which is frequently sung but rarely exceeded whilst highest pitches regularly appear only once or twice in a piece. This observation prompted a more detailed examination of the frequency at which different pitches occur - a subject which will be dealt with later in the chapter.

The position of a voice in a composition is usually a reflection of its pitch. Sometimes, however, the voices appear to be in the wrong order when their ranges are considered, producing a negative value for the distances between voices. In Dunstable's Sancta Dei (MB8 no.47) voice III moves higher than voice II. The same incongruity is also true of voices I and II in Leonel's Gloriose Virginis (CMM50i no.12) and the Sanctus (CMM50ii no.21). Similarly, voice II in Ibo michi (CMM50i no.24) and the Credo (CMM50ii no.19) moves below voice III. To check the validity of the ordering of these voices, their average pitch was calculated. This being quite a complicated task, the help of the computer was needed.

First, all pitches were assigned a numerical value. The lowest pitch employed in this corpus is FF (the second below middle C) and this was therefore designated '1':

FF	GG	A	B	C	D	E	F
1	2	3	4	5	6	7	8
G	a	b	c	d	e	f	g
9	10	11	12	13	14	15	16
a'	b'	c'	d'	e'	f'	g'	
17	18	19	20	21	22	23	

Using these values, the mathematical mean was calculated for all the pitches in each part, allowing for the different lengths of note. The exact mean always falls between notes of the scale and must therefore be quoted in its numerical form. A mean of 10.50 would indicate an average pitch midway between the notes a and b. The calculation was also performed for two-part and three-part sections in isolation, although the usefulness of the information so gained was limited. In differentiating Leonel and Dunstable, no extra advantage was gained over considering the ranges of these sections, so it was not thought necessary to include the results in Appendix 1.

It can be argued that this method does not give an accurate measure of pitch 'as it is heard' because it does not take into account the different spacings of the notes of the scale. However, it is the only method which avoids the problems which would be associated with accidentals and ficta in a system based on the semitone. Also, it conforms with the contemporary view of pitches in terms of the scale and gives a measure of pitch 'as it is written'.

In all the cases of 'wrong' ordering of voices mentioned above, the mean pitch agrees with the arrangement as given in the manuscripts. However, in two four-part pieces, Preco preheminencie (MB8 no.29) and a Sanctus (CMM50ii no.7), voice IV is markedly higher in both range and average pitch than voice III. A possible explanation of this placing was to allow the cantus firmus tenor to appear at the bottom of the texture. However, it

must be mentioned that in a similar motet, Salve scema (MB8 no.30), the tenor is placed at position III.

Bent has commented on Leonel's preference for relatively low tessituras, giving as an example his Quam Pulchra, CMM50i no.26,[24] and it was hoped that this might be a useful characteristic in differentiating his style. However, this piece was found to be an exception, rather than the norm. In fact, there is little difference between the mean pitches in Dunstable and Leonel. Combining all the results to give a mean of means (!) and mean distance between means gives the following. The measurement for all voices combined is probably the best guide to overall tessitura.

	Dun iso	Dun non-iso	Leo desc	Leo non-desc
I	15.09	15.37	14.50	15.00
II	10.57	11.16	11.28	11.14
III	9.77	9.69	8.18	9.7
All Voices		12.27		12.09

From these values, the average distances between voices can easily be calculated. The spacing in descant pieces approximates to three scalic steps (a fourth) between each voice pair. In non-descant compositions, the distance between the top two voices is approximatately four scalic steps (a fifth), as would be expected from the most common clef arrangements. That between the lower voices is almost a step and a half (over a second), though these are almost always notated in the same clef. In Dunstable's isorhythmic motets, voice II often crosses the

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[24] Margaret Bent 'Power, Leonel' in Grove, vol.15, p.177.

slow moving voice III to effect a more active bass line. This is reflected in the closer average pitches of these voices.

	Dun iso	Dun non-iso	Leo desc	Leo non-desc
I/II	4.52	4.21	3.22	3.87
II/III	0.80	1.47	3.10	1.35

Range analysis can be useful in the assessment of different manuscript versions of the same piece. The case of Dunstable's Sub tuam protectionem (MB8 no.51) will be dealt with in Part Two. In his Sancta Maria (MB8 no.49) the duet from b.40 to b.61 is given in one source (Tr92) to voice II and in the other sources to voice III. The mean pitch and range of the music are actually closer to those of voice II. In only one other case of Dunstable, a Sanctus (MB8 no.13), does the mean pitch of a voice III duet overlap the mean pitch of voice II, although in this piece the range of the duet is closer to that of voice III.

In the similar case of Crux fidelis (MB8 no.39), the lower duetting part from b.62 to b.106 is given in one source (ModB) to voice II, while the other sources give the same material to voice III. The mean pitch of this section lies almost midway between those for the two voices. The range is slightly closer to that of the tenor, though, agreeing with the majority of the manuscripts. Also, it is more likely that the pitch of III would be raised to bring it closer to I than the case if the pitch of II was lowered taking it further away from the other duetting voice.

PITCH DISTRIBUTION

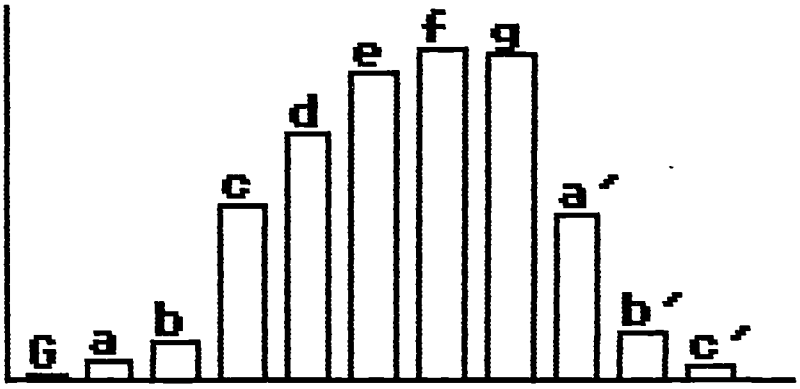
As mentioned earlier, the rates of occurrence of various pitches have been investigated. The computer was used to count the number of times each pitch is used in each voice of a composition and also for the voices in combination. The results were calculated both in terms of frequency and duration of occurrence. Unfortunately, the findings did not help in the differentiation of Dunstable and Leonel's styles, so will not be recounted in full, but some observations are worthy of mention. Dunstable's Sanctus, MB8 no.6, has been chosen to illustrate the general patterns found in this corpus. The results for this composition have been expressed in graphic form in figures 1-4. The second graph in each case shows values linked to duration. There is some variation from piece to piece, but most have a similar structure.

Voice I, being the most purely melodic in function, generally shows a normal distribution of pitches. The bell-shaped spread of results is common in statistical sampling, produced by random variation in a population. The most frequent pitches are those in the centre of the range, with a gradual falling off of values on either side. In voice II the distribution is biased towards pitches higher than the centre of the range. There is usually a gradual falling off to the top end of the range, similar to the shape of voice I, but the opposite end is more drawn out, with the bottom few notes all appearing with a similar low frequency. The graph for voice III is

Figure 1 Pitch distribution in Dunstable's Sanctus 6 Voice I

NO. NOTES 409.00

	NO.	%	DURATION	%
G	1.00	0.24	1.00	0.13
a	5.00	1.22	6.50	0.86
b	9.00	2.20	11.00	1.46
c	43.00	10.51	88.50	11.74
d	60.00	14.67	126.00	16.71
e	75.00	18.34	113.50	15.05
f	81.00	19.80	113.50	15.05
g	80.00	19.56	136.00	18.04
a'	40.00	9.78	86.50	11.47
b'	12.00	2.93	16.00	2.12
c'	3.00	0.73	5.50	0.73



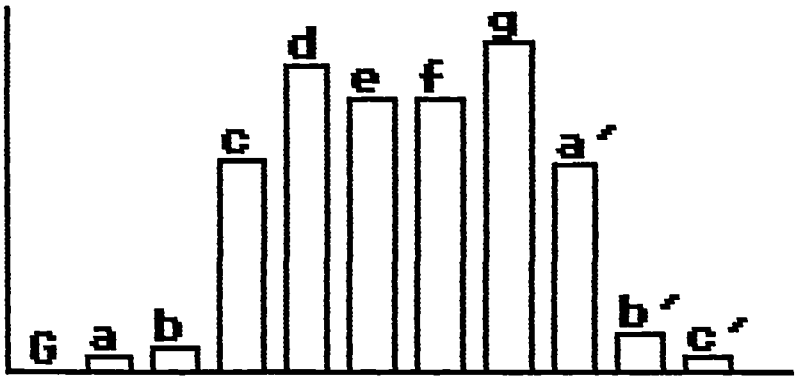


Figure 2 Pitch distribution in Dunstable's Sanctus 6 Voice II

NO. NOTES 182.00

	NO.	%	DURATION	%
C	6.00	3.30	16.00	2.12
D	5.00	2.75	10.00	1.33
E	1.00	0.55	1.00	0.13
F	9.00	4.95	12.00	1.59
G	28.00	15.38	69.00	9.15
a	34.00	18.68	71.00	9.42
b	35.00	19.23	67.50	8.95
c	38.00	20.88	102.50	13.59
d	21.00	11.54	42.50	5.64
e	4.00	2.20	7.50	0.99
f	1.00	0.55	4.00	0.53

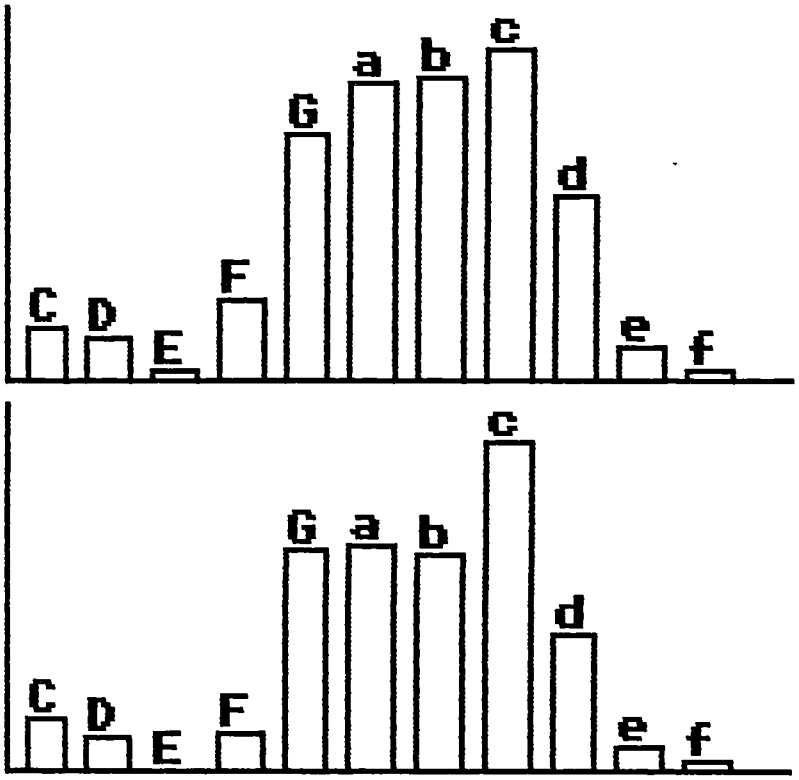
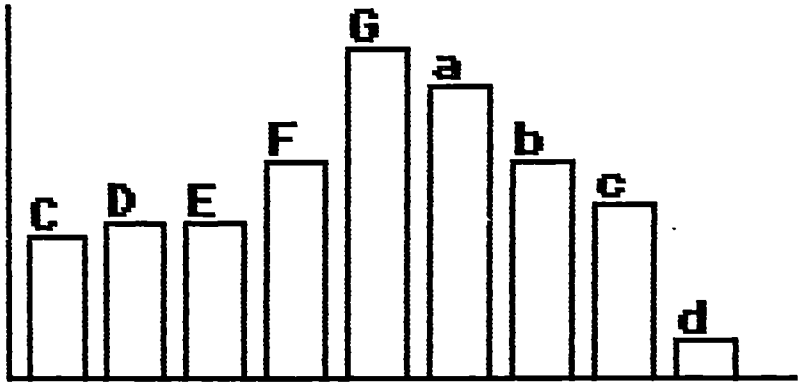


Figure 3 Pitch distribution in Dunstable's Sanctus 6 Voice III

NO. NOTES 240.00

	NO.	%	DURATION	%
C	20.00	8.33	100.00	13.26
D	22.00	9.17	97.00	12.86
E	22.00	9.17	43.00	5.70
F	30.00	12.50	82.00	10.88
G	46.00	19.17	133.00	17.64
a	41.00	17.08	106.00	14.06
b	30.00	12.50	71.00	9.42
c	24.00	10.00	92.00	12.20
d	5.00	2.08	12.00	1.59



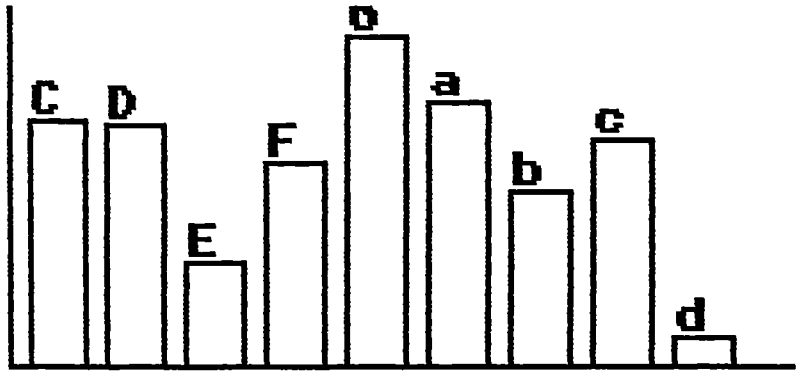
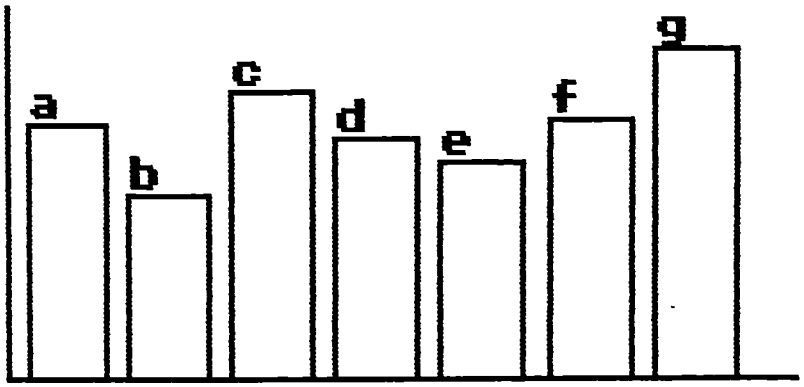


Figure 4 Pitch distribution in Dunstable's Sanctus 6 All voices

NO. NOTES 831.00

	NO.	%	DURATION	%
a	120.00	14.44	270.00	11.94
b	86.00	10.35	165.50	7.32
c	134.00	16.13	404.50	17.88
d	113.00	13.60	287.50	12.71
e	102.00	12.27	165.00	7.29
f	121.00	14.56	211.50	9.35
g	155.00	18.65	339.00	14.99



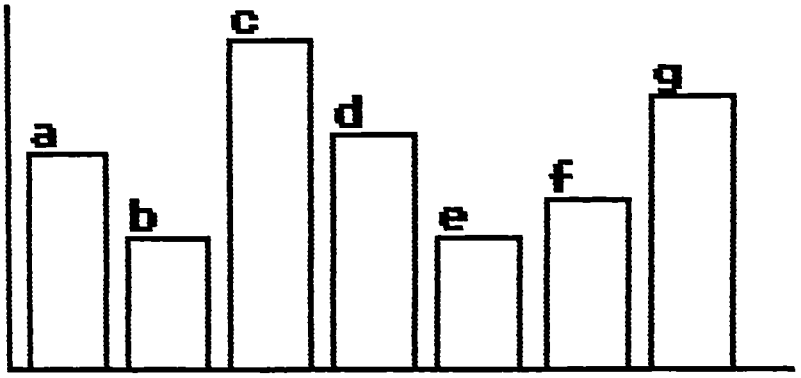
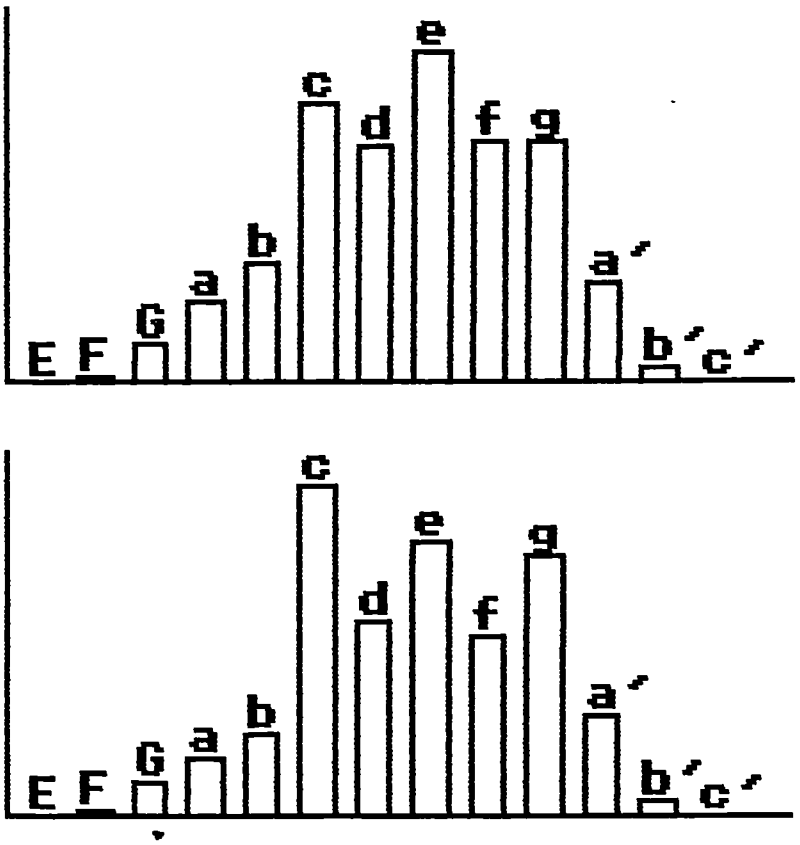


Figure 5 Pitch distribution in Dunstable's Salve Regina 46 Voice I

NO. NOTES 748.00

	NO.	%	DURATION	%
E	1.00	0.13	1.00	0.06
F	3.00	0.40	3.50	0.22
G	16.00	2.14	33.50	2.13
a	35.00	4.68	55.83	3.54
b	52.00	6.95	78.51	4.98
c	123.00	16.44	313.02	19.86
d	104.00	13.90	184.76	11.72
e	147.00	19.65	259.38	16.46
f	108.00	14.44	172.51	10.95
g	107.00	14.30	248.33	15.76
a'	45.00	6.02	93.16	5.91
b'	6.00	0.80	14.50	0.92
c'	1.00	0.13	2.00	0.13



usually much flatter, with less variation in numbers of pitches. There is a gradual falling off at the top end, but much less at the bottom, with the lowest pitch often as frequent as those mid-range. Though voices II and III often share the same range, their average pitches are usually different, and this is illustrated by the lop-sided distribution in each case.

Sometimes, certain pitches are more prominent than would be expected in a normal distribution. Figure 5 for voice I of Dunstable's Salve regina, MB8 no.46, shows a bias towards notes of the C triad. This could be seen as a development towards a tonal centre. However, the different voices in a composition sometimes show different prominent pitches. Also, no definite pattern can be found in the linking of prominent pitches to key signatures.

The overall employment of pitches within a composition can be seen in figure 4, for the Sanctus again. Here, the voices are combined and the letters denote not absolute pitches but pitch names, all occurrences of 'a' at any octave being combined under one heading. In this case, the second graph expressing durations gives a more realistic picture, as the number of notes varies between the voices. If the choice of pitches were random, this graph would be flat; in practice it never is. The 'c' pitch is usually the most prominent, but sometimes this position is taken by the 'f' or 'g'. There is some bias towards 'f' in compositions with flat key signatures, but this is not universal.

In contrast, 'b' is always reduced compared with the

other pitches. Being the least stable pitch, both in its position as leading note in the scale and its fluctuation between flat and natural, it is employed less often than the other pitches and rarely for notes of long duration. Its frequency is often depressed below the line of normal distibution on the single voice graphs. The pitch 'e' is often also depressed, most often in pieces with flat signatures.

It would be an interesting exercise to try to link these different patterns of pitch prominence with the various modes and to consider this information alongside the cadence pitches of pieces. This, however, would be quite a digression from the purpose of this thesis and will be reserved for another time and place.

The subject of pitch cannot be left without a mention of accidentals. Their frequent appearance in Leonel's music has sometimes been noted, but this cannot serve as a marker of his style. There is no evidence as to whether the additions were indicated by the composer and there is every reason to assume, due to variant readings in different manuscripts, that their presence or absence depended more on the habit of the scribe than that of the composer. Continental sources often omit accidentals present in insular manuscripts and this could account for the discrepancy between levels in the two composers, a higher proportion of Dunstable's works having survived abroad.

TIME AND SPEED

Mendel may have been the first to suggest using the computer to calculate average note values, although Wegman has used the idea to compare Masses written over a period of time,[23] and also as a marker of composer individuality in the context of Ockeghem's authorship.[24] He has suggested that his methods may be of value in other problems of authenticity. Their use will therefore be investigated in this chapter.

In the first-mentioned study Wegman calculated the average note length in the combined upper voices of the compositions. It has not proved possible to duplicate his figures. He does not give details of how the averages were calculated or reveal whether a computer was used; such a task completed 'by hand' would be subject to error. Even with the advantage of computer analysis, however, different readings and editorial decisions can affect the result. For example, in Dunstable's Credo and Sanctus on Da gaudiorum premia (MB8 nos.17-18), two editions give conflicting interpretations of the length of the final notes in each section of music, leading to about a 3% difference in the result. For this reason, giving results, as Wegman does, to three decimal places seems

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[23]Rob C. Wegman: 'Concerning Tempo in the English Polyphonic Mass, c.1420-70' in Acta Mus, vol.61 (1989), pp.40-65.

[24]Rob C. Wegman: 'An anonymous Twin of Johannes Ockeghem's 'Missa Quinti toni' in San Pietro B 80' in Tijdschrift van de Vereeniging voor Nederlandsche Muziekgeschiedenis, vol.37 (1987), pp.28-30.

to have no value. One decimal place is probably sufficient.

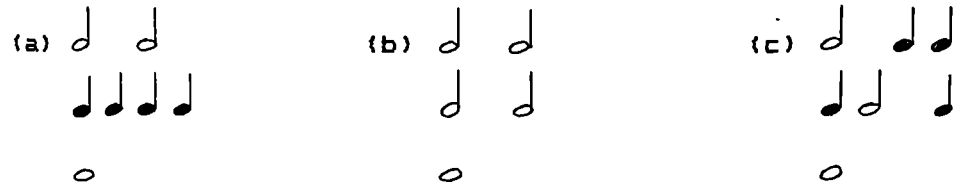
Initial calculations of average note length for this study gave such a large variation of results that this method of analysis was almost abandoned. However, various factors were found to be affecting the outcome. For instance, pieces of a highly sectional nature with frequent longs marking the close of each section would produce artificially high figures for note lengths. To remedy this problem, the process was repeated, this time eliminating end-of-section longs from the calculations. This was a time-consuming process as the computer could not distinguish between these longs and ones which occurred mid-section, but the results, once achieved, were more realistic.

Also, to obtain meaningful results, not only must sections of compositions in different mensurations be treated separately, but so must those with different voice combinations, as note values tend to be shorter in duets (either to compensate for the thinner texture or possibly to allow for greater virtuosity if the duets were sung by soloists).

Allowing for these factors, fairly consistent results can be produced. In view of this and the fact that use of the computer ensures that the results are as accurate as possible, it was thought valid to present them to two decimal places.

Combining the upper voices to give a single result does not take into account the fact that these voices vary

in character and that the lowest voice is sometimes also quite active. One could treat each voice in a composition separately, but this would provide a confusingly large number of results, especially for music of a highly sectional nature. Another method suggested itself which would produce a single result for all the voices in combination and was ideally suited to the musical coding used in this study. An 'average chord length' would measure the rate of change of chord formations in the music and could be conducted on the harmony files already in existence for each composition. These list each successive note combination formed as the music progresses (see p.34). Average chord lengths in the following short examples would be one, two and one crotchets respectively.



A sample of pieces was treated in the one-voice-at-a-time way to test the validity of this combined-voice method. While the former method gives higher results, the two sets of figures obtained were roughly in proportion. The latter method, as well as being less time-consuming, also provides a more realistic measurement of the activity of a piece as apparent to the listener.

Wegman dealt only with the O and C mensurations and gave his figures in terms of a semibreve length. Here,

the minim length was considered more convenient to deal with because in most modern transcription it is represented consistently as a quaver, whereas the semibreve may be represented as a crotchet (in imperfect prolation) or dotted crotchet (in perfect prolation). This is not intended to imply minim equivalence in performance terms; the means of representation is not important so long as it is used consistently and like is only compared with like.

Semibreve equivalence was, though, probably never admitted as a possibility by contemporary theoreticians, who were divided between either breve or minim equivalence.[87] As a by-product of this present study, some insight has been gained into the 'equivalence' question and this subject will be discussed shortly.

Tables 11 and 12 set out the average chord lengths for the music of Dunstable and Leonel. All portions of music using simultaneously combined signatures have been excluded from the calculations, except in the isorhythmic motets where the tenor moves in such long values that the outcome of chord length is not affected.

The figures for the two composers are largely indistinguishable. Both are quite variable, covering a similar range of values. Despite the large amount of time devoted to this study of chord lengths, the only fact emerging which helps in the central task of style

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[87] See Anna Maria Busse Berger: 'The relationship of perfect and imperfect time in Italian theory of the Renaissance' in EMH, vol.5 (1985), p.1 et seq.

Table 11 Dunstable average chord lengths without longs (minims)

	O		C			¢	
	full	duet	full	duet		full	duet
1 Kyrie	1.14						
2 Gloria	1.39	1.31	1.89	1.80			
4 Gloria	1.73		1.52		*		
5 Credo			1.29				
6 Sanctus	1.22		1.11				
7 Gloria			1.33				
8 Credo			1.28			1.15	
9 Gloria	1.80	1.37	2.22	1.92	*		
13 Sanctus	1.59	1.40	1.97	2.50	*		
14 Agnus	1.38	1.37	1.80				
15 Gloria	1.25	1.02	1.31	1.09			
16 Credo	1.37	1.05	1.38	1.18			
17 Credo			1.91	1.89			
23 Albanus	2.05	1.04	2.28	1.76	*		
	1.61	1.32					
24 Ave Regina	1.80	1.15	2.10	1.45	*		
	2.00	1.35					
25 Christe	1.87	1.64	2.18	2.18			
	1.59	2.25 *					
26 Dies	1.58	1.25	2.07	1.44	*		
	1.29	1.31					
27 Gaude	1.92	1.07	1.82	1.57			
	1.55	1.03					
33 Veni	1.47	1.47	1.28	1.30			
35 Ave maris	1.40						
36 Magnificat	1.41	1.17	1.25	1.16			
37 Ave regina	1.76	1.40	1.96				
38 Regina	1.26		1.73		*		
39 Crux	1.45	1.19	1.57	1.79			
43 Gloria	1.51	1.60	1.96	2.00			
44 Quam	1.62					1.56	*
45 Salve	1.59	1.41	1.21				
46 Salve	1.38	1.32	1.91				
			1.69	1.96	*		
47 Sancta	1.40						
48 Sancta	1.47	1.62					
49 Sancta	1.28	1.35	1.94		*		
50 Speciosa	1.45	1.26					
51 Sub tuam	1.18		2.00	2.07			
52 Gaude	1.48	1.27	1.72		*		
53 O crux	1.38	1.05	1.48	1.57			

* indicates diminution

Table 11 Leonel average chord lengths without longs (minims)

	O		C			¢	
	full	duet	full	duet		full	duet
1 Beata						3.35	
2 Ave Regina	2.28					2.43	
4 Ave maris	1.27						
5 Beata			1.09				
10 Salve	1.29	1.29		1.28		1.26	1.04
14 Salve	1.62	1.44					
18 Anima	1.31			1.73	*		
19 Regina	1.58	1.32	2.04				
			1.93		*		
23 Mater	1.25	1.08					
24 Ibo	1.56	1.38					
25 Anima			1.12	1.08			
26 Quam	1.11	1.28	0.99			1.17	
1 Sanctus						3.03	
2 Sanctus						3.24	
3 Sanctus						2.62	
4 Agnus						3.00	
5 Agnus						3.16	
6 Agnus						3.49	
10 Gloria			1.35			1.41	
11 Credo						1.47	
13 Credo			1.07				
14 Credo			1.02				
15 Sanctus			1.30	1.21			
16 Gloria							
18 Gloria	1.38	1.00	1.40	1.33			
Credo	1.27	1.35	1.24	1.50			
19 Credo						0.79	0.95
20 Sanctus	2.04	1.95		1.52			

* indicates diminution

differentiation concerns duet sections. It was noticed that many of Dunstable's duet sections have average chord lengths longer than fully-scored sections in the same mensuration. This is most apparent in his non-isorhythmic motets, where it happens in nine out of seventeen pairs (just over half) of measurements taken. In Leonel's motets, on the other hand, it happens in only one of eight pairs of measurements. The presence of this feature in a disputed work (especially a motet), therefore, suggests Dunstable as the more likely composer. The above finding demonstrates that duets in Dunstable are not always set in a more virtuosic style than the fully-scored sections as might be expected if they were intended for soloists. Also, in Leonel's music a correlation cannot be found between increased speed and those duets marked 'duo' or 'unus' in the manuscripts.[28]

MENSURAL EQUIVALENCE

To return now to the question of equivalence across changes in mensuration, Mendel noted the problem and called for a gathering and sorting of evidence from both theorists and the music itself.[29] Berger subsequently carried out the former task and concluded that most

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[28] For another aspect of duet virtuosity see pp.44,46.

[29] Arthur Mendel: 'Some Ambiguities of the Mensural System' in Studies in Music History: Essays for Oliver Strunk, ed. H. Powers (Princeton, 1968), pp.137-61.

contemporary theoreticians favoured breve equivalence.[30] This runs contrary to much modern opinion on the subject. It is noteworthy that editorial marks of breve equivalence have been deleted in the second, revised edition of Dunstable's works. As a first step towards answering Mendel's second call, Wegman included a comparison of note values in O and C as part of his tempo investigations. As his brief was to observe how practices changed with time, he performed the calculations on thirty-five English masses written by various composers covering a rather large time span, including only four works by Dunstable and Leonel. This present study is able to perform a more thorough investigation of the subject applied to the complete works of just these two composers.

The following discussion assumes that the average perceived speed of music did not change under different mensurations and that chord lengths give a realistic measure of this perceived speed. To illustrate the validity of these ideas a simple case will first be examined. Under the signatures O and ¢ a breve contains the same maximum number of minims - six. The chord length in both these mensurations should therefore be the same no matter whether the breve or minim is taken to be equivalent. Only three pieces in this corpus use both signatures,[31] but in each case the average chord lengths

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[30] Anna Maria Busse Berger: op. cit.

[31] In one of the cases, Dunstable's Quam, the ¢ section is transcribed in augmentation by Bukofzer as indicated in the original manuscript by flagged semiminims. See MB8. Hamm supports the interpretation and notes that this

are, indeed, very similar.

It is unlikely that all duple metre music was intended to be slower than that in triple metre, yet the average chord length measured in terms of the minim is usually longer in C than in O. Minim equivalence would presumably give equal lengths on average; a proportion of 1:1. In breve equivalence, six minims in O would be sung in the time of four in C. We would therefore expect music in C to compensate for the reduction in speed by using shorter length note values. The exact proportion would be 1:0.66. This is, in fact, the reverse of what actually happens in this corpus.

A clue as to the correct interpretation may be held by two of Dunstable's compositions. His Salve regina (MB8 no.46) is transmitted in two Continental manuscripts and his Regina celi (MB8 no.38) in four. Both have their duple metre sections indicated ₵. In breve equivalence, this would indicate eight minims in duple time to be sung in the same time as six in triple time, giving an average chord length proportion of 1:1.33. The actual figure for Salve regina is 1:1.38. That for Regina celi is 1:1.37.

In this period, C in insular manuscripts is often substituted by the diminution ₵ in Continental concordances. Perhaps the Continentals were correcting a bad English habit of writing C when they really meant ₵.

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mensural practice was an English trait. See Charles Hamm: 'A Chronology of the Works of Guillaume Dufay' (diss. University of Princeton, 1964. Published Princeton, 1964; reprinted New York, 1986), pp.53-54.

More musical examples suggest that this may have been the case. Dunstable's Gloria, MB8 no.2, which is contained only in an insular source and employs the C mensuration sign, has a proportion of 1:1.36. His Agnus, MB8 no.14, and the motet Gloria sanctorum (MB8 no.43) both have a proportion of 1:1.30. Fewer compositions by Leonel juxtapose these two signatures, but one of those which does, his Regina celi (CMM50i no.19), has a proportion of 1:1.29.

Some other compositions show less ideal proportions, but then some variation is to be expected. Maybe sections in different mensurations were sometimes designed to be performed at different speeds to provide an element of contrast. Also, some pieces were indeed intended to have minim equivalence. Dunstable's Credo, MB8 no.16, has almost identical rates for duple and triple metre and its Gloria twin (MB8 no.15) has very similar rates. It is very interesting that both these pieces introduce the change to C mensuration at slightly different positions in the three voices so that the complete transition takes place over a few bars. This makes it imperative that the minim value remain constant. It is possible that Dunstable introduced this transition as a means of deliberately achieving an effect that was in opposition to the usual interpretation of the day. The Gloria and Credo on Alma redemptoris attributed to Leonel (CMM50ii no.18) similarly have nearly the same rates for duple and triple sections. A transitional dual time signature is used in the anonymous Sanctus and Agnus which probably form a

cycle with these movements.

Hamm and others explain the time relationships differently. In CMM50i (p.XX), he describes two types of duple time. The first has movement in semibreves and minims under the sign C with a beat on the semibreve moving at the same speed as that in O, thereby implying semibreve equivalence. This is actually the same as minim equivalence as in both these mensurations two minims equal a semibreve. It corresponds to the case in Dunstable's mass pair discussed above.

His second type moves in breves and semibreves and is marked C or ₵. In other words, he acknowledges a shorter average note length and also the fact that the two duple time signatures can be used in the same context. However, he maintains semibreve equivalence and states that ₵ is not a duple proportion, but rather an indication of a different, faster tempo (but not twice as fast). He gives ♩=70-80 for O and ♩=100-120 for ₵. Hamm has therefore arrived by a different route at a speed differential very similar to the 1:1.33 derived in this present study.

MENSURAL SCHEMES

It is convenient at this point to mention the differences in usage of mensuration signs between the composers Leonel and Dunstable. Some mensural schemes seem to be characteristic of English compositions in general and have often been used as a factor in the identification of such

pieces in continental manuscripts. Their value in differentiating one English composer from another is more limited. Compared with his contemporaries, Dunstable appears to use a wider variety of signs and proportions, although it is difficult to assess the interference of continental scribes in this respect. Leonel is noted for his rhythmic complexity, achieved by the use of different mensurations simultaneously, though this is confined to a few mass movements (CMM50ii nos.13-16) and is not a constant feature of his style. In these pieces voice I is written in doubled values throughout to facilitate the notation of small time values. Further rhythmic complexity in the form of cross-rhythms is often indicated by passages in coloration. None of the pieces with conflicting attribution to Dunstable resembles this style category.

RELATIVE VOICE SPEEDS

Another feature connected to note values is the relative speed of voices within a composition. Table 13 shows the speeds of the lower voices as a proportion of the speed of voice I. The figures are based only on fully-voiced sections of music to avoid any distortion caused by different rates of movement in duet sections.

The descant pieces of Leonel, at one extreme, have active lower parts. It is the norm in this style for voice II to be a cantus firmus and to be slightly less

Table 13 Relative voice speeds

	II/I	III/I
DUNSTABLE		
Kyrie 1	1.00	0.75
Gloria 2	0.68	0.37
Gloria 4	0.68	0.45
Credo 5	0.67	0.48
Sanctus 6	0.76	0.59
Gloria 7	0.80	0.59
Credo 8	0.84	0.57
Gloria 9	0.82	0.58
Sanctus 13	0.66	0.30
Agnus 14	0.74	0.43
Gloria 15	0.61	0.22
Credo 16	0.76	0.26
Credo 17	0.72	0.14
Albanus 23	0.62	0.19
Ave 24	0.80	0.27
Christe 25	0.81	0.27
Dies 26	0.68	0.19
Gaude 27	0.70	0.22
Specialis 31	0.96	0.10
Veni 33	0.60	0.23
(Textless) 34	0.59	0.19
Ave 35	0.95	0.80
Magnif. 36	0.93	0.81
Ave 37	0.82	0.75
Regina 38	0.75	0.65
Crux 39	0.55	0.44
Gloria 43	0.75	0.56
Quam 44	0.92	0.89
Salve 45	0.94	0.50
Salve 46	0.74	0.42
Sancta 47	0.81	0.61
Sancta 48	0.64	0.55
Sancta 49	0.87	0.65
Speciosa 50	0.70	0.58
Sub tuam 51	0.92	0.70
Gaude 52	0.73	0.63
O Crux 53	0.81	0.43

	II/I	III/I
LEONEL		
Beata 1	0.76	0.90
Ave 2	0.95	0.88
Ave 4	0.88	0.75
Beata 5	0.85	0.90
Salve 10	0.81	0.69
Salve 14	0.82	0.63
Anima 18	0.90	0.72
Regina 19	0.77	0.54
Mater 23	0.75	0.76
Ibo 24	0.98	0.85
Anima 25	0.94	0.72
Quam 26	0.82	0.81
Sanctus 1	0.78	0.85
Sanctus 2	0.71	0.86
Sanctus 3	0.62	0.74
Agnus 4	0.69	0.79
Agnus 5	0.74	0.75
Agnus 6	0.50	0.83
Gloria 10	0.72	0.62
Credo 11	0.86	0.34
Credo 13	0.58	0.50
Credo 14	0.60	0.43
Sanctus 15	0.76	0.71
Gloria 16	0.70	0.55
Credo 19	0.73	0.36
Sanctus 20	0.71	0.65

			IV/I	Four-part pieces
Gloria 11	1.01	0.77	0.53	DUNSTABLE
Gaude 28	1.01	0.43	0.20	
Preco 29	0.81	0.42	0.19	
Salve 30	0.77	0.23	0.27	
Veni 32	0.53	0.66	0.17	
Ave 7	0.99	0.63	0.44	LEONEL
Gloriose 12	1.10 *	0.64	0.44	
Sanctus 7	0.98	0.80	0.60	
Agnus 7	0.95	0.88	0.65	
Gloria 8	0.87	0.75	0.53	
Gloria 9	0.92	0.87	0.54	
Sanctus 21	1.26	0.85	0.71	

active than voice III. At the other extreme, Dunstable's isorhythmic music with its slow moving tenor exhibits much more contrast between the voices. Not taking these two classes of pieces into account, a difference remains between the two composers, albeit in smaller degree. This is still most marked in voice III. There is co iderable overlap but 67% of Leonel's works give a figure of 0.62 or over, whilst 68% of Dunstable's give less than this value. It is also worthy of note that Leonel's mass music tends to have less mc ement in the lower voices than his motets.

The value of this test is not great as an accurate guide to authorship, but it is easily performed and could add weight to the results of other investigations. Other, more helpful, uses for the information could be in the comparison of possibly related movements of the mass, serving as a measure of similarity between them, or in the assessment of different manuscript versions of the same piece.

Excluding descant compositions, the voices in three-part music are always arranged in the manuscripts in the correct order as regards rate of movement, the most active being at the top of the texture and so on. This seems to have been a more important factor than voice range, which is sometimes at odds with the arrangement (see pp.51-53).

CHORD ANALYSIS

DISSONANCE LEVEL

Several years ago, Gareth Curtis used the concept of dissonance level in an attempt to distinguish between different fifteenth-century musical styles.[32] He found that the level varied considerably between pieces, even within the same style category. Even so, it was decided that a similar approach might reveal insights into the music of Dunstable and Leonel.

Curtis did not describe exactly how his figures were obtained and this study has not duplicated them exactly, probably due to a different method of calculation. However, roughly similar figures have been obtained for the few items common to both studies. As an extension to this present study, each piece has also been analysed for levels of perfect consonance and imperfect consonance.

A perfect consonance is here taken to be one involving only perfect intervals from the bass: those of a unison, fifth, octave and their compounds. Although the interval of a fourth is classed as perfect, chords involving a fourth (or eleventh) from the bass are normally prohibited in the music of this period and appear only in the context of dissonances; they do not often appear on the beat and are not used as resting sonorities,

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[32] Gareth Curtis: 'Stylistic Layers in the English Mass Repertory ca.1400-1450' in PRMA, vol.109 (1982-3), pp.28-29.

for example at cadences. They have therefore been included here as dissonances.

All chords including at least one imperfect interval of a third or sixth (or their compounds) between any two voices, sometimes also in combination with perfect intervals, are treated as imperfect consonances.

In addition to those with a fourth from the bass, dissonant chords also include those which involve a dissonant second or seventh between any pair of notes. There is little evidence in this corpus for a successive composition of voices which, in the fourteenth century, would have allowed any interval between the other voices so long as they were each consonant with the tenor.[33] Chords such as a 6/5 are therefore treated here as dissonances.

The number of chords in each of the above three groups has been calculated and expressed as a percentage of the total number of chords for each composition. However, this produces rather biased figures as dissonances tend to occur only as short time values and perfect consonances as long ones. Durations for each chord-type are therefore also given in terms of a quaver length in modern transcription. Opinions vary as to the relationship of quaver lengths at a change of mensuration (see pp.69-73). However, any allowance for changes in speed should not significantly alter the proportion of

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[33] For a recent opinion on the subject see Bonnie J. Blackburn: 'On Compositional Process in the Fifteenth Century' in JAMS, vol.40 (1987), pp.210-284.

chord-types. Unless otherwise stated, the percentages quoted in this discussion concern duration. Appendix 2 gives data relating to this chapter for the central body of three-part non-descant non-isorhythmic compositions.

The rate of dissonance of three-voice chords can be compared with that for the whole piece and, where appropriate, to that for four-part chords. In general, as might be expected, the more voices that are included, the more clashes occur and the more dissonant the harmony becomes. Leonel's Gloria CMMii no.8, the only piece in the database to include five-part writing, illustrates this principle. The rise in dissonance is accompanied by a rise in imperfect consonance and a decrease in perfect consonance. Rounded-up percentages are as follows:

No. parts	two	three	four	five
Dissonance	9	15	20	28
Imperfect consonance	41	50	69	72
Perfect consonance	51	35	11	0

The figures obtained for all pieces by each composer have been combined to show the spread of results, mean and median results and standard deviation from the mean for different types of pieces (see tables 14-15). The variation amongst pieces by the same composer is surprising. Dunstable's Quam pulchra (MB8 no.44) has often been noted for its consonant style and it is no surprise that this composition shows a low level of dissonance (4.48%). At the other extreme, his Kyrie MB8 no.1 shows the highest level at 19.33%. This last figure might in part be due to errors in transmission as the only surviving manuscript source is unclear in many details.

Table 14 Dunstable chord analysis (% of three-part chords)

	Range	Mean	Median	S.D.
ALL PIECES				
Full triads				
number	23.66-53.46	39.79	39.71	4.76
duration	23.83-52.62	38.15	37.69	4.47
Dissonance				
number	6.56-30.24	18.85	19.58	3.43
duration	4.92-20.49	12.00	12.20	2.27
Perfect consonance				
number	11.99-33.59	20.61	20.37	3.10
duration	17.44-44.88	29.50	28.75	3.68
Imperfect consonance				
number	41.22-73.22	60.54	59.32	4.66
duration	40.93-70.08	58.51	58.28	4.48
ISORHYTHMIC PIECES				
Full triads				
number	23.66-42.14	35.16	34.84	4.41
duration	23.83-42.70	36.61	38.74	4.89
Dissonance				
number	14.91-25.19	19.56	19.53	2.41
duration	7.80-14.99	12.05	13.06	2.08
Perfect consonance				
number	20.14-33.59	25.16	24.06	3.32
duration	25.88-44.88	32.61	31.07	4.90
Imperfect consonance				
number	41.22-62.89	55.28	56.41	3.98
duration	40.93-61.60	55.34	57.34	4.94
NON-ISORHYTHMIC PIECES				
Full triads				
number	31.38-53.46	41.66	40.33	4.71
duration	29.17-52.62	38.75	37.39	4.63
Dissonance				
number	6.56-30.24	18.33	19.53	3.69
duration	4.92-20.49	11.76	12.02	2.23
Perfect consonance				
number	11.99-25.00	18.98	19.62	2.42
duration	17.44-35.38	28.48	28.61	3.12
Imperfect consonance				
number	55.12-73.22	62.70	62.57	4.07
duration	49.44-70.08	59.76	60.41	4.38

Table 15 Leonel chord analysis (% of three-part chords)

	Range	Mean	Median	S.D.
ALL PIECES				
Full triads				
number	30.12-55.84	43.24	43.84	4.33
duration	31.35-53.49	40.53	39.84	4.55
Dissonance				
number	7.69-30.12	18.89	19.57	4.63
duration	4.90-17.87	11.87	11.75	3.43
Perfect consonance				
number	13.18-31.82	20.22	19.88	3.62
duration	19.14-46.30	29.63	30.78	5.21
Imperfect consonance				
number	47.37-78.21	60.89	59.06	5.98
duration	44.44-75.96	58.50	56.48	6.38
GROUP I PIECES				
Full triads				
number	36.31-55.84	46.07	47.29	4.38
duration	33.86-53.49	42.64	42.92	4.32
Dissonance				
number	10.39-23.84	16.78	16.44	3.83
duration	6.76-12.24	9.15	9.12	1.25
Perfect consonance				
number	16.88-31.82	24.03	22.66	3.85
duration	20.54-46.30	34.22	37.21	5.77
Imperfect consonance				
number	50.00-72.73	59.20	57.06	6.06
duration	44.44-71.71	56.63	54.34	6.17
NON-GROUP I PIECES				
Full triads				
number	30.12-50.39	41.82	42.96	3.86
duration	31.35-49.77	39.48	39.39	4.19
Dissonance				
number	7.69-30.12	19.95	21.63	4.55
duration	4.90-17.87	13.23	15.18	3.29
Perfect consonance				
number	13.18-23.34	18.32	18.56	2.80
duration	19.14-33.33	27.33	29.22	4.49
Imperfect consonance				
number	47.37-78.21	61.73	59.95	5.80
duration	49.48-75.96	59.44	56.49	6.40

Neither of these pieces is representative of Dunstable's style. Leonel shows an even greater spread of results, as demonstrated by the larger standard deviation. This is mainly due to his descant pieces which are generally low in dissonance. The highest occurrence is in his Credo CMM50ii no.11 which has an overall level of 16.56%.

Comparing the average results for Dunstable with those for Leonel was disappointing from the point of view of differentiating composer style. Not only is the spread of results large, but the mean values are very similar. It has often been assumed that the 'sweet' style of Dunstable's writing, as admired by Continental musicians and often commented upon, is due to its consonant nature. It is worthy of note that Leonel, maybe a generation ahead of Dunstable, was producing music with a very similar pattern of consonance.

A more characteristic and narrower spread of results was obtained for groups of pieces in specific categories, for example descant or isorhythm. These results are interesting and worthy of more detailed comment.

It might have been expected that the dissonance level in Dunstable's isorhythmic pieces would be higher than the norm due to the immutable nature of the tenor and the slightly antiquated form of composition. However, the mean dissonance level is almost identical to that of his other works. The spread of results and therefore the standard deviation is smaller, however, indicating a consistency of style amongst these pieces.

The group I pieces by Leonel have, as might be

expected, a lower dissonance level than his later pieces but still a higher level than might have been expected from general conceptions of this style. The level of imperfect consonance is also lower and the level of perfect consonance higher.

The most valid comparison between the composers concerns those pieces which fall outside these two groups. Here there is a small difference in consonance levels, but insufficient to help in the determination of authorship due to the wide spread of results. Levels do prove to be of help in Part Two, however, in the comparison and evaluation of related mass movements whose patterns of consonance and dissonance sometimes prove to be very similar.

A more marked difference exists with respect to four-part writing in which Dunstable uses a much higher percentage of perfect consonance than does Leonel (22.59% of four-note chords compared with 14.63%). Even the three-part chords within this texture show a similar difference (31.27% compared with 21.38%). This cannot be accounted for simply by the difference in composition types as isorhythmic and non-isorhythmic music in three parts does not show a comparable difference.

Various other types of chord level in three-part music were calculated to try to isolate composer-specificity, with little success. For instance, there was little difference in the use of second inversion triads. The levels of full triads employed are included in the tables to demonstrate the variation between the

different types of composition, although Dunstable's non-isorhythmic and Leonel's non-descant works again show a very close correspondence.

Fuller has recently described two types of imperfect chord.[34] The first contains only one imperfect interval combined with one perfect, for example a fifth and a third (5/3). The other contains two imperfect intervals, for example a sixth and a third (6/3). This latter type she calls doubly-imperfect and suggests that it should be set apart from other sonority types. Chords of the type containing a repeated imperfect interval (i.e. the upper parts in unison) are not discussed, so it is not known how Fuller would classify these. In any event, no great difference can be found between the levels of different types of imperfect chord in Dunstable and Leonel's three-part music.

Although four-part music does not enter into Fuller's study, it follows that three classes of imperfect chord would exist in this case: singly, doubly and triply imperfect. Assuming that repeated intervals are allowed, the mean percentage levels of four-part chords for Dunstable and Leonel are as follows:

	singly	doubly	triply
Dunstable	46.09	14.29	3.24
Leonel	42.10	20.51	6.55

Dunstable seems to favour singly imperfect and Leonel doubly imperfect chords. The proportions of these two

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[34] Sarah Fuller: 'On Sonority in Fourteenth-century Polyphony: Some Preliminary Reflections' in Journal of Music Theory, vol.30.1 (1986), p.42.

chord-types are respectively three to one and two to one for the two composers.

Another relationship which has been investigated is that between perfect and imperfect consonance. During the fifteenth century there was a gradual shift away from bare perfect consonances and towards a universal use of full triads, even as final chords. In theory it should be possible to map this transition by comparing the levels of these chords as used by various composers. It was decided to do this for Leonel and Dunstable. The ratio of perfect to imperfect three-part chords was calculated for each piece. The results are given in Table 16.

The picture which emerged was very surprising. There seems to be no consistency for either composer. The ratio, which decreases as music becomes more triadic, varies from 0.68 to 0.25 for the non-descant compositions, with a mean of 0.48 for both composers. Only when the descant pieces of Leonel are considered in isolation is a difference detected. The mean for these pieces is 0.63, showing them to be in general more harmonically primitive, in keeping with the theory that they are amongst his earliest works. The range of values is again wide; the most exceptional is that for Beata progenies, CMM50i no.1, with a ratio of only 0.29.

As a logical progression, it might be that increasingly larger proportions of imperfect consonance reflect the subsequent chronology of composition of the non-descant pieces. Hamm, in the collected edition, has attemped to arrange Leonel's pieces chronologically

Table 16 Proportion of Perfect Consonance to Imperfect Consonance

LEO	Agnus 6	1.04		
LEO	Sanctus 3	0.74		
LEO	Agnus 5	0.73		
LEO	Sanctus 1	0.71		
LEO	Agnus 4	0.68		
		0.68	DUN	Gloria 9
LEO	Credo 11	0.66		
		0.66	DUN	Sanctus 6
		0.65	DUN	Ave 35
LEO	Sanctus 20	0.64		
LEO	Credo 19	0.61		
		0.61	DUN	Kyrie 1
LEO	Regina 19	0.59		
LEO	Credo 14	0.59		
LEO	Salve 10	0.58		
		0.58	DUN	Agnus 14
		0.57	DUN	O Crux 53
LEO	Ave 2	0.55		
LEO	Gloria 10	0.55		
LEO	Sanctus 15	0.55		
		0.55	DUN	Crux 39
		0.54	DUN	Salve 45
LEO	Anima 18	0.53		
LEO	Sanctus 2	0.52		
		0.51	DUN	Sanctus 13
LEO	Gloria 18	0.50		
LEO	Credo 18	0.50		
		0.50	DUN	Salve 46
		0.50	DUN	Gloria 43
		0.48	DUN	Gaude 52
		0.48	DUN	Magnificat 36
		0.47	DUN	Sancta 49
		0.47	DUN	Regina 38
		0.44	DUN	Speciosa 50
LEO	Beata 5	0.43		
		0.43	DUN	Gloria 2
		0.42	DUN	Credo 5
LEO	Credo 13	0.41		
		0.41	DUN	Credo 8
		0.39	DUN	Sub tuam 51
		0.39	DUN	Quam 44
		0.38	DUN	Ave 37
		0.38	DUN	Gloria 4
LEO	Gloria 16	0.37		
		0.35	DUN	Sancta 48
		0.35	DUN	Gloria 7
LEO	Quam 26	0.33		
LEO	Anima 25	0.31		
LEO	Salve 14	0.30		
LEO	Beata 1	0.29		
LEO	Mater 23	0.29		
LEO	Ibo 24	0.25		
		0.25	DUN	Sancta 47

according to style. A statistical correlation calculation performed to compare his ordering of these pieces with the ratio of perfect to imperfect consonance present in each one does demonstrate some association between the two, though not strongly. For the motets the coefficient of correlation is 0.341 and for the mass movements 0.396. The latter value only is significant at the 0.05 confidence level. No chronology is available for Dunstable's works, though Howlett has suggested a date of 1426 for Dunstable's motet Albanus roseo (MB8 no.23).[33] This would place it reasonably early in his career, though the piece does not have a high ratio (0.45).

ACCENTED DISSONANCE

In works of dubious authorship, the type of dissonance employed has often been cited as reason for favouring one composer over the other, though usually without further explanation. For example, Bukofzer considered that the 'treatment of dissonance' in Salve mater salvatoris (MB8 no.62) suggested Leonel as the author (MB8 commentary). Emphasis is usually placed on Dunstable's 'pan-consonant' style and his care in approaching dissonances,[34] so there seems to be an implication that the dissonances employed

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[33] D.R. Howlett: 'A Possible Date for a Dunstable Motet' in MR, vol.36 (1975), pp.81-84.

[34] See, for example, Margaret Bent 'Dunstable, John' in Grove, vol.5 (1980), p.723.

by Leonel are somehow cruder or less well prepared.

Reid has very successfully used dissonance treatment to differentiate the style of Dufay from that of other composers.[37] His study appears to have been in great depth, classifying every dissonant occurrence in terms of type, duration and resolution. It would, in theory, be possible to apply his methods to the music of Leonel and Dunstable, though the enormity of the task made it impractical as part of this present study (Reid's whole PhD thesis was confined to that single subject). There is also some doubt as to whether such a project would be so successful for this corpus. Dufay is noted for his systematic use of dissonance which sets him apart from other composers of his generation, so it is not surprising that this element of his writing alone can serve as an indicator of his style. The use of dissonance in the English school is, by comparison, cruder, more variable and less easy to classify. Also, the generally low level of dissonance, which has been noted as a characteristic of insular music in general, means that there would be less material on which to conduct a statistical analysis. This present approach, in which dissonance is considered in less detail but alongside other features of style, is probably more suited to the music.

Most of the dissonance present in this corpus is unaccented, produced by the natural movement of upper voices over a slower tenor. It was decided that, in a

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[37] John W. Reid: 'Testing for Authenticity in the Works of Dufay' in MR, vol.45 (1984), pp.163-178.

compromise to Reid's study, an investigation of the smaller proportion of accented dissonance would probably provide the most interesting data on differences between Leonel and Dunstable. A computer programme was designed to locate all dissonant combinations occurring when new chords are struck. Once found, these were easily classified 'by hand' into various types. It is possible that the methods used overlooked a small amount of what would normally be classed as accented dissonance, for example where a suspension consists of a tied note so that no completely new chord combination is struck on the beat. However, the same approach was used consistently throughout the corpus.

The overall level of accented dissonance does vary between the two composers, Leonel showing a slightly higher level than Dunstable. As the level of dissonance has been shown to vary depending on the number of voices involved (see above p.79), it was not thought valid to compare overall levels in pieces containing different proportions of duet writing. Separate calculations were therefore performed for two- and three-part chords. To eliminate any correlation with varying relative voice rates between the composers (see pp.74-76), the percentages are out of the level of accented chords, not of the total chords in a composition. The calculations involving duration of dissonance produced a slightly greater separation between the composers than those involving numbers of chords. For the results see Tables 17-18. Pieces with no true duet writing are excluded from

Table 17 Level of accented dissonance in two-part chords (% total duration of accented dissonance)

		0.00	DUN	Agnus 14
		0.00	DUN	Ave 37
		0.00	DUN	Speciosa 50
		0.00	DUN	Gaude 52
		0.00	DUN	O Crux 53
LEO	Ibo 24	0.00		
LEO	Quam 26	0.00		
LEO	Gloria 18	0.00		
LEO	Regina 19	0.54		
LEO	Mater 23	0.55		
		0.56	DUN	Sancta 49
		0.72	DUN	Gloria 9
		0.97	DUN	Magnificat 36
		1.03	DUN	Gloria 43
		1.11	DUN	Sancta 48
		1.12	DUN	Sanctus 13
		1.16	DUN	Crux 39
		1.16	DUN	Salve 45
		1.36	DUN	Salve 46
LEO	Anima 18	1.43		
LEO	Salve 14	1.48		
LEO	Sanctus 15	1.78		
		1.92	DUN	Sub tuam 51
		2.11	DUN	Gloria 2
LEO	Anima 25	2.14		
LEO	Credo 14	2.17		
LEO	Credo 13	2.22		
LEO	Credo 18	2.59		
LEO	Credo 19	2.98		
LEO	Salve 10	3.05		
		3.44	DUN	Sanctus 6
		3.45	DUN	Gloria 7
LEO	Gloria 16	3.85		
LEO	Credo 11	6.62		
LEO	Sanctus 20	8.28		

Table 18 Level of accented dissonance in three-part chords (% total duration of accented chords)

		0.00	DUN	Sanctus 6
		0.00	DUN	Credo 8
		0.00	DUN	Ave 37
		0.00	DUN	Sancta 48
		0.00	DUN	O Crux 53
LEO	Mater 23	0.00		
LEO	Ibo 24	0.00		
LEO	Anima 25	0.00		
LEO	Quam 26	0.00		
LEO	Gloria 18	0.00		
		0.28	DUN	Regina 38
		0.47	DUN	Gloria 2
		0.49	DUN	Crux 39
		0.54	DUN	Salve 45
		0.57	DUN	Gloria 4
LEO	Salve 14	0.90		
		0.93	DUN	Sancta 49
		1.03	DUN	Agnus 14
		1.29	DUN	Gaude 52
		1.32	DUN	Sancta 47
		1.34	DUN	Magnificat 36
		1.38	DUN	Ave 35
LEO	Credo 11	1.73		
		1.83	DUN	Sub Tuam 51
LEO	Anima 18	1.97		
		2.03	DUN	Gloria 9
		2.04	DUN	Gloria 43
		2.16	DUN	Quam 44
		2.55	DUN	Speciosa 50
		2.59	DUN	Gloria 7
LEO	Regina 19	2.67		
LEO	Credo 18	2.71		
		3.05	DUN	Kyrie 1
		3.09	DUN	Sanctus 13
LEO	Gloria 10	3.13		
LEO	Salve 10	3.16		
LEO	Credo 13	3.33		
LEO	Credo 19	3.40		
		4.09	DUN	Credo 5
LEO	Sanctus 20	4.28		
LEO	Gloria 16	4.69		
LEO	Sanctus 15	4.84		
LEO	Credo 14	4.97		

the two-part calculations. The mean percentages for the duration calculations are:

	2-part	3-part
DUN	0.98	1.32
LEO	2.34	2.32

In contrast to the levels of dissonance overall, those for accented dissonance are quite similar for two- and three-part music, remarkably so for Leonel. The slight difference in this respect between the two composers prompted a comparison of two- and three-part levels for each individual piece but the results were not consistent enough to use as a test for authorship.

Levels of dissonance must be treated with caution. It is possible that some may be the result of manuscript errors; the majority could be avoided by the alteration of a single note. Where the same pieces have been found in two different sources there are usually slight discrepancies between them. Where more than two sources exist, a majority verdict can be passed on the correct interpretation of varying passages, although where insufficient information is available, the possibility must always exist that some of the transmitted dissonance was not originally intended. Conversely, it is very tempting in transcribing manuscripts to eliminate dissonance by altering the source material in the assumption that mistakes have been made by the scribe. Because of this, some intended dissonance may not be evident in modern trancriptions. As has already been stated, the encoding of music for this thesis has been performed mostly from the versions in three collected

editions and it is possible that editorial policy has varied between them. This slight uncertainty cannot be avoided unless the original manuscripts are consulted in every case. However, as far as scribal error is concerned, it is equally likely to occur in the works of both composers, so the higher level in the works of Leonel probably reflects a real difference between the two. It would be unwise to use levels of accented dissonance as a sole indicator of authorship, but they are useful in combination with other tests and so long as the condition of the original manuscript is taken into account.

The dissonant chord types will now be examined in more detail. The level of accented dissonance overall is quite low, so most chord types occur only once or a few times in the works of each composer - too rarely to make sense in statistical calculations. In comparison, a 7/3 chord occurs quite often, but in roughly equal numbers in both composers (24% of all cases of accented dissonance in Leonel and 21% in Dunstable). The bare fourth in two-part writing, however, is almost as frequent and more than twice as common in Leonel (62% of cases of two-part accented dissonance as opposed to 30% in Dunstable). Added to the fact that accented dissonance is more common overall in Leonel, the presence of three or more bare fourths in a single piece is an indication of composition by him, although most works have insufficient two-part writing to make this method of identification possible in more than a few cases. It may be more valuable in considering whole mass cycles where a larger sample of

music is available.

An examination of the function of the accented dissonance also reveals small differences between the composers. In both it is employed in the approach to cadence points and in similar amounts, though in Leonel much more is not associated with cadence points (59% as opposed to 38% in Dunstable). Surprisingly, the music of both contains similar numbers of non-functional occurrences which cannot be explained in terms of any sort of unessential note or cadence approach. This is evidence to support the theory that some of this haphazard dissonance might be due to manuscript error. If these instances are not taken into consideration, the level in Dunstable not associated with cadence points falls to 19% and almost all of this consists of accented passing notes.

The actual types of dissonance counted are shown in Table 19. While Dunstable uses appoggiaturas only at the approach to a cadence, in Leonel they occur in other positions, and occasionally even at what might otherwise have been a cadence point (see Example 1). Leonel favours ascending, and Dunstable descending auxiliary notes.

Example 1. Leonel Credo 13

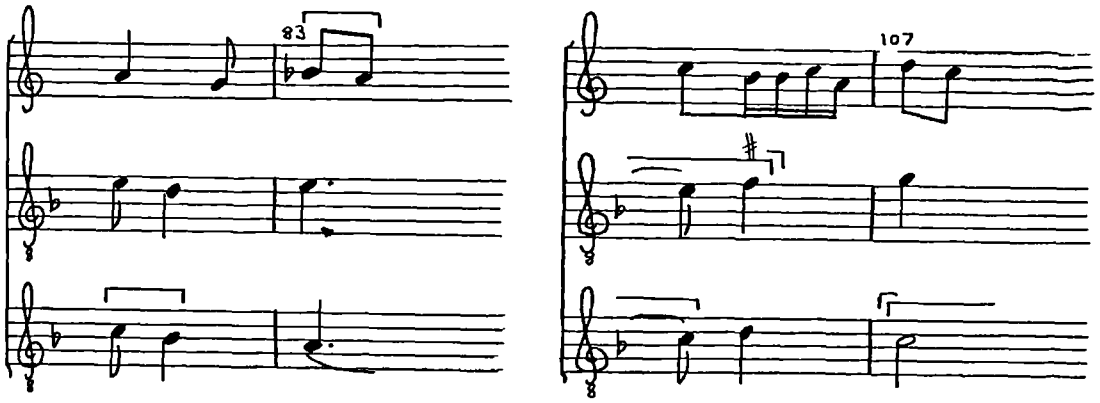

Table 19 Types of Accented Dissonance
(Nos. of occurrences)

	Dunstable		Leonel	
	Cadence Approach	Non-cadence Approach	Cadence Approach	Non-cadence Approach
Non-functional	29	21	24	6
Passing	20	12	8	14
Appoggiatura	12	12	-	11
Suspension	6	11	2	15
Upper auxiliary	6	7	-	1
Lower auxiliary	2	1	2	9
Upward appoggiatura	2	1	-	-
Retardation	1	1	-	2
Total functional	49	33	12	52
Total	78	54	36	58

CHORD TYPES

As an examination of dissonance levels alone did not provide enough information to distinguish effectively between the music of Dunstable and that of Leonel, it was decided that a more detailed study would be undertaken, analysing each piece for individual chord types. The results are extensive and difficult to abbreviate so the appendix gives them in full but only for the central body of three-part works.

Four-part pieces were particularly difficult to analyse. The limited memory capacity of the BBC computer meant that the large number of different chord permutations possible with this number of parts could not be handled simultaneously. The problem was finally solved by dividing the task into seventeen different programmes to run in succession.

A preliminary step in every analysis was the dividing of each piece into two, three and, if appropriate, four-part voice combinations. The descant pieces of Leonel consist almost completely of three-part harmony; there are very few rests in the texture. The more common style, however, involves frequent resting of voices and duet interludes. On average, a three-part Dunstable composition is only 60% three-part chords, although this figure varies considerably, depending on the length of the duet sections. Four-part pieces contain even more rests so that the texture does not become dense. They consist, on average, of 45% four-part and 30% three-part chords in

Dunstable. Leonel employs a slightly higher proportion of four-part chords.

In order to analyse each chord it was necessary to order the notes as regards pitch. This being the case, the computer programme was also designed to keep note of the number of chords involving crossing of the voice-parts. This number was very variable, reflecting, in part, the distance apart of the voice ranges, a subject dealt with elsewhere. Leonel's descant pieces, however, contain very little crossing - a feature characteristic of this style.

In the tables, chords are described by specifying exact distances from the lowest note. 6/3 indicates a three-note chord with notes a third and sixth above the bass. It does not indicate any other arrangement of a first inversion chord.

Some small differences in chord frequency as used by Dunstable and Leonel are apparent. For instance, it was noticed that in four-part compositions, the average levels of certain chords showed differences of several fold. The wide variation in level from piece to piece renders most of these chords unreliable indicators, although two particular ones give consistently characteristic results. Their mean levels are:

	Leonel	Dunstable
6/5/3	1.07%	0.11%
7/5/3	1.94%	0.56%

This finding, though possibly an indicator of authorship, must be treated with caution. It may be that the smallness of the sample of four-part pieces accounts

for the inequality of the results between the two composers. Also, the sets are dissimilar in that four out of five of the Dunstable but none of the Leonel pieces are isorhythmic.

The results for the three-part pieces, for which there is a more satisfactory sample size, contain no such immediately obvious indicators. The figures show a wide variation from piece to piece. At first sight, little can be done to distinguish the composers. However, several weeks of determined effort and manipulation of figures produced the following successful method.

First, to show overall average levels of chord usage by the two composers, analyses were produced combining all the ascribed non-descant, non-isorhythmic pieces for each one. From these it was possible to compare in detail the levels of particular chords. For a particular chord type, the mid-point was then taken between the levels for Dunstable and Leonel. The level for each individual piece can therefore be compared with this midpoint to determine on which side it lies. Although no single chord-type gives useful results, if the levels for every chord-type are treated in this way and the scores combined, a more meaningful picture appears.

Simply adding together the differences for every chord produced results which reflected mainly the levels of those chords which appear in high numbers. For example, differences of a few percent in levels of 6/3 chords swamped differences of a small fraction of a percent in chords of lower frequency. A scheme was

therefore developed which calculates the difference of the chord level from the average in terms of a multiple of the average, for example if an average level is 2% and the level in the piece in question is 4% the piece will score two in favour of one composer.

All the scores are combined, the scores in favour of Dunstable being subtracted from those in favour of Leonel. The resulting figures are adjusted to make the average zero. A composition by Dunstable is therefore indicated by a negative figure and one by Leonel as a positive figure. These 'chord differences' are shown in Table 20.

Of all the tests developed in this project, this one achieves the most successful separation of Leonel and Dunstable. Very little overlap exists between the values for the two composers. Leonel's Gloria, CMM50ii no.10, is transitional in style between descant and his more advanced pieces. Nevertheless, a low score should be regarded as inconclusive. The very high score in favour of Dunstable for Ave maris (MB8 no.35) might be due to the shortness of this composition providing only a small sample of chords.

Table 20 Chord differences

		-108.148	DUN	Ave 35
		-85.005	DUN	Gloria 7
		-48.251	DUN	Kyrie 1
		-38.447	DUN	Salve 46
		-36.027	DUN	Sanctus 13
		-34.579	DUN	Speciosa 50
		-32.592	DUN	Gloria 2
		-30.540	DUN	Gloria 4
		-26.968	DUN	Magnificat 36
		(-22.804	DUN	AVERAGE)
		-22.697	DUN	O Crux 53
		-22.304	DUN	Sancta 49
		-21.359	DUN	Crux 39
		-19.947	DUN	Credo 8
		-19.307	DUN	Credo 5
		-18.086	DUN	Sancta 48
		-17.134	DUN	Ave 37
		-12.654	DUN	Sub Tuam 51
		-12.578	DUN	Sanctus 6
LEO	Sanctus 20	-11.863		
		-9.353	DUN	Gaude 52
LEO	Gloria 10	-7.524		
		-7.352	DUN	Sancta 47
		-7.149	DUN	Agnus 14
		-6.592	DUN	Quam 44
		-6.541	DUN	Regina 38
		-4.115	DUN	Salve 45
		0.089	DUN	Gloria 43
		1.014	DUN	Gloria 9
LEO	Credo 19	2.458		
LEO	Anima 25	3.660		
LEO	Mater 23	4.056		
LEO	Salve 14	6.087		
LEO	Credo 13	6.179		
LEO	Salve 10	6.686		
LEO	Gloria 16	9.319		
LEO	Regina 19	18.129		
LEO	Sanctus 15	20.715		
(LEO	AVERAGE	22.804)		
LEO	Quam 26	24.217		
LEO	Ibo Michi 24	27.101		
LEO	Gloria 18	32.992		
LEO	Credo 14	33.284		
LEO	Credo 18	50.711		
LEO	Anima 18	68.140		
LEO	Credo 11	82.056		

MELODIC STRUCTURE

This chapter of the investigation concerns the intervallic structure of melodies, each voice-part of a composition having been subjected to a separate analysis. Successive notes in the melody were compared and the interval between them computed. Intervals with an intervening small rest marking a phrase end were included, but not those where the rest is sufficiently long to render the melody severely disjointed, as when the other involved parts perform a duet.

The computer programme performing the analysis was designed to classify intervals as species of major, minor etc. The prepared melody files take into account all sharps and flats transmitted by the sources, including both key signatures and accidentals added in the course of the piece, as discussed on p.30, though in performance these pitches would probably have been modified according to the traditions of musica recta and musica ficta. Despite much modern discussion of these processes, there is still no complete understanding of contemporary practice, so it is impossible to perform an analysis which takes it into account. For this reason, the figures obtained could be slightly inaccurate and so most of the observations to be made are based on the collective figures for each interval type, for example all thirds irrespective of species. The results, abbreviated in this way, are listed in Appendix 3.

The use of plainsong in some compositions might be

expected to govern the melodic structure. In fact, where a chant is employed in paraphrase in an upper voice, the results are indistinguishable from those of freely-composed melodies. The borrowed melody in these cases is often decorated to such an extent that the result must reflect the composer's personal style. It is quite possible that amongst those melodies thought to have been freely-composed some may have been based on an as yet unidentified chant. It has therefore not been considered necessary to treat any of these voices differently.

Where the chant is used undecorated in the tenor, as in the isorhythmic technique, the intervallic structure is not representative of the composer's style (except in as much as that he had free choice of the portion of chant to be employed). Also, in pieces with a slow-moving tenor, the number of notes appearing is often not sufficient on which to perform a meaningful statistical analysis and the results are anomalous. The lowest voice is therefore not a good indicator of personal compositional technique in this corpus (though Morehen has used it as a basis for defining Byrd's style).[30]

The structure of a typical voice is easily visualized in the form of a graph. Figure 6 is that for voice I of Leonel's motet Anima mea (CMM50i no.18). Ascending intervals are indicated above the x-axis and descending intervals below. That melodic movement is largely

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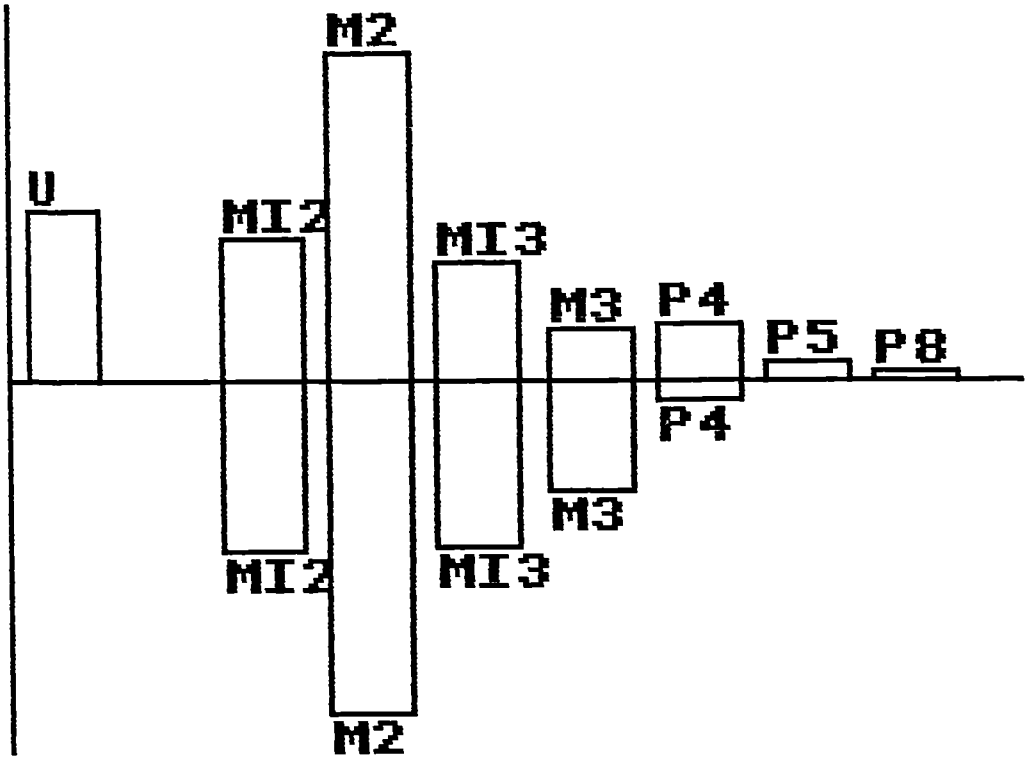
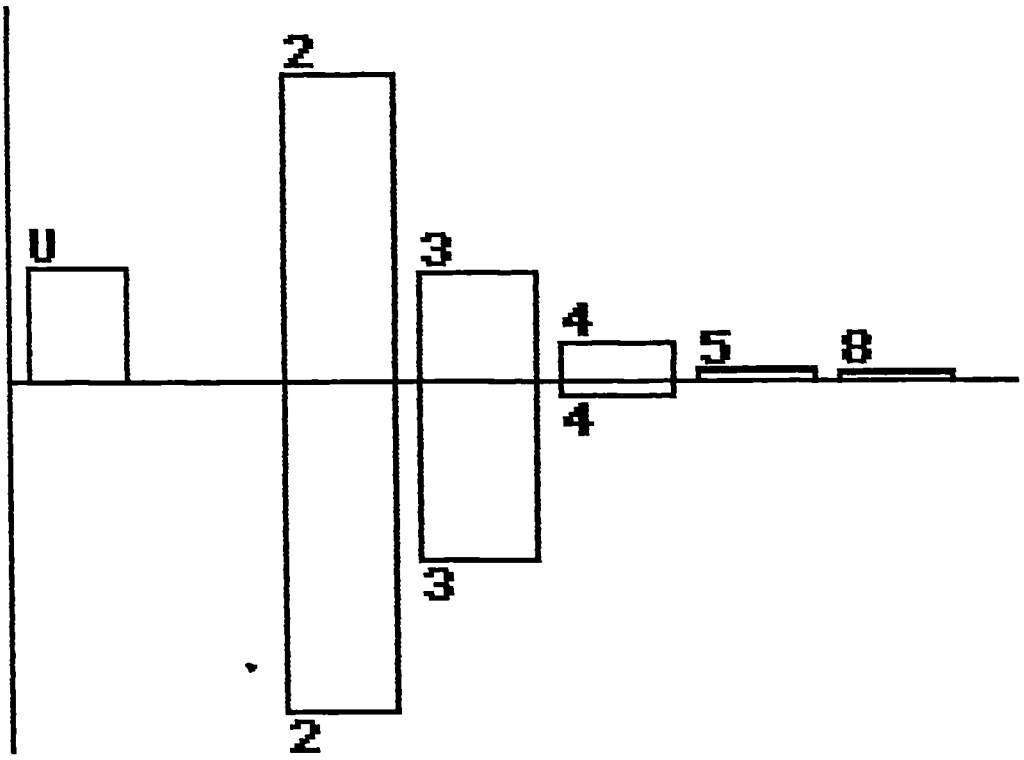
[30] John Morehen: 'Byrd's Manuscript Motets: a New Perspective' in Byrd Studies, Ed. Alan Brown and Richard Turbet, (Cambridge, 1992), pp.51-62.

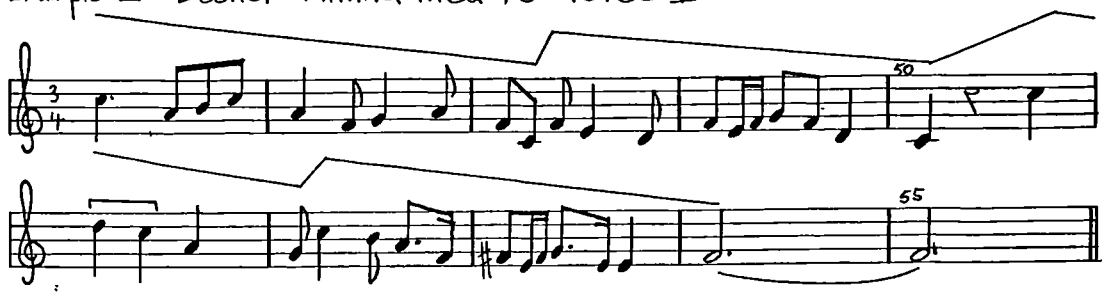
Figure 6 Melodic intervals in Leonel's Anima 18 voice I





stepwise is obvious from any brief survey of the music in score. In this motet over 62% of intervals are a second. The overall average for the upper voices in Dunstable is 56% and in Leonel 60%. Large intervals tend to be ascending ones and consequently the stepwise movement has a downward bias. The melodic contour thus often takes on a 'sawtooth' appearance, phrases beginning by upward leap and continuing by descending steps. This is illustrated in E ample 2. In this voice, the mean interval sizes for ascending and descending movement are 2.55 and 2.40 steps respectively. The ratio of descending to ascending movement is 1.11 - a typical value.

Example 2 Leonel Anima mea 18 Voice I



In general, the larger the interval, the less commonly it occurs. It is usual to find an occasional ascending octave, but other intervals of over a fifth are quite rare, occurring only once in every three hundred notes (0.36 percent of intervals). Table 21 shows the mean rates of occurrence for these rare interval types in three-part compositions by Dunstable and Leonel. Descant and isorhythmic pieces are excluded.

There are many more large intervals in voice II than in voice I. Many indications are present in the music of

Table 21 Occurrence of rare melodic interval types (hundredths of a percent)

		ascending			/	descending		
		6th	7th	8ve	9th	-6th	-7th	-8ve
VOICE I								
mid-phrase	DUN	2		3				
	LEO	3		3				
intervening	DUN	3	1	18	1			
rest	LEO	1	6	16				
between	DUN			2				
sections	LEO							1
total	DUN	5	1	23	1			
	LEO	4	6	19				1
VOICE II								
mid-phrase	DUN	17	15	67		1	1	17
	LEO	22	19	58				15
intervening	DUN	4	18	36	1	1		1
rest	LEO	6	11	17		4	2	2
between	DUN			3				
sections	LEO	2				2		2
total	DUN	21	33	106	1	2	1	18
	LEO	30	30	75		6	2	19
VOICE III								
mid-phrase	DUN	6	8	90				
	LEO	12	9	47				3
intervening	DUN	4	2	14			2	
rest	LEO		3	15				3
between	DUN	4	4	23				
sections	LEO			18				
total	DUN	14	14	127			2	
	LEO	12	12	80				6

	6th	7th	8ve	9th	-6th	-7th	-8ve
	ascending			/	descending		

this period that the method of successive composition in which each voice was written in turn against the tenor was giving way to a more harmonic viewpoint in which all the parts had to be considered in combination.[39] The use of larger, less melodic intervals in voice II indicates that the smoothness of this part was considered to be less important than that of voice I and also less important than its function as a harmonic 'filler'. The early pieces of Leonel exhibit a much smoother line in voice II than do his later works, reflecting this change in emphasis.

Dunstable, on average, uses more ascending octaves than does Leonel, especially in the lower voices, but the levels in individual compositions are too low to be a reliable indicator of authorship. However, the overall use of large intervals in the upper voices combined is a little greater in Leonel than in Dunstable (average levels 0.43% and 0.31% respectively). The distribution is shown in Table 22.

Sometimes, especially in Dunstable, large intervals seem to have a thematic function, appearing more than once in the same context and/or at the same pitch within a single piece. This is most obvious in the isorhythmic motets where repeats of a tenor color are often harmonized in a similar way. For example, in Albanus roseo (MB8 no.23) an ascending seventh from G to f occurs seven times in voice II. Whilst amplifying the effect, the reharmonizations are not solely responsible for the

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[39] See Bonnie J. Blackburn: op. cit.

Table 22 Presence of large rare intervals in voices I and II

		0.00	DUN	Kyrie 1
		0.00	DUN	Gloria 2
		0.00	DUN	Gloria 4
		0.00	DUN	Magnificat 36
		0.00	DUN	Ave 37
		0.00	DUN	Gloria 43
		0.00	DUN	Sancta 48
		0.00	DUN	Speciosa 50
LEO	Salve 14	0.00		
LEO	Credo 19	0.00		
		0.13	DUN	Regina 38
LEO	Gloria 16	0.13		
		0.15	DUN	Crux 39
		0.15	DUN	O Crux 53
LEO	Gloria 18	0.15		
		0.16	DUN	Sanctus 13
		0.17	DUN	Sanctus 6
		0.18	DUN	Gaude 52
		0.19	DUN	Credo 8
		0.20	DUN	Gloria 9
LEO	Anima 18	0.21		
LEO	Credo 14	0.24		
LEO	Regina 19	0.26		
LEO	Sanctus 20	0.26		
		0.29	DUN	Quam 44
LEO	Credo 18	0.32		
		0.33	DUN	Gloria 7
		0.42	DUN	Sub tuam 51
LEO	Credo 13	0.44		
		0.45	DUN	Sancta 49
LEO	Ibo 24	0.50		
		0.55	DUN	Credo 5
LEO	Anima 25	0.56		
LEO	Gloria 10	0.59		
		0.60	DUN	Sancta 47
LEO	Salve 10	0.62		
		0.64	DUN	Salve 45
LEO	Sanctus 15	0.69		
		0.70	DUN	Agnus 14
LEO	Mater 23	0.76		
LEO	Credo 11	0.77		
		0.95	DUN	Ave 35
LEO	Quam 26	1.22		
		1.77	DUN	Salve 46

multiple appearances of this progression, which is present against all three tenor colors. The phenomenon is also found in non-isorhythmic compositions such as Salve Regina (MB8 no.46) which has seven instances of a rising seventh C-b in different contexts. The thematic link can extend to paired mass movements, serving to strengthen the unification between them and therefore the claim to common authorship. Dunstable's Gloria and Credo on Jesu Christe Fili Dei (MB8 nos.15-16) each have two instances of a rising seventh from C to b in voice II. Though both are composed over an identical tenor, the progression is, surprisingly, not associated with reharmonization in this case. Repeated large intervals are just the most obvious aspect of a more widespread use of melodic repetition and variation, a subject which deserves more detailed study.

Often, the large intervals are found between the last note of one section of music and the first note of the next, especially in voice III. It is debatable whether these should be regarded as part of the melodic line. Many others have an intervening rest marking the end of a melodic phrase. Most of those occurring in voice I are of this type, outnumbering those occurring mid-phrase by more than four to one. In voice III the picture is reversed. Voice II has more than twice as many mid-phrase large intervals as those between phrases, again showing that a smooth melodic line is less important here than in the top voice.

Table 21 confirms that, as discussed above, descending large intervals are much less numerous than

ascending ones. This comparison extends to fourths and fifths. Descending seconds and thirds are, however, more numerous than ascending ones. This reflects the general tendency towards descending phrases separated by upward leaps. To measure this tendency, the mean ascending and descending interval size has been calculated for each voice and compared. The ratio of these sizes averages 1.07 for both voice I and voice II and is the same for both composers, so cannot be used to differentiate between them.

The number of unisons present reflects the amount of declamation in the melody. In voice I Dunstable occasionally uses quite a high level, for example in his Credo MB8 no.5. Music with 20% or more unisons in this voice is more likely to be by him than by Leonel.

In voice I the only specific interval type which varies sufficiently between the two composers to allow differentiation of their styles is that of an ascending fifth. The levels of this interval in the ascribed pieces are given in Table 23. The mid-point between the averages for Dunstable and Leonel is 0.705%. A higher result than this favours Leonel as composer, a lower result favours Dunstable. In this way, 74% of cases correctly predict the author. However, it is noteworthy that there is a small concentration of Dunstable's compositions giving a high result. This produces a polarization of figures for his music.

The structure of voice I is seen to be very similar in all other respects for both composers. Consideration

Table 23 Percentage level of melodic ascending fifths in voice I

		0.00	DUN	Kyrie 1
		0.00	DUN	Magnificat 36
		0.00	DUN	Ave 37
LEO	Gloria 18	0.00		
		0.17	DUN	Gloria 15
		0.19	DUN	Gloria 2
		0.24	DUN	Regina 38
		0.25	DUN	Sancta 47
		0.27	DUN	O Crux 53
LEO	Gloria 10	0.27		
		0.28	DUN	Sanctus 6
LEO	Mater 23	0.47		
		(0.55	DUN	AVERAGE)
		0.59	DUN	Salve 46
		0.63	DUN	Gloria 7
		0.64	DUN	Gloria 4
		0.65	DUN	Crux 39
		0.66	DUN	Speciosa 50
LEO	Credo 14	0.69		
		0.71	DUN	Quam 44
		0.72	DUN	Sub tuam 51
		0.72	DUN	Agnus 14
		0.74	DUN	Gloria 9
		0.74	DUN	Gloria 43
		0.75	DUN	Sanctus 13
		0.76	DUN	Credo 8
LEO	Salve 10	0.77		
		0.78	DUN	Sancta 49
LEO	Gloria 16	0.78		
LEO	Credo 18	0.78		
LEO	Regina 19	0.78		
LEO	Sanctus 20	0.81		
(LEO	AVERAGE	0.86)		
LEO	Credo 11	0.93		
LEO	Anima 25	0.99		
LEO	Sanctus 15	0.99		
LEO	Credo 13	1.07		
LEO	Anima 18	1.08		
		1.15	DUN	Credo 16
		1.23	DUN	Sancta 48
		1.41	DUN	Gaude 52
		1.52	DUN	Credo 5
LEO	Ibo 24	1.52		
		1.97	DUN	Salve 45
LEO	Salve 14	2.04		
		2.08	DUN	Ave 35
LEO	Quam 26	2.12		
LEO	Credo 19	2.34		

of the other interval types does not increase the separation of values. For voice II, however, more overall differentiation is possible. Hughes recognized the idiosyncrasy of this voice when he suggested that it might be possible to date compositions by the style of the contratenor.[40] The differences which can be shown to exist between Leonel and Dunstable in this respect are probably due to the changing nature of this voice. Though the data have been analysed in many different ways, a similar manipulation to that used in calculating chord differences (see pp.98-99) produced the greatest separation of results.

The calculation of interval differences excludes intervals of a sixth and over as these have already been considered in the previous paragraphs and duplication of information would produce a bias in the testing. Ascending and descending intervals of a second, third, fourth and fifth are included. For each piece, the levels are compared with the difference of the averages for each composer. A positive result indicates composition in the style of Leonel and a negative result in the style of Dunstable. This collective interval method is possibly more reliable as an indicator of authorship than that using only a single interval type.

Separation of the two composers is quite successful, though less so than that obtained with chord differences. This is probably because fewer interval classes than chord

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[40] Andrew Hughes: 'Some Notes on the Early Fifteenth-Century Contratenor' in M&L, vol.50 (1969), pp.376-387.

TABLE 24 Interval differences voice II

		-1.417	DUN	Sancta 48
		-0.950	DUN	Agnus 14
		-0.914	DUN	Speciosa 50
		-0.888	DUN	O crux 53
		-0.838	DUN	Gloria 4
		-0.817	DUN	Salve 46
		-0.667	DUN	Gaude 52
		-0.660	DUN	Gloria 9
		-0.651	DUN	Gloria 15
LEO	Sanctus 15	-0.594		
LEO	Anima 18	-0.582		
		-0.552	DUN	Gloria 43
		-0.436	DUN	Ave 37
		-0.422	DUN	Credo 16
		-0.400	DUN	Sanctus 13
		-0.399	DUN	Credo 5
		-0.396	DUN	Gloria 7
		-0.387	DUN	Sanctus 6
		(-0.339	DUN	AVERAGE)
		-0.137	DUN	Gloria 2
		-0.106	DUN	Regina 38
		-0.105	DUN	Sancta 47
		-0.065	DUN	Salve 45
		-0.043	DUN	Crux 39
		-0.032	DUN	Kyrie 1
LEO	Credo 18	0.006		
		0.007	DUN	Sub Tuam 51
LEO	Credo 19	0.008		
LEO	Anima 25	0.009		
LEO	Regina 19	0.015		
		0.028	DUN	Magnificat 36
LEO	Mater 23	0.108		
		0.155	DUN	Ave 35
LEO	Credo 13	0.165		
LEO	Gloria 18	0.193		
		0.219	DUN	Credo 8
LEO	Salve 10	0.293		
(LEO	AVERAGE	0.339)		
LEO	Credo 14	0.381		
LEO	Salve 14	0.405		
LEO	Credo 11	0.498		
LEO	Gloria 16	0.669		
LEO	Gloria 10	0.676		
LEO	Ibo 24	0.720		
		0.915	DUN	Quam 44
LEO	Sanctus 20	1.459		
		1.543	DUN	Sancta 49
LEO	Quam 26	1.928		

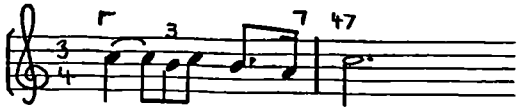
types are involved, leading to the figures produced being quite small in value. However, authorship is correctly identified in 82% of the attributed works (see Table 24).

The sequence of intervals in a melody is a topic which deserves study. Certain melodic structures have been recognized as being characteristic of the English school during this period. One is a rising triadic opening. From the tables of interval frequencies it can be calculated that a rising third appears, on average, about once in every ten intervals. Its incidence at the beginning of a composition is higher than this, though the values for Leonel and Dunstable are similar at about one in three. The probability of two consecutive rising thirds would, by chance, be one in a hundred, yet three of our central Dunstable compositions begin in this way. Many more follow the rough outline of a triad, though here the calculation of probabilities becomes difficult; how many intervening notes are allowable before the pattern ceases to be triadic? This highlights the main problem in a statistical analysis of melody. Patterns which would appear similar to the eye would be discounted by a computer if a single intervening note varied.

Another common phrase beginning is a falling third. 23% of pieces open in this way, again a higher proportion than would happen by chance. In Dunstable this is usually followed by a further downward step of a second; the pattern in Leonel is more variable. This could be a factor in differentiating their styles, although as some melodies are based on chant its value is uncertain.

The so-called 'English figure', a melodic pattern associated with cadences, has often been discussed.[41] The most basic form, as in Example 3, is associated with coloration, though many variations on the figure appear. Again, the progression is a characteristic of English compositions in general and was employed by both Dunstable and Leonel, though a little more frequently by the former. During an investigation of cadence types (see p.123) its presence was noted in around 78% of Dunstable's and 59% of Leonel's pieces. Alone, it cannot serve as a marker of their individual styles but is potentially useful in evaluating compositions with conflicting ascription to continental composers.

Example 3 Dunstable Salve 46



[41] See, for example, Charles Hamm: A Chronology of the Works of Guillaume Dufay, (Princeton, 1964), especially pp.52-53, 94.

TEXT

A study of the treatment of text does not produce a great deal which is useful to differentiate the music of Dunstable and Leonel. Their choice of texts seems to have been rather limited; all the motets are sacred in nature, none being on a political theme as is sometimes the case in Dufay. A noticeable emphasis on Marian subjects reflects the contemporary cult of the Virgin but otherwise the selection of subject matter is unremarkable and nothing obviously divides the two composers.

That textual considerations were of little importance in this period is verified by the inconsistency of underlay; it is often very vague with different manuscripts being at variance in their positioning of the words. Bukofzer, in his edition of Dunstable's works, often modified the underlay to correspond with that of the borrowed plainsong or to take into consideration matching motifs between voices. There is no evidence to suggest that fifteenth-century musicians would have taken pains to be so accurate. No doubt the underlay is more often a reflection of scribal practice rather than composer intention. It is, therefore, questionable whether its study would reveal any useful information.

A further disregard for clear articulation is demonstrated in the polytextual nature of the isorhythmic motets. A similar effect is achieved in settings of the Credo which telescope the text in order to limit the length of the movement. This was a characteristic feature

of English mass settings in general and was used by both Dunstable and Leonel, although Dunstable also uses the technique in two Glorias.

Obvious correlations between text and style are lacking, the overall mood of the music rarely reflecting that of the changing subject-matter. The difficulties of ascertaining the correct underlay (compounded by the well-intended interference of modern editors) make word-painting impossible to assess in transcription. In one example where the present writer has had cause to study the original manuscript,[44] the word 'morte' appears to be associated with an accented appoggiatura. It could also have been intentional that Dunstable's Credo on Jesu Christe Fili Dei (MB8 no.16) sets the words 'descendit' (bb.68-70) and 'ascendit' (bb.96-97) to falling and rising figures respectively, but in other places similar associations seem to be absent, even in the most likely situations. A cursory appraisal of the music of Dunstable and Leonel does not reveal any difference between them in this respect, so further investigation was deemed unwarranted, especially as word-painting, if it did exist, would be very difficult to quantify.

One characteristic which can easily be measured, however, is the density of text within a composition or, in other words, the amount of music set to a given length of text. Texting of the lower voices is erratic; sometimes they are given text, sometimes just an incipit

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[44] The Kyrie Lux et origo, possibly by Leonel, b.59. A transcription is given in the appendix to Part Two.

and sometimes no indication at all. Also, they vary in nature, sometimes resembling the free-flowing top voice, and sometimes being so unvocal as to lead many past writers to hypothesize an instrumental execution. Due to these problems and uncertainties, and to ensure easy comparison of different pieces, the density of text in voice I only will be considered here. One composition by Dunstable (MB8 no.34) is untexted and so excluded from consideration.

The number of syllables given to the top voice in each composition has been counted. From this, the number of notes per syllable and also the number of minims per syllable can be calculated. An 'Amen' at the end of a piece is very often given a more extended melismatic treatment than the rest of the text. This produces a distorted figure for the general density of text. The 'Amen' portions have, therefore, been excluded from the calculations.

The results are shown in Table 25. As can be seen, the variety is too large to help indicate authorship in all individual cases, although a few conclusions can be m de. The number of minims per syllable gives larger results and a slightly greater separation between the two composers, so the figures quoted hereafter will concern this ratio. Dunstable on average spreads his text a little more thinly than Leonel. Fourteen or more minims per syllable points to composition by him. The mean results for each composer are shown below.

Table 25 Text Density in voice I

	notes per syllable	minims per syllable
DUNSTABLE		
Kyrie 1	8.88	16.47
Gloria 2	3.15	6.62
Gloria 4	2.26	5.13
Credo 5	1.16	2.05
Sanctus 6	7.44	10.67
Gloria 7	1.79	3.11
Credo 8	1.42	2.25
Gloria 9	2.64	5.89
Gloria 11	2.82	5.40
Sanctus 13	8.38	18.04
Agnus 14	5.96	11.24
Gloria 15	3.31	4.88
Credo 16	1.94	3.02
Credo 17	1.73	3.56
Ave 35	2.22	4.36
Magnificat 36	2.72	4.18
Ave 37	5.07	11.11
Regina 38	10.32	19.75
Crux 39	7.86	13.59
Gloria 43	2.82	6.05
Quam 44	1.53	2.80
Salve 45	3.32	6.31
Salve 46	3.63	7.09
Sancta 47	2.09	4.46
Sancta 48	4.00	6.85
Sancta 49	5.41	10.90
Speciosa 50	2.35	3.99
Sub tuam 51	6.75	16.59
Gaude 52	2.80	5.05
O crux 53	3.04	5.62
LEONEL		
Salve 10	2.52	4.93
Gloriose 12	2.32	5.07
Salve 14	4.43	8.45
Anima 18	3.02	5.53
Regina 19	5.71	12.00
Mater 23	9.00	13.92
Ibo 24	2.67	5.94
Anima 25	3.33	4.71
Quam 26	2.59	3.97
Gloria 10	1.82	2.40
Credo 11	1.62	2.61
Credo 13	2.13	2.29
Credo 14	1.90	2.05
Sanctus 15	8.84	13.57
Gloria 16	2.17	2.99
Gloria 18	2.10	3.31
Credo 18	2.16	3.44
Credo 19	1.49	1.54
Sanctus 20	5.69	13.02
Sanctus 21	4.10	12.69

	Dunstable	Leonel
mass movements	7.02	5.45
motets	8.04	7.17
overall	7.57	6.22

Only when comparing pieces on the same text can an accurate comparison of the composers be made. This is possible using mass settings, especially those of the Gloria and Credo as enough of these are known to give a clear picture.

	LEO	Gloria 10	2.40			
	LEO	Gloria 16	2.99			
			3.11	DUN	Gloria 7	T
	LEO	Gloria 18	3.31			
			4.88	DUN	Gloria 15	
			5.13	DUN	Gloria 4	T
			5.40	DUN	Gloria 11	
			5.89	DUN	Gloria 9	
			6.62	DUN	Gloria 2	
T	LEO	Credo 19	1.54			
T	LEO	Credo 14	2.05			
			2.05	DUN	Credo 5	
			2.25	DUN	Credo 8	T
	LEO	Credo 13	2.29			
	LEO	Credo 11	2.61			
			3.02	DUN	Credo 16	
T	LEO	Credo 18	3.44			
			3.56	DUN	Credo 17	T

As can be seen, the separation for the Gloria movements is almost complete. A figure for a Gloria of less than three minims per syllable points to Leonel as composer. On the other hand, a figure of more than four points to Dunstable.

Settings of the other mass movements (Kyrie, Sanctus and Agnus) survive in too few numbers to make a reasonable comparison of the composers. Those which are available, as might have been expected from the short text, have a

large number of minims to the syllable. In comparison, the Gloria and Credo are very long texts and are set in the most compressed way. It might have been thought that where telescoping is employed in these movements, greater room would have been given for a more melismatic treatment. In reality, the telescoped movements (indicated 'T' above) are often the most syllabic.

CADENCES

Phrase lengths are generally short in the music of Dunstable and Leonel, so a large proportion of any composition consists of the preparation and execution of cadences. These progressions are therefore so important that no comprehensive study of the corpus can be complete without considering them, although to do so is problematic, mainly due to the difficulties of defining the term 'cadence' as it relates to this historical period. A quantitative analysis must attempt such a definition, although for several reasons the task is not as straightforward as might initially be thought. Many different cadential formulae occur in the music and it is sometimes difficult to say whether a cadence was intended at any particular point. Most textbooks can afford to select convenient isolated examples as illustrations of the norm (leading students to a necessarily simplified view of the music), but an analysis of a complete corpus cannot ignore unusual instances.

Wienpahl conducted a survey of cadences in order to trace their development through the course of the fifteenth century.[43] Although not expressly stated, he seems to have overcome the problem of defining cadence points by examining only the final cadence of each composition. This method has the advantage of consistency

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[43] Robert W. Wienpahl: 'The Evolutionary Significance of 15th Century Cadential Formulae' in JMT, vol.4 (1960), pp.131-152.

but misses out on accuracy as the overall use of more advanced formulae is underestimated. It is perhaps natural for composers to have fallen back on well-worn progressions with which to conclude a piece, rather than new or experimental ones.

A cadence should occur at the end of a phrase. Sometimes a cadential formula occurs mid-phrase and a subjective judgement must be made as to whether the term 'cadence' is applicable in each case. Such subjectivity need not invalidate any conclusions of the investigation so long as the problem is acknowledged and an effort is made to keep judgements consistent throughout. However, it may be difficult for different workers to reproduce the same results, as a degree of personal interpretation is inevitable.

In contrast, phrases and even whole musical sections occasionally end with very strange progressions which do not resolve or sound even remotely cadential. This happens most often in isorhythmic pieces where the structure is dictated by form and not phrase; many phrase-endings cannot cadence properly because of the configuration of the tenor melody. Also, slow-moving harmonies over a static bass do not allow frequent cadence points (although often giving the illusion of modern perfect and imperfect cadences at places where the harmony does change but where no cadence is intended). However, the phenomenon is not restricted to isorhythmic works.

Due to the variability in cadential formulae and the other problems discussed above, the locating of cadence

points by computer was considered to be more complicated than the 'by hand' method and therefore not employed. It must be admitted that, in consequence, the results are open to possible error, though extensive checking has been carried out. In order that no information be overlooked, it was decided to record every progression that could be even remotely cadential and also every progression occurring at a phrase end, whether a standard cadential pattern or not. For each occurrence the following points were noted, together with any other interesting observations:

i) Number of parts involved;

ii) Type of progression;

iii) Finality of the cadence;

iv) Whether a rest follows in voice I;

v) The approach chords;

vi) The movement of parts after the cadence;

vii) The cadence pitch;

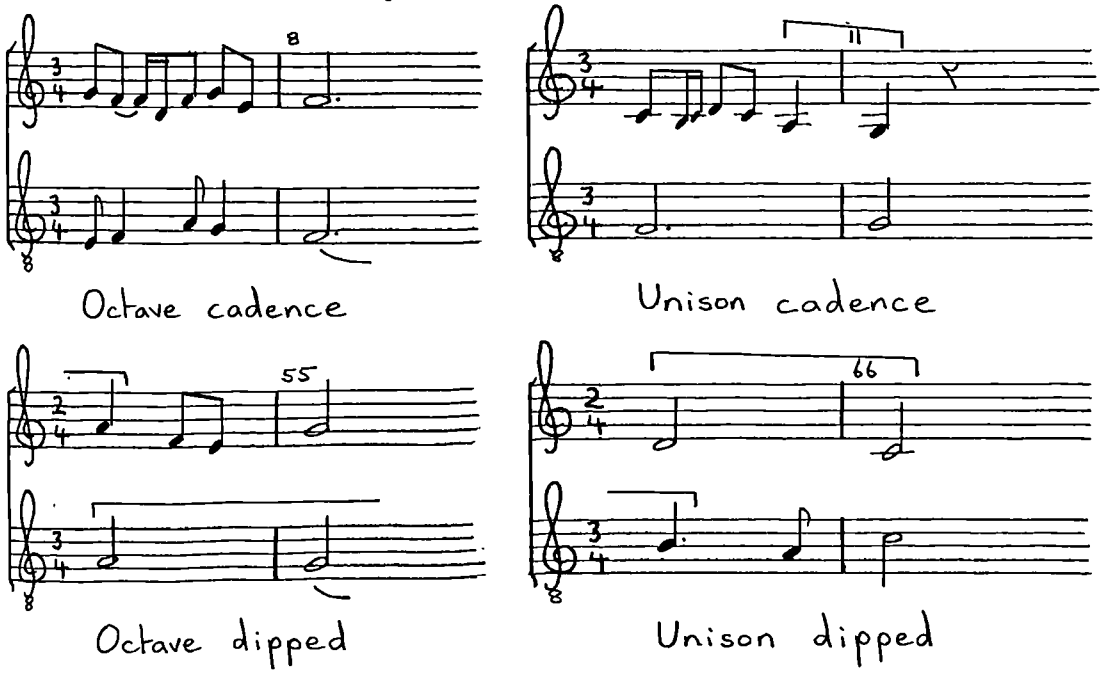
viii) The presence of the 'English figure'.

It was not considered appropriate to reproduce all this information here, mainly because of the amount of space it would cover. Also, none of it is obscure, and so can easily be observed from a score, unlike the computer-derived measurements of previous chapters. Some specific examples will be described in the following text, but mostly it will be sufficient to quote general rates of occurrence of the various progressions.

TWO-PART CADENCES

The description of the earliest cadence, an 'occursus' or coming together of parts whereby a unison or octave is approached by step in contrary motion, is still adequate to deal with most of the two-part writing of the fifteenth century. Often, the ascending voice dips a degree lower before resolving upwards, now by a third. This is most common in octave cadences, applying to the upper voice, although occasionally also occurs in the unison type, applying to the lower voice. For illustrations of all these types see Example 4.

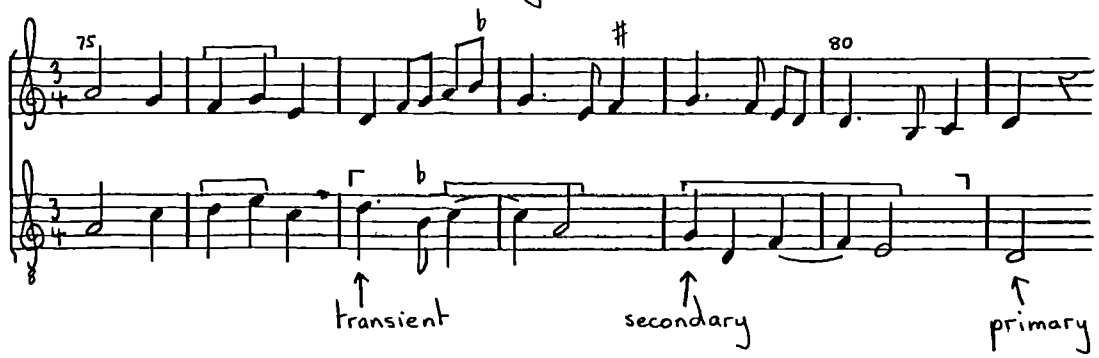
Example 4 Leonel Regina celi 19



Sometimes, where two and three-part phrases overlap, another voice enters at the cadence point, producing a three-part chord.

Not all unisons and octaves are necessarily cadences. Those approached by leap have been eliminated in an attempt to simplify the data collection, although an occasional phrase does end by leap, for instance by an upward fourth in the lower part. It was found useful to divide the remaining instances into three groups depending on the degree of finality of the progression (see Example 5). The first consists of main cadence points occurring at phrase ends, indicated by an ensuing rest or the end of a section of music. They resolve on long notes in relation to the general flow of the music. Secondary cadences are taken to be those occurring with no rest following but nevertheless with some pause in the flow of the music and/or a melodic preparation and increase of tension typical of a cadence. Tension is produced by an increased rate of flow of the parts and the presence of dissonance which is then resolved at the cadence point. The third category contains those transient progressions producing no halt in the musical flow and no melodic preparation. These are not considered to be true cadences and therefore not included in the following discussion.

Example 5 Dunstable Salve regina 45



A close inspection of the two-part writing of Dunstable and Leonel reveals no great differences in cadence type, although a few general trends are noticeable. Dunstable employs a slightly higher percentage of secondary cadences than Leonel (28% compared to 22%). Though the effect is difficult to quantify, his music also exhibits a clearer distinction between the two categories, the allocation of cadences to one or the other being more easily performed. The proportion of secondary cadences does vary considerably from piece to piece, and would only be of value in differentiating between the composers if a large sample of music was being considered, for example a whole mass.

Amazingly, the two composers gave the identical result of 18% unison cadences in the first category. However, Dunstable uses a larger proportion in the secondary type (40% compared to 27% for Leonel) which might in part explain the more distinct separation of categories.

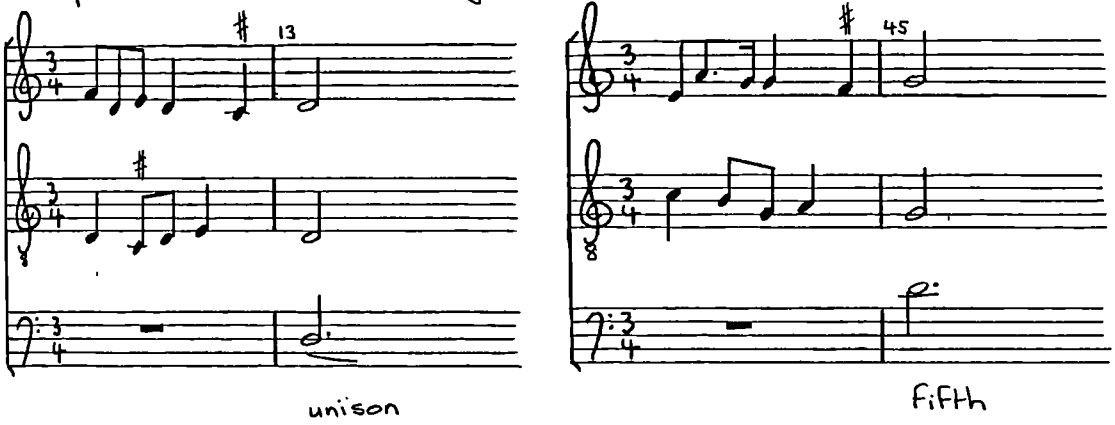
Leonel in both categories and Dunstable in his second category have 26% of cadences with a dip in the ascending voice. However, a larger proportion, 33%, of Dunstable's main cadences exhibit this characteristic. If it is reasonable to suppose that the dip increases the tension of preparation, thus producing a firmer cadence, the larger proportion of this type of progression also adds to the distinction of primary and secondary cadences in this composer. A high proportion of 'dip' cadences in any one piece, though, does not necessarily indicate composition

by Dunstable as the range of values is quite large. Leonel, in fact, exhibits the widest range; of his pieces containing dipped cadences, the proportion of octave cadences employing a dip varies from 10% to 75%, whilst for Dunstable the variation is between 25% and 65%. The numbers of these cadences might be of value only in assessing a large sample of music. A more useful marker appears to be the dipped unison cadence. It is characteristic of Dunstable, occurring several times in his music, whereas in Leonel only one example has been found.

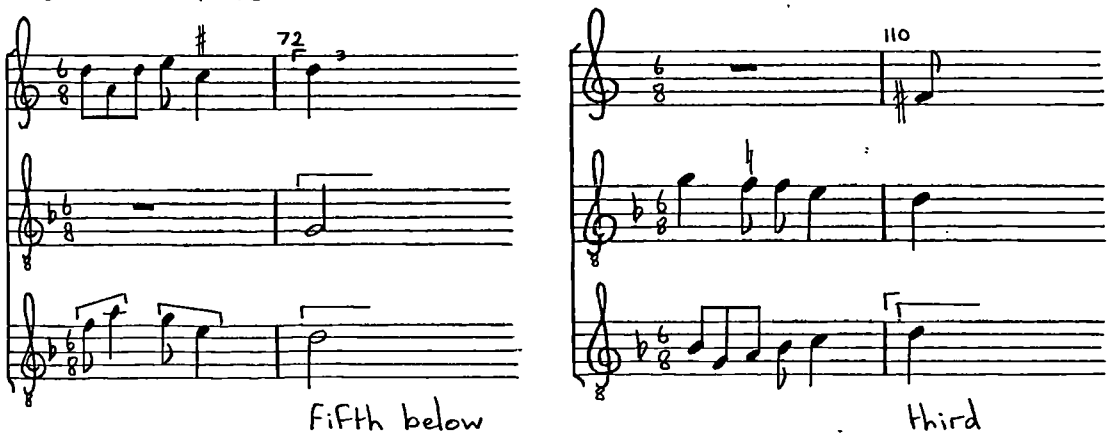
Due to the disposition of the tenor in isorhythmic compositions, these pieces employ many overlapping two- and three-part phrases and so a high proportion of their two-part cadences resolve onto a three-part chord. This occurs to a lesser degree in the non-isorhythmic compositions where 8% of Dunstable's two-part cadences are of this type. In Leonel the occurrence is double this, ie. 16%, due to the more fragmentary nature of his duet writing. Example 6 overleaf shows the various types of overlap employed.

In exactly two thirds of cases, Dunstable's added voice is on the same pitch as one of the cadencing voices. In the other instances he adds a fifth above the lower cadencing part. Leonel employs each of these methods in 30% of cases. However, he is more adventurous in the other instances. In 22% he adds a third above the cadence pitch. Dunstable does employ this interval on four occasions in the isorhythmic motets, but not elsewhere.

Example 6 Dunstable Ave regina 24



Leonel Credo 13



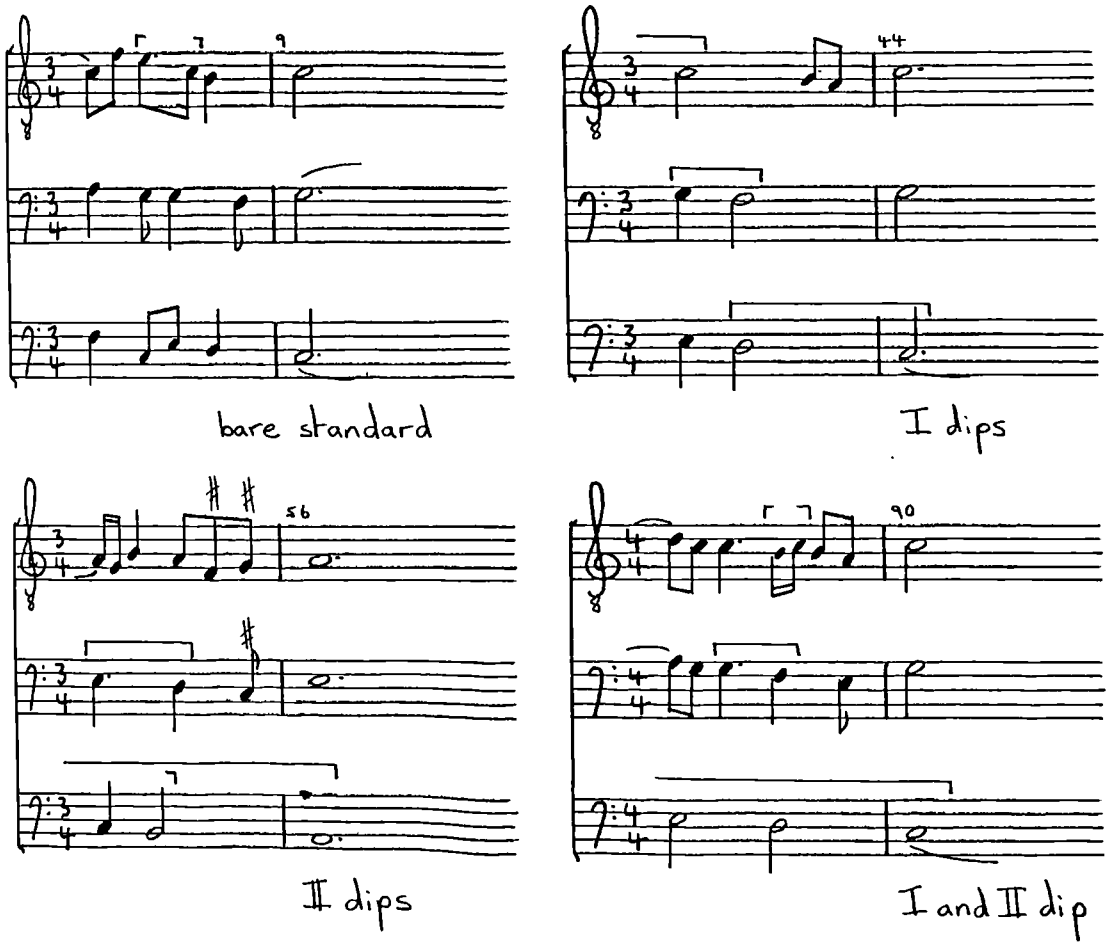
Leonel also employs the unexpected interval of an added fifth below the cadence pitch in 17% of cases.

THREE-PART CADENCES

The addition of a further voice to the two-part formula can produce many harmonic permutations. The one most consistently used during the mediaeval period has often been described. It occurs when the two cadencing voices move outwards to an octave whilst an added inner voice moves stepwise upwards onto the fifth degree above the

final. The sound of this cadence is affected by the species of interval by which the voices move. This is dependent upon the pitch of the cadence and any melodic inflections imposed by a key signature, accidentals or musica ficta. This cadence rarely appears in a bare form but is embellished rhythmically and/or melodically. Often, one or both of the upper voices dips a further degree lower before resolving upwards, as in the two-part writing discussed above. All these cadences will be described as the 'standard' type and are illustrated in Example 7.

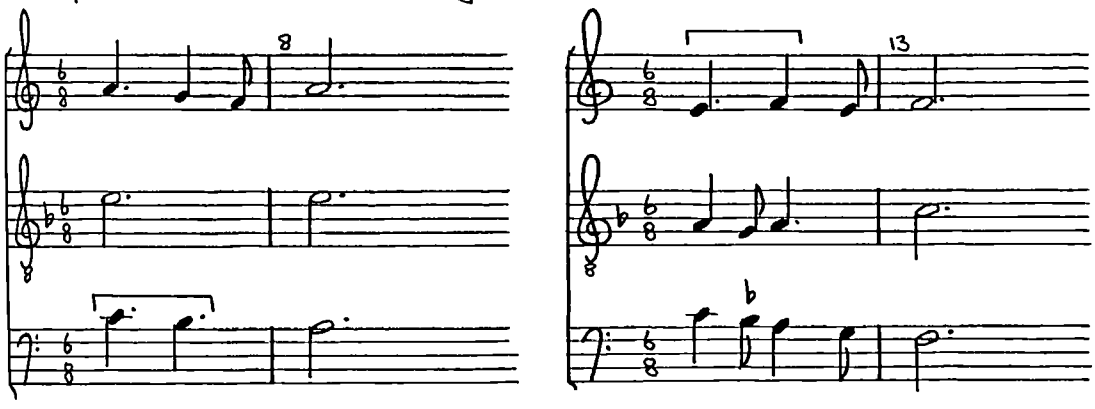
Example 7 Dunstable Gloria 2



The distribution of dipped cadences is similar to that in two-part music; they are more frequent overall in Dunstable but the level in individual pieces is more variable in Leonel. In the highest voice of standard cadences they occur in 38% of cases in the former composer and only 28% of cases in the latter. However, the highest level in any one composition is 77% for Dunstable and 100% for Leonel.

The descant music of Leonel uses this standard cadence type almost exclusively. Two interesting variations which appear only here are shown in Example 8. In the first, voice II remains static during the progression. The second illustrates other cruder forms which do not exhibit stepwise movement to the fifth.

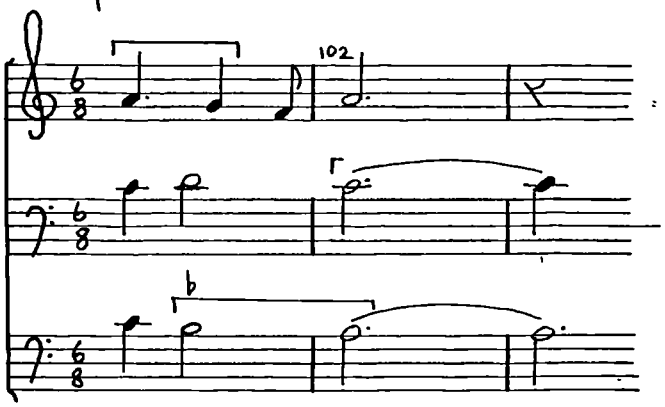
Example 8 Leonel Ave Regina 2



The most common cadence variation occurs when the middle voice moves onto the third degree above the cadence pitch to produce resolution onto an imperfect chord. It is difficult to decide in all cases whether to class this progression as cadential; it may have been used as a

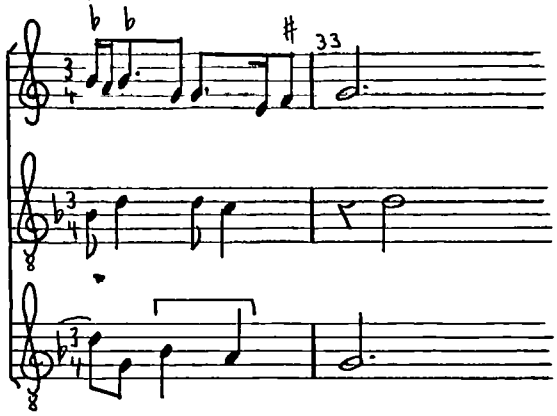
delaying tactic in a deliberate attempt to avoid a cadence by stringing out the phrase for a longer period. In any event, the number of occurrences in each composer is not very different, so does not differentiate between them. Of those cases which do seem to be cadential, there are about one for every twenty-four standard cadences in Dunstable and one for every thirty-two in Leonel (see Example 9).

Example 9 Dunstable Gloria 4



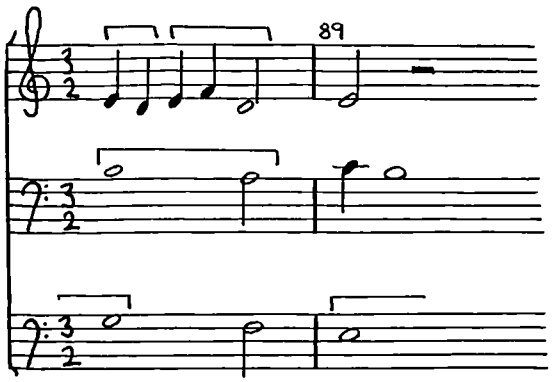
Two other variations on the standard cadence are to be found in the music of Dunstable. The first, as in Example 10, is a delaying of the entry of voice II by a

Example 10 Dunstable Sancta Dei 47



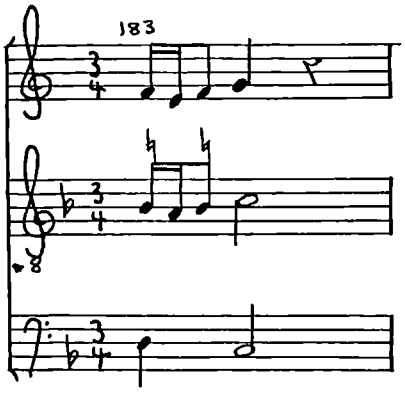
rest at the cadence point. The second, as in Example 11, also delays the resolution of voice II but by an appoggiatura from the note above. He uses the first type five and the second type six times. Leonel uses an appoggiatura of this type on one occasion only.

Example 11 Dunstable Gloria 4



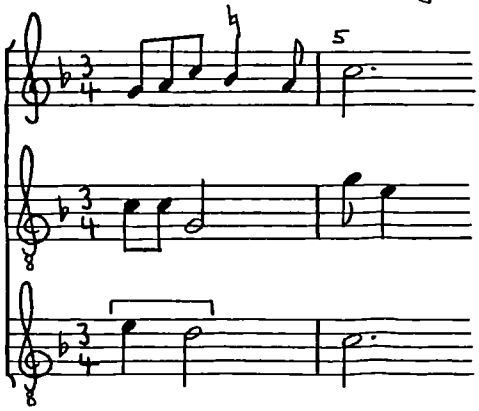
An inversion of the top two voices of the standard cadence produces a formula whereby the parts resolve onto a 12/8 chord (Example 12). This progression appears in roughly equal numbers in the music of Dunstable and Leonel. The same formula is often used to open a phrase.

Example 12 Dunstable Magnificat 36



Another, more advanced, cadence type has been described by other writers. In it, the added voice moves upwards by an octave, crossing the lower cadencing voice and landing again on the fifth degree above the final (see Example 13). The combination of the lower voices gives the illusion of a rising fourth at the bottom of the texture, similar to that in a modern perfect cadence. The progression will be described here as the 'octave leap' cadence. It is a characteristic of Dunstable's style; he employs it on sixteen occasions in his surviving music. Seven of these are in his isorhythmic compositions. The remaining nine are contained in six pieces and occur once for every thirty-seven standard cadences overall. Leonel does employ the cadence twice in his non-descant pieces, that is once for every 128 standard cadences.

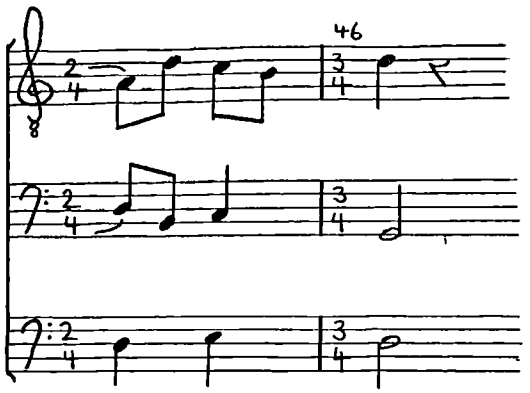
Example 13 Dunstable Kyrie I



Even more common are cadences which are more explicitly tonal in shape, though these forms are not usually noted as part of the styles of these composers. Example 14 shows the most frequently-met type in which the

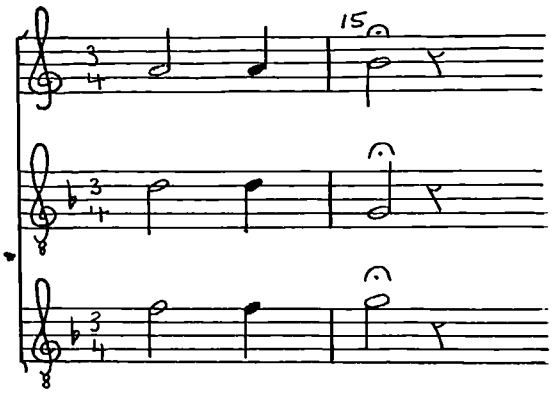
lowest part (often voice II) falls by a fourth. Usually the upper voices retain the octave cadence formula. The resulting chord on the cadence point is reminiscent of the overlapping two and three-part phrases in Leonel discussed above, where he adds a fifth below the cadence pitch. The voices sometimes abandon this movement to produce a true tonal-sounding cadence.

Example 14 Leonel Qvam 26



Another similar tonal-sounding type with a falling fifth in the bottom voice (Example 15) is equally common in Dunstable but there is only one instance in Leonel.

Example 15 Dunstable Sancta 47



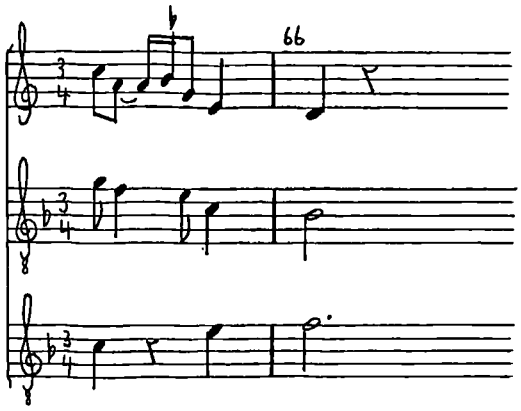
Frequencies of these tonal-sounding types compared with that of the standard cadence are:

	octave leap	IV-I	V-I
Dunstable	1 per 37	1 per 68	1 per 68
Leonel	1 per 151	1 per 151	

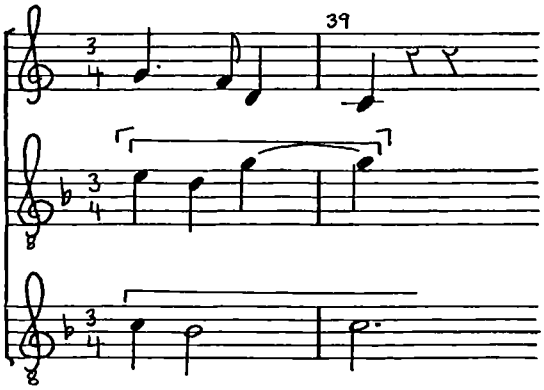
More rarely, unusual cadences occur which are difficult to classify as they cannot be described by a single formula, taking many different, possibly accidental, possibly experimental, forms. These cadences are not usually mentioned (or conveniently overlooked). However, the aim of this study is not to generalize style but to look for the unusual which may prove helpful in distinguishing individual styles. For example, a rather strange progression has been observed twice in Leonel's music. In Salve Regina CMM50i no.10 b.83 and the Sanctus CMM50ii no.16 b.51, voice II descends by an octave, crossing voice III to produce the illusion of a descending sixth in the bass.

A large proportion of phrases end with none of the cadences described above. For example, two of the voices sometimes move onto a unison as opposed to an octave. The other anomalous instances employ too wide a variety of progressions to mention each one individually, though the most common final chord in these cases is a triad in close position (Example 16). Leonel concludes his phrases more often with a bare fifth (5/1) chord than does Dunstable; fourteen instances have been found, i.e. one in twenty phrases end this way, whereas only one in 145 do so in Dunstable (Example 17). He also tends to use these

Example 16 Leonel Salve 14



Example 17 Leonel Anima 18



miscellaneous endings more often in prominent positions than does Dunstable, although 'prominence' is a difficult concept to measure. There is only one instance of Dunstable ending a section of music in this way.

The proportion of phrases with miscellaneous endings in each attributed composition has been calculated. A phrase is taken to end immediately before a rest in voice I or at the end of a section of music. Whether all such endings are considered or just those landing on a close position triad, pieces by Leonel contain a larger percentage than those by Dunstable (see Tables 26 and 27). 10% or less of these phrase endings is indicative of composition by Dunstable. More than 45% miscellaneous endings or 43% close position endings would indicate composition by Leonel. In both cases, 32% of attributed pieces can be allocated to these areas.

Table 26 Phrases with Miscellaneous Endings (%)

LEO	Credo 18	79		
LEO	Anima 18	67		
LEO	Gloria 18	67		
LEO	Quam 26	56		
LEO	Credo 11	56		
LEO	Mater 23	50		
LEO	Ibo 24	50		
		45	DUN	Credo 5
LEO	Gloria 10	42		
		40	DUN	Crux 39
		38	DUN	Speciosa 50
LEO	Credo 13	37		
LEO	Credo 19	36		
LEO	Gloria 16	34		
		33	DUN	Gloria 2
		33	DUN	Ave 35
		32	DUN	Magnificat 36
LEO	Anima 25	30		
LEO	Credo 14	29		
		29	DUN	Kyrie 1
		26	DUN	Sub tuam 51
		26	DUN	Sanctus 13
LEO	Salve 14	25		
		25	DUN	O crux 53
		25	DUN	Sancta 47
LEO	Sanctus 15	23		
LEO	Salve 10	22		
		22	DUN	Quam 44
		20	DUN	Gloria 7
		20	DUN	Credo 8
		20	DUN	Sancta 49
		17	DUN	Gloria 43
LEO	Regina 19	14		
		14	DUN	Gloria 4
		14	DUN	Regina 38
		14	DUN	Salve 45
LEO	Sanctus 20	11		
		10	DUN	Ave 37
		10	DUN	Gloria 9
		8	DUN	Gaude 52
		8	DUN	Agnus 14
		6	DUN	Sanctus 6
		6	DUN	Salve 46
		0	DUN	Sancta 48

Table 27 Phrases ending with a close position chord (%)

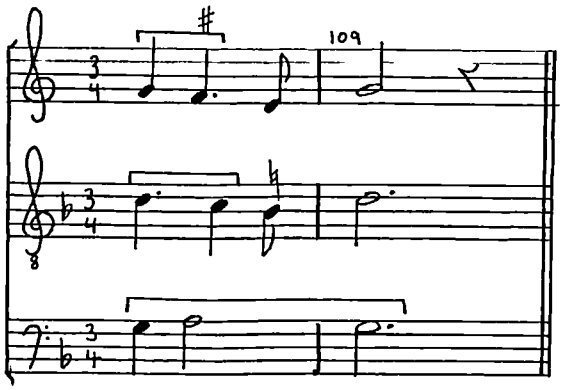
LEO	Anima 18	67		
LEO	Credo 18	57		
LEO	Mater 23	50		
LEO	Ibo 24	50		
LEO	Gloria 18	44		
LEO	Credo 11	43		
		40	DUN	Crux 39
LEO	Gloria 10	38		
LEO	Credo 19	36		
		36	DUN	Credo 5
LEO	Credo 13	33		
		33	DUN	Gloria 2
		33	DUN	Ave 35
LEO	Quam 26	31		
LEO	Gloria 16	27		
LEO	Credo 14	26		
LEO	Salve 14	25		
		25	DUN	O crux 53
		23	DUN	Magnificat 36
		23	DUN	Speciosa 50
LEO	Salve 10	22		
		22	DUN	Sancta 47
LEO	Anima 25	20		
		20	DUN	Sub tuam 51
		20	DUN	Sanctus 13
LEO	Sanctus 15	18		
		17	DUN	Kyrie 1
		17	DUN	Quam 44
		17	DUN	Gloria 43
		15	DUN	Credo 8
LEO	Regina 19	14		
		14	DUN	Gloria 4
		14	DUN	Regina 38
		14	DUN	Salve 45
LEO	Sanctus 20	11		
		10	DUN	Sancta 49
		3	DUN	Gloria 9
		8	DUN	Agnus 14
		6	DUN	Salve 46
		0	DUN	Sanctus 6
		0	DUN	Sancta 48
		0	DUN	Gloria 7
		0	DUN	Gaude 52
		0	DUN	Ave 37

OTHER CHARACTERISTICS OF CADENCES

It is reasonable to suppose that the means of approach to, and quitting of, cadences might exhibit composer-related characteristics. The chords immediately adjacent to those of all standard cadence progressions have therefore been examined.

The chord preceding a standard cadence is nearly always an arrangement of that on the cadence point itself. The most common arrangement is that of a first inversion triad, producing a stepwise descent to the cadence point in voice III. However, in a small proportion of cases the arrangement is identical to that on the cadence point, as in Example 18. This is almost twice as common in

Example 18 Dunstable Gloria 9

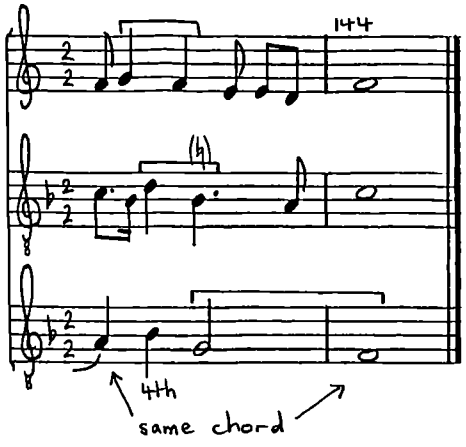


Dunstable, occurring in 13% of cases as opposed to 7% of cases in Leonel. The progression is associated with final cadences at the end of sections of music, especially in Dunstable. In this composer 29% of final cadences are approached in this way as opposed to 12% in Leonel. The

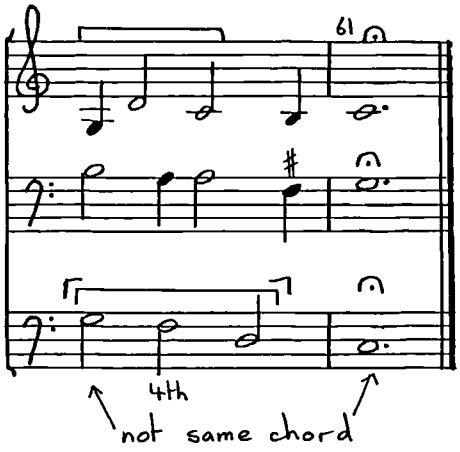
progression is to be found in 42% of compositions by Dunstable and 17% of those by Leonel.

Less commonly, the chord immediately preceding the cadence is based on the fourth degree above the cadence pitch. In Dunstable this chord is always an insertion between the normal antepenultimate and penultimate chords. In Leonel, the approach via the fourth degree is slightly more frequent (14% of standard cadences as opposed to 12% in Dunstable) and appears more often in prominent positions (24% of end-of-section cadences as opposed to 17% in Dunstable). However, the most distinguishing characteristic in Leonel is that a third of these instances are not preceded by the usual chord on the cadence pitch. 39% of his pieces contain at least one instance of this atypical preparation (Example 19).

Example 19 Dunstable Crux 39

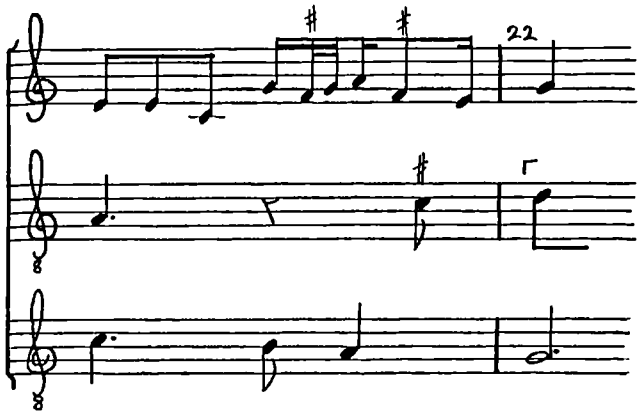


Leonel Sanctus 20



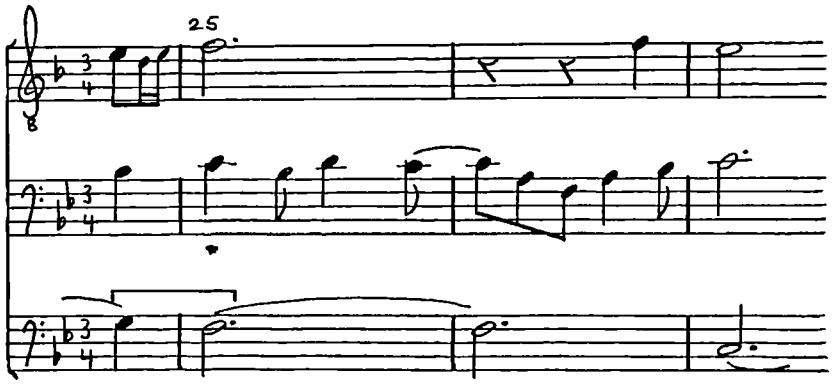
Occasionally, the antepenultimate chord consists of two notes only, there being a rest in voice II. This is four times as common in Leonel, occurring in about 8% of cadences, as opposed to only 2% in Dunstable (Example 20).

Example 20 Leonel Credo 19



A cadence is often followed by a chord containing an octave between voices II and III. This is approached by voice III from the cadence point in a descending movement of any interval between a second and a fifth. The two chords are sometimes separated by a rest in voice I, and then voice II often provides a decorated melodic link between them. The progression happens a little more often in Dunstable than in Leonel (once in every five standard cadences as opposed to once in every eight). Also, the progressions in Dunstable are more prominent and standardized to the typical pattern (see Example 21).

Example 21 Dunstable O Crux 53



In Leonel, voice III often also supplies intervening decorative notes and the rest in voice I appears less often; only seven examples can be found with a rest and no decoration in voice III, as opposed to thirty-five in Dunstable.

The periods between cadences vary in length. No standard phrase length exists, although the average period varies according to the piece - some tend to have consistently short, others consistently long phrases. As this could be a factor in individual styles, the spacing of cadences has been calculated for each piece. This has been performed both in terms of the average number of chords per cadence and the average length in minims between cadences. Both methods show that cadences are, on average, closer together in Leonel, although the latter method produces a slightly clearer separation between the two composers and so is used for the figures shown in Table 28. The calculations are based on all possible cadence types including standard progressions in any position, more unusual progressions which occur at phrase endings and two-part cadences in the primary and secondary categories. Less than 15.7 minims per cadence indicates composition by Leonel while more than 28.5 minims per cadence indicates composition by Dunstable. 39% of attributed pieces lie in these areas. In several instances, cadences are so close in Leonel that the cadence point of one serves as the antepenultimate chord of the next.

Table 28 Cadence Spacing (minims per cadence)

LEO	Credo 13	12.9		
LEO	Quam 26	13.1		
LEO	Gloria 10	13.7		
LEO	Credo 19	14.3		
LEO	Credo 14	14.5		
LEO	Gloria 16	15.2		
LEO	Sanctus 15	15.6		
		15.7	DUN	Quam 44
LEO	Anima 25	18.5		
LEO	Credo 11	19.1		
LEO	Salve 10	20.3		
		21.0	DUN	Credo 8
		21.0	DUN	Speciosa 50
		21.3	DUN	Credo 5
		21.5	DUN	Sanctus 6
LEO	Mater 23	21.9		
		22.0	DUN	Ave 35
		22.1	DUN	Magnificat 36
LEO	Sanctus 20	22.4		
LEO	Salve 14	22.7		
		23.0	DUN	Regina 38
		23.4	DUN	Gloria 7
		23.7	DUN	Salve 45
LEO	Gloria 18	23.9		
		24.3	DUN	Crux 39
LEO	Credo 18	25.3		
		25.5	DUN	Ave 37
		25.6	DUN	Kyrie 1
		25.8	DUN	Gloria 9
LEO	Anima 18	25.9		
		26.0	DUN	Gaude 52
LEO	Ibo 24	28.0		
		28.0	DUN	Sanctus 13
LEO	Regina 19	28.5		
		28.6	DUN	O crux 53
		29.1	DUN	Agnus 14
		29.4	DUN	Sancta 49
		29.8	DUN	Gloria 43
		30.0	DUN	Sub tuam 51
		30.5	DUN	Sancta 48
		31.0	DUN	Sancta 47
		31.1	DUN	Salve 46
		32.2	DUN	Gloria 4
		33.5	DUN	Gloria 2

FOUR-PART CADENCES

Composition in four parts allows for a greater number of permutations of position for the voices. A fourth part can duplicate one of the other three at the unison or octave. Alternatively it can supply a third in the final chord, producing a fuller, more modern-sounding harmony. The proportion of cadences in four-part music which are based on a full triad is therefore greater than in three parts.

THE DEVELOPMENT TOWARDS TONALITY

In addition to fulfilling the objective of differentiating the music of Leonel and Dunstable, this study has provided an insight into the development of the cadence during their lifetimes. Because of its presence in the Old Hall manuscript, there is good reason to presume that the descant music of Leonel is the earliest under consideration. The cadence is seen to develop from a purely modal form as used in these works into a period of experimentation and diversification in the later works of Leonel and those of Dunstable. Amongst the experiments appear the first tonal forms. Dunstable, the younger man, employs these more frequently than Leonel.

The case of the octave leap formula is especially noteworthy. It provides a link between the modal standard cadence, from which it retains stepwise contrary motion

onto the octave, and the tonal perfect cadence with true movement by an ascending fourth in the bass. Its lifespan seems to have been limited to only a few decades, reaching its height in the Burgundian period.[44] The levels of this cadence might, then, be a valuable dating factor. Although not within the scope of this thesis, a more detailed study of other composers' work in this respect could prove interesting.

Following an article by Caldwell which traces the beginnings of tonality back to around 1400 in England and examines key schemes in a composition by Dunstable,[45] it was hoped that analysis in terms of pitch organization might provide information useful to this thesis. However, despite careful cataloguing of all cadence pitches and analysis of the data in several different ways, no evidence could be found that the choice of pitches or the sequence of pitches used for cadences differs between the two composers. Nor can it be said that any consistent tonal organization was observed. Though Caldwell thought the term 'modulation' could be appropriately used in connection with this period, this present study will, more cautiously, describe cadences as being merely 'on' a certain pitch. Modulation implies a more systematic organization of tonal structure and chord hierarchy than can be demonstrated here.

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[44] Robert W. Wienpahl: op. cit., p.134.

[45] John Caldwell: 'Some Aspects of Tonal Language in Music of the Fifteenth and Sixteenth Centuries' in PRMA, vol.110 (1983-84), pp.1-24.

One small fact emerging from the investigation is that Dunstable does use the same pitch in succession more often than Leonel. Measured in terms of three-part standard cadences only, around 15% of cadences in Dunstable repeat the previous pitch, as opposed to 10% in Leonel. It is doubtful whether this difference is large enough to be of great value in differentiating individual pieces and certainly could not be used in isolation as evidence of authorship, yet may furnish additional corroborative evidence in combination with other facts.

APPENDICES

TO

PART ONE

APPENDICES

THE COLLECTED DATA

The information which has been amassed during the course of this project would fill several volumes; it would be impossible and unnecessary to reproduce all of it here. However, the following appendices contain, in abbreviated form, some of the most basic statistics collected. Many of the more complex data have been derived from these fundamental figures, and it is almost certain that further conclusions could be drawn from them, relevant to topics which have not been investigated during this study. They are included here in the hope that they will prove useful to future workers. The chord analysis information has been restricted to non-descant and non-isorhythmic three-part compositions.

APPENDIX ONE

RANGE DATA

	clef	mean pitch	whole piece		full texture		duet texture	
DUNSTABLE								
KYRIE 1								
voice I	C1	16.70	c-d'	9				
voice II	C3	12.96	F-a'	10				
voice III	C3	10.37	E-g	10				
all voices			E-d'	14				
DUNSTABLE								
GLORIA 2								
voice I	C3	12.40	F-g	9	F-g	9	F-g	9
voice II	C5	8.44	A-c	10				
voice III	C5	7.12	A-b	9	A-b	9	A-bb	9
all voices			A-g	14				
DUNSTABLE								
GLORIA 4								
voice I	C2	15.40	a-d'	11				
voice II	C4	10.80	D-e	9				
voice III	C4	9.09	C-e	10				
all voices			C-d'	16				
DUNSTABLE								
CREDO 5								
voice I	C1	17.61	c-e'	10				
voice II	C3	12.87	F-a'	10				
voice III	C3	12.28	F-a'	10				
all voices			F-e'	14				
DUNSTABLE								
SANCTUS 6								
voice I	C1	14.52	G-c'	11	G-c'	11	A-c'	10
voice II	C4	10.58	C-f	11				
voice III	C4	8.61	C-d	9	C-d	9	C-d	9
all voices			C-c'	15				
DUNSTABLE								
GLORIA 7								
voice I	C1	17.70	d-f'	10				
voice II	C3	12.50	F-g	9				
voice III	C3	11.02	F-f	8				
all voices			F-f	15				
DUNSTABLE								
CREDO 8								
voice I	C2	14.69	G-c'	11				
voice II	C4	10.20	C-f	11				
voice III	C4	9.55	C-e	10				
all voices			C-c'	15				

	clef	mean pitch	whole piece		full texture		duet texture	
DUNSTABLE								
GLORIA 9								
voice I	C2	15.04	G-c'	11	G-c'	11	G-c'	11
voice II	C4	11.88	D-g	11	D-f	10	G-g	8
voice III	C5	9.17	C-e	10	C-e	10	C-e	10
all voices			C-c'	15				
DUNSTABLE								
GLORIA 11								
voice I	C1	17.11	c-e'	10	c-e'	10	c-d'	9
voice II	C1	16.80	c-d'	9	c-d'	9	c-d'	9
voice III	C3	12.47	F-a'	10	F-g	9	F-a'	10
voice IV	C3	11.00	F-g	9	F-g	9	F-g	9
all voices			F-e'	14				
DUNSTABLE								
SANCTUS 13								
voice I	C2	14.82	G-c'	11	G-b'	10	a-c'	10
voice II	C5	10.06	C-e	10				
voice III	C5	9.62	C-d	9	C-d	9	F-d	6
all voices			C-c'	15				
DUNSTABLE								
AGNUS 14								
voice I	C3	12.56	F-a'	10	F-a'	10	F-f	8
voice II	C5	9.11	Bb-d	10				
voice III	C5	6.76	Bb-G	6	Bb-G	6	Bb-G	6
all voices			Bb-a'	14				
DUNSTABLE								
GLORIA 15								
voice I	C3	13.56	F-bb	11	F-bb	11	F-bb	11
voice II	C5	8.58	A-d	11	A-d	11	Bb-d	10
voice III	C5	8.45	C-bb	7				
all voices			A-bb	16				
DUNSTABLE								
CREDO 16								
voice I	C2	15.23	a-d'	11	a-d'	11	a-c'	10
voice II	C4	10.89	C-f	11	C-f	11	C-f	11
voice III	C4	8.45	C-bb	7				
all voices			C-d'	16				
DUNSTABLE								
CREDO 17								
voice I	C1	16.71	c-e'	10				
voice II	C3	12.93	F-a'	10				
voice III	C4	11.02	F-e	9				
all voices			F-e'	14				

	clef	mean pitch	whole piece	full texture	duet texture
DUNSTABLE					
ALBANUS 23					
voice I	C1	17.25	c-e' 10	c-e' 10	c-d' 9
voice II	C3	12.21	F-a' 10	F-a' 10	F-a' 10
voice III	C3	12.87	G-f 7		
all voices			F-e' 14		
DUNSTABLE					
AVE REGINA 24					
voice I	C2	14.39	G-b' 10	G-b' 10	G-b' 10
voice II	C4	10.17	C-f 11	D-e 9	C-f 11
voice III	C4	10.73	D-d 8		
all voices			C-b' 14		
DUNSTABLE					
CHRISTE 25					
voice I	C1	16.59	G-d' 12	C-d' 9	G-d' 12
voice II	C3	12.83	E-a' 11	F-a' 10	E-a' 11
voice III	C3	10.67	F-d' 14		
all voices			E-d' 14		
DUNSTABLE					
DIES 26					
voice I	C2	14.50	a-c' 10	a-b' 9	a-c' 10
voice II	C4	9.96	C-f 11	C-f 11	D-f 10
voice III	C4	9.02	C-d 9		
all voices			C-c' 15		
DUNSTABLE					
GAUDE 27					
voice I	C3	12.79	F-a' 10	G-a' 9	F-a' 10
voice II	C5	8.73	A-d 11	A-d 11	Bb-d 10
voice III	C6	7.05	A-a 8		
all voices			A-a' 15		
DUNSTABLE					
GAUDE 28					
voice I	C2	15.42	a-c' 10	a-c' 10	c-b' 7
voice II	C2	14.46	G-c' 11	G-c' 11	A-a' 8
voice III	C4	8.97	C-e 10		
voice IV	C3	10.40	G-c 4		
all voices			C-c' 15		
DUNSTABLE					
PRECO 29					
voice I	C1	17.29	d-d' 8	d-d' 8	d-d' 8
voice II	C2	14.39	G-a' 9	c-a' 6	G-a' 9
voice III	C4	8.95	C-d 9		
voice IV	C4	10.40	F-c 5		
all voices			C-d' 16		

	clef	mean pitch	whole piece	full texture	duet texture
DUNSTABLE					
SALVE 30					
voice I	C2	14.53	a-b' 9	a-b' 9	bb-a' 7
voice II	C3	11.13	E-f 9	E-f 9	E-f 9
voice III	C4	9.09	C-d 9		
voice IV	C5	6.46	Bb-G 6		
all voices			Bb-b' 15		
DUNSTABLE					
SPECIALIS 31					
voice I	C1	17.13	c-e' 10	c-e' 10	c-e' 10
voice II	C3	12.60	F-a' 10	F-a' 10	F-a' 10
voice III	C3	12.48	G-g 8		
all voices			F-e' 14		
DUNSTABLE					
VENI 32					
voice I	C1	18.19	e-e' 8	e-e' 8	e-e' 8
voice II	C2	14.56	G-a' 9	G-a' 9	G-a' 9
voice III	C3	12.06	F-a' 10		
voice IV	C3	11.65	G-e 6		
all voices			F-e' 14		
DUNSTABLE					
VENI 33					
voice I	C2	14.33	G-bb' 10	a-bb' 9	G-bb' 10
voice II	C4	9.05	C-e 10	C-e 10	C-d 9
voice III	C4	8.21	B-c 9		
all voices			B-bb' 15		
DUNSTABLE					
(TEXTLESS) 34					
voice I	C2	15.12	a-d' 11		
voice II	C4	9.73	GG-f 14		
voice III	??	8.62	D-c 7		
all voices			GG-d' 19		
DUNSTABLE					
AVE MARIS 35					
voice I	C1	15.24	b-d' 10		
voice II	C4	9.14	C-e 10		
voice III	C4	8.68	C-e 10		
all voices			C-d' 16		
DUNSTABLE					
MAGNIFICAT 36					
voice I	C2	14.11	G-b' 10	b-a' 7	G-b' 10
voice II	C4	10.01	C-e 10	D-e 9	C-d 9
voice III	C4	8.11	C-c 8		
all voices			C-b' 14		

	clef	mean pitch	whole piece	full texture	duet texture
DUNSTABLE					
AVE REGINA 37					
voice I	C1	16.45	b-d' 10	b-d' 10	c-d' 9
voice II	C3	13.25	F-a' 10	F-a' 10	G-a' 9
voice III	C4	10.69	D-e 9	D-e 9	G-e 6
all voices			D-d' 15		
DUNSTABLE					
REGINA 38					
voice I	C1	16.58	c-e' 10		
voice II	C3	12.70	F-a' 10		
voice III	C3	10.94	E-g 10		
all voices			E-e' 15		
DUNSTABLE					
CRUX 39					
voice I	C1	16.66	c-e' 10	c-e' 10	c-d' 9
voice II	C3	12.99	G-a' 9		
voice III	C3	10.88	E-a' 11	E-g 10	E-a' 11
(duet section		11.96)			
all voices			E-e' 15		
DUNSTABLE					
GLORIA 43					
voice I	C1	16.54	c-d' 9	c-d' 9	c-d' 9
voice II	C3	12.75	F-a' 10	F-a' 10	G-a' 9
voice III	C3	11.77	F-g 9		
all voices			F-d' 13		
DUNSTABLE					
QUAM 44					
voice I	C2	14.20	a-bb' 9		
voice II	C4	9.40	C-e 10		
voice III	C4	8.19	Bb-d 10		
all voices			Bb-bb' 15		
DUNSTABLE					
SALVE 45					
voice I	C2	14.49	a-c' 10	a-c' 10	a-b' 9
voice II	C4	10.72	C-f 11	C-f 11	D-e 9
voice III	C4	8.73	C-d 9		
all voices			C-c' 15		
DUNSTABLE					
SALVE 46					
voice I	C2	13.69	E-c' 13	G-c' 11	F-b' 11
voice II	C4	9.40	C-e 10	C-e 10	C-e 10
voice III	C4	8.47	C-e 10		
all voices			C-c' 15		

	clef	mean pitch	whole piece		full texture		duet texture	
DUNSTABLE								
SANCTA 47								
voice I	C1	16.88	d-f'	10				
voice II	C3	12.09	F-g	9				
voice III	C3	11.61	F-a'	10				
all voices			F-f'	15				
DUNSTABLE								
SANCTA 48								
voice I	C2	14.46	G-b'	10	G-b'	10	c-bb'	7
voice II	C4	10.13	C-e	10	C-e	10	F-e	7
voice III	C4	9.00	C-d	9				
all voices			C-b'	14				
DUNSTABLE								
SANCTA 49								
voice I	C1	16.83	c-e'	10	c-d'	9	c-e'	10
voice II	C3	12.53	F-a'	10				
voice III	C3	11.74	F-a'	10	F-g	9	F-a'	10
(duet section		12.95)						
all voices			F-e'	14				
DUNSTABLE								
SPECIOSA 50								
voice I	C1	16.58	b-d'	10				
voice II	C3	13.22	F-a'	10				
voice III	C3	11.23	F-g	9				
all voices			F-d'	13				
DUNSTABLE								
SUB TUAM 51								
voice I	C2	13.87	G-c'	11	(G-c'	11	G-a'	9)
voice II	C4	9.42	C-e	10				
(?added 3rd part		8.64)						
voice III	C4	8.85	C-d	9	(C-d	9	C-d	9)
all voices			C-c'	15				
DUNSTABLE								
GAUDE 52								
voice I	C1	16.67	b-d'	10	c-d'	9	b-d'	10
voice II	C3	13.72	F-a'	10				
voice III	C3	11.36	F-a'	10	F-f	8	F-a'	10
all voices			F-d'	13				
DUNSTABLE								
O CRUX 53								
voice I	C3	13.28	F-a'	10	G-a'	9	F-a'	10
voice II	C5	9.51	Bb-d	10	Bb-d	10	Bb-d	10
voice III	C5	7.37	A-c	10	A-c	10	Bb-c	9
all voices			A-a'	15				

	clef	mean pitch	whole piece		full texture		duet texture	
LEONEL								
BEATA 1								
voice I	C2	14.50	b-b'	8				
voice II	C3	10.76	G-e	6				
voice III	C5	8.38	C-d	9				
all voices			C-b'	14				
LEONEL								
AVE REGINA 2								
voice I	C1	15.55	c-c'	8				
voice II	C3	12.38	G-g	8				
voice III	C5	8.92	C-d	9				
all voices			C-c'	15				
LEONEL								
BEATA 5								
voice I	C1	15.63	c-c'	8				
voice II	C3	12.12	G-g	8				
voice III	C4	9.60	C-d	9				
all voices			C-c'	15				
LEONEL								
AVE REGINA 7								
voice I	C1	17.48	c-d'	9	d-d'	8	c-d'	9
voice II	C1	15.92	c-d'	9	c-d'	9	c-d'	9
voice III	C3	12.62	F-g	9				
voice IV	C3	10.76	F-f	8				
all voices			F-d'	13				
LEONEL								
SALVE 10								
voice I	C1	16.03	b-d'	10	b-d'	10	c-d'	9
voice II	C3	12.08	F-g	9	F-g	9	F-g	9
voice III	C3	10.70	F-g	9				
all voices			F-d'	13				
LEONEL								
GLORIOSE 12								
voice I	C2	14.38	a-a'	8	a-a'	8	a-a'	8
voice II	C2	14.17	a-b'	9	a-a'	8	a-b'	9
voice III	C4	9.78	C-d	9	D-d	8	C-d	9
voice IV	C4	8.15	C-d	9	C-c	8	D-d	8
all voices			C-b'	14				
LEONEL								
SALVE 14								
voice I	C1	16.31	a-d'	11	c-d'	9	a-d'	11
voice II	C3	12.76	F-a'	10	F-a'	10	F-a'	10
voice III	C3	11.46	F-g	9	F-g	9	F-g	9
all voices			F-d'	13				

	clef	mean pitch	whole piece	full texture	duet texture
LEONEL					
ANIMA 18					
voice I	C1	16.68	c-e' 10	c-e' 10	c-e' 10
voice II	C3	12.81	F-a' 10	(F-a' 10	F-a' 10)
voice III	C3	11.33	E-a' 11	E-g 10	F-a' 10
all voices			E-e' 15		
LEONEL					
REGINA 19					
voice I	C2	14.47	G-c' 11	b-c' 9	G-a' 9
voice II	C4	11.03	C-e 10		
voice III	C4	9.11	C-e 10	C-d 9	C-e 10
all voices			C-c' 15		
LEONEL					
MATER 23					
voice I	C1	16.61	b-d' 10	c-d' 9	b-d' 9
voice II	C3	12.28	E-a' 11	F-g 9	E-a' 11
voice III	C3	11.56	E-g 10		
all voices			E-d' 14		
LEONEL					
IBO MICHI 24					
voice I	C1	16.66	c-e' 10	c-e' 10	G-e' 6
voice II	C3	12.36	E-a' 11		
voice III	C3	11.79	F-a' 10	F-a' 10	F-a' 10
all voices			E-e' 15		
LEONEL					
ANIMA 25					
voice I	C1	16.44	bb-d' 10	c-d' 9	bb-d' 10
voice II	C3	12.78	F-a' 10	F-g 9	F-a' 10
voice III	C3	11.34	E-a' 11	E-g 10	F-a' 10
all voices			E-d' 14		
LEONEL					
QUAM 26					
voice I	C4	10.51	D-e 9	D-e 9	E-e 8
voice II	F4	5.95	FF-a 10	FF-a 10	GG-a 9
voice III	F4	4.96	FF-a 10		
all voices			FF-e 14		
LEONEL					
SANCTUS 1					
voice I	C1	15.39	c-c' 8		
voice II	C2	12.02	G-a' 9		
voice III	C4	9.36	C-d 9		
all voices			C-c' 15		

	clef	mean pitch	whole piece		full texture	duet texture
LEONEL						
SANCTUS 2						
voice I	C2	13.60	a-a'	8		
voice II	C4	9.84	E-d	7		
voice III	C5	7.56	C-d	9		
all voices			C-a'	13		
LEONEL						
SANCTUS 3						
voice I	C2	14.75	a-a'	8		
voice II	C3	11.62	F-e	7		
voice III	C5	8.32	C-d	9		
all voices			C-a'	13		
LEONEL						
AGNUS 4						
voice I	C1	15.56	b-c'	9		
voice II	C3	12.08	G-g	8		
voice III	C4	8.86	D-d	8		
all voices			D-c'	14		
LEONEL						
AGNUS 5						
voice I	C1	16.02	c-c'	8		
voice II	C3	12.55	G-g	8		
voice III	C5	9.32	D-d	8		
all voices			D-c'	14		
LEONEL						
AGNUS 6						
voice I	C1	15.78	c-c'	8		
voice II	C3	12.43	b-e	4		
voice III	C5	8.91	D-c	7		
all voices			D-c'	14		
LEONEL						
SANCTUS 7						
voice I	C1	16.53	c-d'	9		
voice II	C1	16.22	c-d'	9		
voice III	C4	9.78	C-e	10		
voice IV	C3	10.87	F-f	8		
all voices			C-d'	16		
LEONEL						
AGNUS 7						
voice I	C1	17.04	d-d'	8		
voice II	C1	16.56	c-d'	9		
voice III	C3	11.87	F-g	9		
voice IV	C3	10.71	F-f	8		
all voices			F-d'	13		

	clef	mean pitch	whole piece		full texture		duet texture	
LEONEL								
GLORIA 8								
voice I	C1	12.76	F-g	9	F-g	9	F-g	9
(voice Ia		12.83)						
voice II	C1	12.23	F-g	9				
voice III	C3	7.93	Bb-c	9				
voice IV	C3	6.78	Bb-c	9	Bb-c	9	Bb-bb	8
all voices			Bb-g	13				
LEONEL								
GLORIA 9								
voice I	C1	15.64	b-d'	10				
voice II	C1	15.94	b-d'	10				
voice III	C3	12.35	F-g	9				
voice IV	C3	11.04	F-f	8				
all voices			F-d'	13				
LEONEL								
GLORIA 10								
voice I	C1	16.91	c-d'	9				
voice II	C3	13.75	F-a'	10				
voice III	C3	11.32	F-g	9				
all voices			F-d'	13				
LEONEL								
CREDO 11								
voice I	C3	13.47	F-a'	10				
voice II	C5	7.83	Bb-d	10				
voice III	C5	9.29	C-d	9				
all voices			Bb-a'	14				
LEONEL								
CREDO 13								
voice I	C1	16.49	c-e'	10				
voice II	C3	12.98	F-a'	10				
voice III	C3	11.48	F-a'	10				
all voices			F-e'	14				
LEONEL								
CREDO 14								
voice I	C3	12.60	E-g	10				
voice II	F3	9.05	Bb-d	10				
voice III	F3	7.13	Bb-c	9				
all voices			Bb-g	13				
LEONEL								
SANCTUS 15								
voice I	C2	13.59	G-a'	9	G-a'	9	G-a'	9
voice II	C4	10.09	C-e	10				
voice III	C5	8.14	C-d	9				
all voices			C-a'	13				

	clef	mean pitch	whole piece	full texture	duet texture
LEONEL					
GLORIA 16					
voice I	C3	13.44	G-a' 9		
voice II	C4	9.35	C-e 10		
voice III	C5	8.34	C-d 9		
all voices			C-a' 13		
LEONEL					
GLORIA 18					
voice I	C1	16.58	G-e' 13	c-e' 10	G-d' 12
voice II	C3	12.98	F-a' 10	F-a' 10	F-a' 10
voice III	C3	10.88	F-f 8		
all voices			F-e' 14		
LEONEL					
CREDO 18					
voice I	C1	16.88	c-e' 10	c-e' 10	c-e' 10
voice II	C3	12.55	F-bb' 11	F-a' 10	F-bb' 11
voice III	C3	10.88	F-f 8		
all voices			F-e' 14		
LEONEL					
CREDO 19					
voice I	C2	14.53	a-c' 10	a-c' 10	a-b' 9
voice II	C4	10.64	D-e 9		
voice III	C4	9.63	D-f 10	D-e 9	D-f 10
all voices			D-c' 14		
LEONEL					
SANCTUS 20					
voice I	C3	13.75	G-bb' 10	G-a' 9	a-bb' 9
voice II	C4	9.12	C-d 9		
voice III	C5	8.45	C-d 9	C-c 9	C-d 9
all voices			C-bb' 14		
LEONEL					
SANCTUS 21					
voice I	C3	12.67	F-G 9		
voice II	C3	12.66	G-a' 9		
voice III	C5	9.05	C-e 10		
voice IV	C5	8.02	C-d 9		
all voices			C-a' 13		

APPENDIX TWO

CHORD DATA

DUNSTABLE KYRIE 1

	NO.	%	DURATION	%
Single notes	0.00	0.00	0.00	0.00
2-note chords	13.00	5.96	16.00	5.67
3-note chords	205.00	94.04	266.00	94.33
Dissonance	62.00	28.44	54.50	19.33
Perf. Cons.	34.00	15.60	85.00	30.14
Imp. Cons.	122.00	55.96	142.50	50.53
Full triads	73.00	33.49	78.50	27.84
Chords with crossed voices	38.00	17.43	36.00	12.77
DISSONANCES				
9/1	1.00	0.49	1.00	0.38
4/2	1.00	0.49	1.00	0.38
5/2	2.00	0.98	2.00	0.75
6/2	4.00	1.95	3.00	1.13
8/2	1.00	0.49	1.00	0.38
4/3	2.00	0.98	1.50	0.56
7/3	13.00	6.34	10.50	3.95
9/3	2.00	0.98	2.00	0.75
11/3	1.00	0.49	1.00	0.38
5/4	1.00	0.49	0.50	0.19
6/4	3.00	1.46	2.00	0.75
7/4	4.00	1.95	3.50	1.32
8/4	3.00	1.46	2.50	0.94
6/5	2.00	0.98	1.00	0.38
9/5	2.00	0.98	2.00	0.75
11/5	5.00	2.44	5.00	1.88
9/6	1.00	0.49	1.00	0.38
12/6	4.00	1.95	4.00	1.50
8/7	1.00	0.49	1.00	0.38
10/7	2.00	0.98	2.00	0.75
11/7	1.00	0.49	1.00	0.38
12/7	1.00	0.49	1.00	0.38
11/8	1.00	0.49	1.00	0.38
10/9	3.00	1.46	3.00	1.13
11/10	1.00	0.49	1.00	0.38
	62.00	30.24	54.50	20.49
PERFECT CONSONANCES				
8/1	1.00	0.49	1.00	0.38
5/5	2.00	0.98	3.00	1.13
8/5	17.00	8.29	62.00	23.31
12/5	2.00	0.98	3.00	1.13
8/8	4.00	1.95	7.00	2.63
12/8	4.00	1.95	4.00	1.50
	30.00	14.63	80.00	30.08
IMPERFECT CONSONANCES				
6/1	1.00	0.49	1.00	0.38
3/3	4.00	1.95	3.50	1.32
5/3	17.00	8.29	14.00	5.26
6/3	35.00	17.07	42.50	15.98
8/3	14.00	6.83	19.00	7.14
10/3	4.00	1.95	6.00	2.26
12/3	1.00	0.49	1.00	0.38
10/5	5.00	2.44	7.00	2.63
6/6	4.00	1.95	4.00	1.50
8/6	9.00	4.39	11.50	4.32
10/6	11.00	5.37	11.00	4.14
10/8	7.00	3.41	10.00	3.76
12/10	1.00	0.49	1.00	0.38
	113.00	55.12	131.50	49.44

DUNSTABLE GLORIA 2

	NO.	%	DURATION	%
Single notes	15.00	1.95	28.00	2.20
2-note chords	289.00	37.63	486.00	38.21
3-note chords	464.00	60.42	758.00	59.59
Dissonance	161.00	20.96	184.01	14.47
Perf. Cons.	200.00	27.08	443.17	34.84
Imp. Cons.	399.00	51.95	644.82	50.69
Full triads	173.00	22.53	287.99	22.64
Chords with crossed voices	117.00	15.23	199.00	15.64
DISSONANCES				
2/1	4.00	0.86	4.34	0.57
4/1	3.00	0.65	2.50	0.33
7/1	4.00	0.86	5.00	0.66
2/2	1.00	0.22	1.00	0.13
5/2	5.00	1.08	6.00	0.79
6/2	2.00	0.43	2.00	0.26
4/3	3.00	0.65	2.50	0.33
7/3	22.00	4.74	24.50	3.23
9/3	2.00	0.43	2.34	0.31
6/4	5.00	1.08	4.00	0.53
7/4	12.00	2.59	13.00	1.72
8/4	6.00	1.29	6.00	0.79
6/5	2.00	0.43	2.00	0.26
7/5	1.00	0.22	1.00	0.13
9/5	8.00	1.72	12.00	1.58
11/5	12.00	2.59	15.33	2.02
9/6	3.00	0.65	2.50	0.33
11/6	4.00	0.86	5.67	0.75
12/6	2.00	0.43	2.33	0.31
9/7	2.00	0.43	2.00	0.26
10/7	3.00	0.65	4.00	0.53
12/7	1.00	0.22	1.00	0.13
9/8	3.00	0.65	2.67	0.35
11/8	8.00	1.72	8.66	1.14
	118.00	25.43	132.34	17.46
PERFECT CONSONANCES				
1/1	3.00	0.65	4.00	0.53
5/1	19.00	4.09	31.16	4.11
8/1	7.00	1.51	8.00	1.06
5/5	3.00	0.65	5.00	0.66
8/5	29.00	6.25	101.00	13.32
12/5	11.00	2.37	23.34	3.08
8/8	2.00	0.43	3.00	0.40
12/8	7.00	1.51	14.00	1.85
	81.00	17.46	189.50	25.00
IMPERFECT CONSONANCES				
3/1	14.00	3.02	21.33	2.81
6/1	12.00	2.59	17.34	2.29
10/1	1.00	0.22	2.00	0.26
3/3	9.00	1.94	13.34	1.76
5/3	56.00	12.07	108.48	14.31
6/3	69.00	14.87	95.51	12.60
8/3	35.00	7.54	53.66	7.08
10/3	9.00	1.94	16.00	2.11
10/5	36.00	7.76	69.33	9.15
8/6	4.00	0.86	6.50	0.86
10/6	3.00	0.65	5.00	0.66
10/8	15.00	3.23	24.67	3.25
13/8	2.00	0.43	3.00	0.40
	265.00	57.11	436.16	57.54

DUNSTABLE GLORIA 4

	NO.	%	DURATION	%
Single notes	0.00	0.00	0.00	0.00
2-note chords	49.00	11.06	112.00	12.87
3-note chords	394.00	88.94	758.00	87.13
Dissonance	92.00	20.77	111.17	12.78
Perf. Cons.	86.00	19.41	247.50	28.45
Imp. Cons.	265.00	59.82	511.33	58.77
Full triads	182.00	41.08	350.00	40.23
Chords with crossed voices	116.00	26.19	197.00	22.64
DISSONANCES				
4/1	3.00	0.76	4.00	0.53
5/2	2.00	0.51	1.50	0.20
6/2	4.00	1.02	3.50	0.46
4/3	2.00	0.51	2.00	0.26
7/3	21.00	5.33	29.17	3.85
9/3	5.00	1.27	5.00	0.66
6/4	8.00	2.03	9.00	1.19
7/4	8.00	2.03	8.00	1.06
8/4	2.00	0.51	3.00	0.40
9/4	1.00	0.25	1.00	0.13
9/5	14.00	3.55	16.50	2.18
11/5	4.00	1.02	4.00	0.53
9/6	1.00	0.25	1.00	0.13
11/6	3.00	0.76	6.00	0.79
10/7	1.00	0.25	1.00	0.13
11/8	5.00	1.27	4.50	0.59
12/9	1.00	0.25	2.00	0.26
13/9	1.00	0.25	2.00	0.26
	86.00	21.83	103.17	13.61
PERFECT CONSONANCES				
5/1	8.00	2.03	13.00	1.72
8/1	4.00	1.02	12.00	1.58
8/5	25.00	6.35	107.00	14.12
12/5	6.00	1.52	15.00	1.98
12/8	17.00	4.31	33.50	4.42
	60.00	15.23	180.50	23.81
IMPERFECT CONSONANCES				
3/1	5.00	1.27	8.00	1.06
6/1	12.00	3.05	25.00	3.30
10/1	1.00	0.25	2.00	0.26
3/3	4.00	1.02	7.00	0.92
5/3	43.00	10.91	74.50	9.83
6/3	67.00	17.01	120.00	15.83
8/3	22.00	5.58	37.33	4.92
10/3	13.00	3.30	24.00	3.17
12/3	1.00	0.25	2.00	0.26
10/5	51.00	12.94	120.50	15.90
8/6	7.00	1.78	12.00	1.58
10/6	8.00	2.03	14.00	1.85
10/8	6.00	1.52	12.00	1.58
13/8	7.00	1.78	12.00	1.58
12/10	1.00	0.25	4.00	0.53
	248.00	62.94	474.33	62.58

DUNSTABLE SANCTUS 6

	NO.	%	DURATION	%
Single notes	10.00	1.96	21.00	2.83
2-note chords	213.00	41.85	341.00	45.96
3-note chords	286.00	56.19	380.00	51.21
Dissonance	92.00	18.07	86.00	11.59
Perf. Cons.	145.00	28.49	301.50	40.63
Imp. Cons.	272.00	53.44	354.50	47.78
Full triads	122.00	23.97	137.00	18.46
Chords with crossed voices	50.00	9.82	59.00	7.95
DISSONANCES				
6/2	3.00	1.05	2.50	0.66
7/2	1.00	0.35	0.50	0.13
4/3	1.00	0.35	1.00	0.26
7/3	15.00	5.24	13.00	3.42
9/3	1.00	0.35	0.50	0.13
6/4	3.00	1.05	3.00	0.79
7/4	9.00	3.15	8.50	2.24
8/4	5.00	1.75	4.50	1.18
10/4	1.00	0.35	1.00	0.26
7/5	2.00	0.70	2.00	0.53
9/5	4.00	1.40	4.00	1.05
11/5	2.00	0.70	2.00	0.53
11/6	1.00	0.35	1.00	0.26
12/6	1.00	0.35	1.00	0.26
11/7	1.00	0.35	1.00	0.26
11/8	6.00	2.10	5.00	1.32
	56.00	19.58	50.50	13.29
PERFECT CONSONANCES				
5/1	6.00	2.10	5.50	1.45
8/1	2.00	0.70	5.00	1.32
8/5	28.00	9.79	94.00	24.74
12/5	9.00	3.15	10.00	2.63
8/8	1.00	0.35	1.00	0.26
12/8	15.00	5.24	16.00	4.21
	61.00	21.33	131.50	34.61
IMPERFECT CONSONANCES				
3/1	1.00	0.35	2.00	0.53
6/1	4.00	1.40	3.50	0.92
3/3	2.00	0.70	2.00	0.53
5/3	31.00	10.84	35.00	9.21
6/3	68.00	23.78	69.00	18.16
8/3	19.00	6.64	22.00	5.79
10/3	4.00	1.40	4.50	1.18
10/5	15.00	5.24	25.00	6.58
8/6	2.00	0.70	3.00	0.79
10/6	4.00	1.40	4.00	1.05
10/8	11.00	3.85	17.50	4.61
13/8	8.00	2.80	10.50	2.76
	169.00	59.09	198.00	52.11

DUNSTABLE GLORIA 7

	NO.	%	DURATION	%
Single notes	0.00	0.00	0.00	0.00
2-note chords	49.00	20.68	64.00	19.51
3-note chords	188.00	79.32	264.00	80.49
Dissonance	37.00	15.61	40.00	12.20
Perf. Cons.	51.00	21.52	84.00	25.61
Imp. Cons.	149.00	62.87	204.00	62.20
Full triads	59.00	24.89	77.00	23.48
Chords with crossed voices	48.00	20.25	64.00	19.51
DISSONANCES				
7/1	1.00	0.53	2.00	0.76
7/3	11.00	5.85	11.00	4.17
9/3	1.00	0.53	1.00	0.38
11/3	1.00	0.53	1.00	0.38
6/4	1.00	0.53	1.00	0.38
7/4	2.00	1.06	2.00	0.76
8/4	1.00	0.53	1.00	0.38
9/4	1.00	0.53	1.00	0.38
10/4	1.00	0.53	1.00	0.38
11/4	1.00	0.53	1.00	0.38
6/5	1.00	0.53	1.00	0.38
11/5	2.00	1.06	2.00	0.76
11/6	1.00	0.53	3.00	1.14
12/6	1.00	0.53	1.00	0.38
12/7	1.00	0.53	1.00	0.38
11/8	1.00	0.53	1.00	0.38
14/8	1.00	0.53	1.00	0.38
11/9	1.00	0.53	1.00	0.38
	30.00	15.96	33.00	12.50
PERFECT CONSONANCES				
5/1	2.00	1.06	2.00	0.76
8/1	4.00	2.13	5.00	1.89
5/5	1.00	0.53	1.00	0.38
8/5	7.00	3.72	21.00	7.95
12/5	7.00	3.72	18.00	6.82
12/8	7.00	3.72	11.00	4.17
15/8	2.00	1.06	2.00	0.76
	30.00	15.96	60.00	22.73
IMPERFECT CONSONANCES				
3/1	1.00	0.53	2.00	0.76
6/1	10.00	5.32	11.00	4.17
3/3	1.00	0.53	1.00	0.38
5/3	23.00	12.23	27.00	10.23
6/3	20.00	10.64	22.00	8.33
8/3	29.00	15.43	39.00	14.77
10/3	13.00	6.91	18.00	6.82
12/3	1.00	0.53	1.00	0.38
10/5	12.00	6.38	22.00	8.33
8/6	3.00	1.60	3.00	1.14
10/6	1.00	0.53	1.00	0.38
10/8	8.00	4.26	17.00	6.44
13/8	6.00	3.19	7.00	2.65
	128.00	68.09	171.00	64.77

DUNSTABLE CREDO 8

	NO.	%	DURATION	%
Single notes	0.00	0.00	0.00	0.00
2-note chords	44.00	10.76	54.00	10.27
3-note chords	365.00	89.24	472.00	89.73
Dissonance	45.00	11.00	44.50	8.46
Perf. Cons.	108.00	26.41	156.00	29.66
Imp. Cons.	256.00	62.59	325.50	61.88
Full triads	142.00	34.72	192.50	36.60
Chords with crossed voices	134.00	32.76	180.00	34.22
DISSONANCES				
4/1	1.00	0.27	1.00	0.21
7/1	2.00	0.55	2.00	0.42
6/2	1.00	0.27	0.50	0.11
4/3	2.00	0.55	2.00	0.42
7/3	18.00	4.93	18.00	3.81
9/3	2.00	0.55	2.00	0.42
7/4	6.00	1.64	6.00	1.27
8/4	1.00	0.27	1.00	0.21
9/5	1.00	0.27	1.00	0.21
11/5	1.00	0.27	1.00	0.21
9/6	1.00	0.27	1.00	0.21
12/6	1.00	0.27	1.00	0.21
9/8	2.00	0.55	2.00	0.42
11/8	3.00	0.82	3.00	0.64
	42.00	11.51	41.50	8.79
PERFECT CONSONANCES				
5/1	9.00	2.47	14.00	2.97
8/1	5.00	1.37	5.00	1.06
5/5	3.00	0.82	3.00	0.64
8/5	35.00	9.59	66.00	13.98
12/5	11.00	3.01	13.00	2.75
8/8	3.00	0.82	3.00	0.64
12/8	19.00	5.21	22.00	4.66
	85.00	23.29	126.00	26.69
IMPERFECT CONSONANCES				
3/1	8.00	2.19	9.00	1.91
6/1	9.00	2.47	9.00	1.91
10/1	1.00	0.27	1.00	0.21
3/3	9.00	2.47	9.00	1.91
5/3	54.00	14.79	81.00	17.16
6/3	56.00	15.34	58.50	12.39
8/3	26.00	7.12	29.00	6.14
10/3	7.00	1.92	8.00	1.69
12/3	2.00	0.55	3.00	0.64
10/5	26.00	7.12	45.00	9.53
8/6	7.00	1.92	8.00	1.69
10/6	4.00	1.10	5.00	1.06
10/8	22.00	6.03	30.00	6.36
13/8	7.00	1.92	9.00	1.91
	238.00	65.21	304.50	64.51

DUNSTABLE GLORIA 9

	NO.	%	DURATION	%
Single notes	11.00	1.26	22.00	1.37
2-note chords	420.00	47.95	692.00	43.20
3-note chords	445.00	50.80	888.00	55.43
Dissonance	140.00	15.98	169.00	10.55
Perf. Cons.	275.00	31.39	648.00	40.45
Imp. Cons.	461.00	52.63	785.00	49.00
Full triads	203.00	23.17	352.00	21.97
Chords with crossed voices	62.00	7.08	126.00	7.87
DISSONANCES				
4/1	2.00	0.45	2.00	0.23
7/1	1.00	0.22	1.00	0.11
5/2	4.00	0.90	5.00	0.56
4/3	2.00	0.45	2.00	0.23
7/3	25.00	5.62	37.00	4.17
9/3	1.00	0.22	1.00	0.11
5/4	1.00	0.22	2.00	0.23
6/4	12.00	2.70	11.50	1.30
7/4	15.00	3.37	21.50	2.42
8/4	4.00	0.90	6.00	0.68
9/4	1.00	0.22	1.00	0.11
6/5	1.00	0.22	0.50	0.06
7/5	5.00	1.12	7.00	0.79
9/5	6.00	1.35	7.00	0.79
11/5	1.00	0.22	1.00	0.11
8/7	2.00	0.45	1.50	0.17
9/7	2.00	0.45	2.00	0.23
10/7	1.00	0.22	2.00	0.23
12/7	1.00	0.22	1.00	0.11
11/8	5.00	1.12	7.00	0.79
11/9	1.00	0.22	2.00	0.23
	93.00	20.90	121.00	13.63
PERFECT CONSONANCES				
5/1	8.00	1.80	13.00	1.46
8/1	4.00	0.90	8.00	0.90
5/5	1.00	0.22	1.00	0.11
8/5	61.00	13.71	206.00	23.20
12/5	5.00	1.12	19.00	2.14
8/8	4.00	0.90	5.50	0.62
12/8	15.00	3.37	57.00	6.42
	98.00	22.02	309.50	34.85
IMPERFECT CONSONANCES				
3/1	6.00	1.35	13.00	1.46
6/1	8.00	1.80	14.00	1.58
3/3	6.00	1.35	11.00	1.24
5/3	62.00	13.93	88.00	9.91
6/3	105.00	23.60	184.50	20.78
8/3	24.00	5.39	45.00	5.07
10/3	1.00	0.22	1.00	0.11
10/5	18.00	4.04	52.00	5.86
8/6	9.00	2.02	15.00	1.69
10/6	5.00	1.12	10.00	1.13
10/8	8.00	1.80	16.00	1.80
13/8	1.00	0.22	2.00	0.23
12/10	1.00	0.22	6.00	0.68
	254.00	57.08	457.50	51.52

DUNSTABLE SANCTUS 13

	NO.	%	DURATION	%
Single notes	11.00	2.03	28.00	2.78
2-note chords	260.00	47.88	478.00	47.42
3-note chords	272.00	50.09	502.00	49.80
Dissonance	99.00	18.23	121.50	12.05
Perf. Cons.	180.00	33.15	412.50	40.92
Imp. Cons.	264.00	48.62	474.00	47.02
Full triads	94.00	17.31	173.00	17.16
Chords with crossed voices	88.00	16.21	174.00	17.26
DISSONANCES				
2/1	1.00	0.37	1.00	0.20
4/1	3.00	1.10	3.00	0.60
7/1	6.00	2.21	7.00	1.39
5/2	4.00	1.47	4.00	0.80
6/2	2.00	0.74	2.00	0.40
7/3	17.00	6.25	23.00	4.58
9/3	3.00	1.10	3.00	0.60
5/4	1.00	0.37	1.00	0.20
6/4	1.00	0.37	1.00	0.20
7/4	2.00	0.74	2.00	0.40
7/5	4.00	1.47	6.00	1.20
9/5	5.00	1.84	6.00	1.20
11/5	3.00	1.10	4.00	0.80
13/5	1.00	0.37	1.00	0.20
7/6	1.00	0.37	1.00	0.20
9/6	1.00	0.37	2.00	0.40
12/6	1.00	0.37	2.00	0.40
8/7	1.00	0.37	1.00	0.20
9/8	2.00	0.74	2.00	0.40
11/8	2.00	0.74	2.00	0.40
	61.00	22.43	74.00	14.74
PERFECT CONSONANCES				
5/1	6.00	2.21	8.00	1.59
8/1	6.00	2.21	11.00	2.19
5/5	3.00	1.10	4.00	0.80
8/5	21.00	7.72	79.00	15.74
12/5	9.00	3.31	16.00	3.19
8/8	4.00	1.47	7.00	1.39
12/8	7.00	2.57	20.00	3.98
	56.00	20.59	145.00	28.88
IMPERFECT CONSONANCES				
3/1	5.00	1.84	7.00	1.39
6/1	6.00	2.21	8.00	1.59
3/3	2.00	0.74	3.00	0.60
5/3	34.00	12.50	65.00	12.95
6/3	32.00	11.76	45.00	8.96
8/3	14.00	5.15	25.00	4.98
10/3	6.00	2.21	10.00	1.99
10/5	19.00	6.99	47.00	9.36
6/6	1.00	0.37	1.00	0.20
8/6	6.00	2.21	8.00	1.59
10/6	8.00	2.94	15.00	2.99
10/8	13.00	4.78	31.00	6.18
13/8	9.00	3.31	18.00	3.59
	155.00	56.99	283.00	56.37

DUNSTABLE AGNUS 14

	NO.	%	DURATION	%
Single notes	5.00	1.27	8.00	1.31
2-note chords	186.00	47.09	266.00	43.46
3-note chords	204.00	51.65	338.00	55.23
Dissonance	45.00	11.39	39.67	6.48
Perf. Cons.	141.00	35.70	256.33	41.88
Imp. Cons.	209.00	52.91	316.00	51.63
Full triads	81.00	20.51	123.67	20.21
Chords with crossed voices	43.00	10.89	61.00	9.97
DISSONANCES				
4/1	1.00	0.49	2.00	0.59
5/2	3.00	1.47	2.50	0.74
4/3	3.00	1.47	2.00	0.59
7/3	5.00	2.45	5.33	1.58
9/3	1.00	0.49	0.67	0.20
5/4	2.00	0.98	2.00	0.59
6/4	1.00	0.49	0.50	0.15
7/4	4.00	1.96	3.50	1.04
11/4	1.00	0.49	1.00	0.30
7/5	1.00	0.49	1.00	0.30
9/5	2.00	0.98	1.50	0.44
11/5	4.00	1.96	3.50	1.04
	28.00	13.73	25.50	7.54
PERFECT CONSONANCES				
5/1	5.00	2.45	7.00	2.07
8/1	4.00	1.96	7.00	2.07
5/5	1.00	0.49	1.00	0.30
8/5	24.00	11.76	67.00	19.82
12/5	12.00	5.88	20.00	5.92
12/8	5.00	2.45	13.00	3.85
	51.00	25.00	115.00	34.02
IMPERFECT CONSONANCES				
3/1	6.00	2.94	10.00	2.96
6/1	2.00	0.98	2.00	0.59
3/3	5.00	2.45	6.00	1.78
5/3	23.00	11.27	24.50	7.25
6/3	35.00	17.16	53.67	15.88
8/3	15.00	7.35	28.50	8.43
10/3	9.00	4.41	13.83	4.09
10/5	16.00	7.84	31.00	9.17
8/6	5.00	2.45	8.00	2.37
10/6	6.00	2.94	14.00	4.14
10/8	2.00	0.98	4.00	1.18
13/8	1.00	0.49	2.00	0.59
	125.00	61.27	197.50	58.43

DUNSTABLE AVE MARIS 35

	NO.	%	DURATION	%
Single notes	0.00	0.00	0.00	0.00
2-note chords	2.00	2.82	4.00	3.64
3-note chords	69.00	97.18	106.00	96.36
Dissonance	14.00	19.72	11.00	10.00
Perf. Cons.	16.00	22.54	39.50	35.91
Imp. Cons.	41.00	57.75	59.50	54.09
Full triads	23.00	32.39	35.50	32.27
Chords with crossed voices	30.00	42.25	43.00	39.09
DISSONANCES				
7/1	1.00	1.45	0.50	0.47
6/2	1.00	1.45	0.50	0.47
8/2	1.00	1.45	0.50	0.47
7/3	3.00	4.35	2.50	2.36
9/3	1.00	1.45	1.00	0.94
7/4	2.00	2.90	1.50	1.42
8/4	1.00	1.45	0.50	0.47
11/5	2.00	2.90	2.00	1.89
11/6	1.00	1.45	1.00	0.94
12/7	1.00	1.45	1.00	0.94
	14.00	20.29	11.00	10.38
PERFECT CONSONANCES				
8/1	3.00	4.35	4.00	3.77
8/5	8.00	11.59	24.50	23.11
12/5	3.00	4.35	7.00	6.60
12/8	1.00	1.45	2.00	1.89
	15.00	21.74	37.50	35.38
IMPERFECT CONSONANCES				
6/1	1.00	1.45	0.50	0.47
10/1	2.00	2.90	3.00	2.83
5/3	4.00	5.80	5.50	5.19
6/3	7.00	10.14	8.00	7.55
8/3	8.00	11.59	9.50	8.96
10/3	4.00	5.80	5.00	4.72
12/3	1.00	1.45	3.00	2.83
10/5	10.00	14.49	18.00	16.98
13/8	2.00	2.90	3.00	2.83
15/10	1.00	1.45	2.00	1.89
	40.00	57.97	57.50	54.25

DUNSTABLE MAGNIFICAT 36

	NO.	%	DURATION	%
Single notes	22.00	2.65	34.00	3.02
2-note chords	490.00	59.04	615.00	54.62
3-note chords	318.00	38.31	477.00	42.36
Dissonance	105.00	12.65	82.50	7.33
Perf. Cons.	210.00	25.30	398.50	35.39
Imp. Cons.	515.00	62.05	645.00	57.28
Full triads	179.00	21.57	251.00	22.29
Chords with crossed voices	35.00	4.22	29.00	2.58
DISSONANCES				
5/2	6.00	1.89	5.00	1.05
6/2	2.00	0.63	1.00	0.21
4/3	2.00	0.63	1.50	0.31
7/3	7.00	2.20	5.50	1.15
6/4	3.00	0.94	2.00	0.42
7/4	14.00	4.40	14.00	2.94
8/4	1.00	0.31	1.00	0.21
6/5	2.00	0.63	2.00	0.42
7/5	2.00	0.63	1.00	0.21
9/5	4.00	1.26	2.50	0.52
11/5	1.00	0.31	0.50	0.10
9/6	5.00	1.57	4.00	0.84
11/6	1.00	0.31	0.50	0.10
	50.00	15.72	40.50	8.49
PERFECT CONSONANCES				
5/5	2.00	0.63	2.00	0.42
8/5	44.00	13.84	127.50	26.73
12/8	7.00	2.20	13.00	2.73
	53.00	16.67	142.50	29.87
IMPERFECT CONSONANCES				
3/1	5.00	1.57	5.00	1.05
6/1	4.00	1.26	3.00	0.63
5/3	23.00	7.23	22.50	4.72
6/3	124.00	38.99	196.50	41.19
8/3	16.00	5.03	15.00	3.14
10/3	1.00	0.31	1.00	0.21
10/5	13.00	4.09	12.00	2.52
8/6	4.00	1.26	2.50	0.52
10/6	15.00	4.72	17.50	3.67
10/8	10.00	3.14	19.00	3.98
	215.00	67.61	294.00	61.64

DUNSTABLE AVE REGINA 37

	NO.	%	DURATION	%
Single notes	11.00	2.64	18.00	2.52
2-note chords	193.00	46.28	284.00	39.78
3-note chords	213.00	51.08	412.00	57.70
Dissonance	54.00	12.95	61.84	8.66
Perf. Cons.	111.00	26.62	238.50	33.40
Imp. Cons.	252.00	60.43	413.66	57.94
Full triads	108.00	25.90	195.00	27.31
Chords with crossed voices	28.00	6.71	57.00	7.98
DISSONANCES				
7/1	1.00	0.47	1.00	0.24
5/2	2.00	0.94	2.00	0.49
6/2	1.00	0.47	1.00	0.24
4/3	2.00	0.94	2.00	0.49
7/3	4.00	1.88	5.00	1.21
5/4	1.00	0.47	1.00	0.24
6/4	2.00	0.94	3.00	0.73
7/4	8.00	3.76	14.00	3.40
8/4	2.00	0.94	3.00	0.73
6/5	1.00	0.47	1.00	0.24
7/5	3.00	1.41	4.00	0.97
10/7	1.00	0.47	1.00	0.24
9/8	1.00	0.47	1.00	0.24
11/8	1.00	0.47	2.00	0.49
	30.00	14.08	41.00	9.95
PERFECT CONSONANCES				
5/1	3.00	1.41	5.00	1.21
8/1	1.00	0.47	2.00	0.49
5/5	1.00	0.47	2.00	0.49
8/5	25.00	11.74	86.00	20.87
12/5	1.00	0.47	2.00	0.49
8/8	1.00	0.47	1.00	0.24
12/8	3.00	1.41	5.00	1.21
	35.00	16.43	103.00	25.00
IMPERFECT CONSONANCES				
3/1	6.00	2.82	13.00	3.16
6/1	7.00	3.29	10.00	2.43
3/3	2.00	0.94	3.00	0.73
5/3	33.00	15.49	50.00	12.14
6/3	57.00	26.76	107.00	25.97
8/3	14.00	6.57	26.00	6.31
10/3	1.00	0.47	2.00	0.49
10/5	8.00	3.76	20.00	4.85
8/6	5.00	2.35	9.00	2.18
10/6	7.00	3.29	13.00	3.16
10/8	7.00	3.29	13.00	3.16
12/10	1.00	0.47	2.00	0.49
	148.00	69.48	268.00	65.05

DUNSTABLE REGINA 38

	NO.	%	DURATION	%
Single notes	3.00	0.49	4.00	0.43
2-note chords	47.00	7.68	72.00	7.83
3-note chords	562.00	91.83	844.00	91.74
Dissonance	101.00	16.50	102.00	11.09
Perf. Cons.	129.00	21.08	266.50	28.97
Imp. Cons.	382.00	62.42	551.50	59.95
Full triads	223.00	36.44	309.50	33.64
Chords with crossed voices	84.00	13.73	133.00	14.46
DISSONANCES				
4/1	8.00	1.42	6.50	0.77
7/1	4.00	0.71	3.50	0.41
3/2	1.00	0.18	1.00	0.12
4/2	1.00	0.18	1.00	0.12
5/2	2.00	0.36	2.00	0.24
6/2	2.00	0.36	1.50	0.18
7/2	2.00	0.36	2.00	0.24
9/2	1.00	0.18	2.00	0.24
4/3	2.00	0.36	2.00	0.24
7/3	25.00	4.45	26.50	3.14
9/3	3.00	0.53	3.00	0.36
5/4	4.00	0.71	3.50	0.41
6/4	1.00	0.18	0.50	0.06
7/4	12.00	2.14	12.00	1.42
6/5	3.00	0.53	2.50	0.30
7/5	4.00	0.71	6.00	0.71
9/5	5.00	0.89	4.00	0.47
11/5	3.00	0.53	3.00	0.36
13/5	1.00	0.18	1.00	0.12
7/6	1.00	0.18	0.50	0.06
11/6	3.00	0.53	3.00	0.36
12/6	3.00	0.53	5.00	0.59
9/7	1.00	0.18	0.50	0.06
10/7	2.00	0.36	2.00	0.24
12/7	1.00	0.18	2.00	0.24
13/7	1.00	0.18	1.00	0.12
11/8	2.00	0.36	2.00	0.24
	98.00	17.44	99.50	11.79
PERFECT CONSONANCES				
1/1	3.00	0.53	5.00	0.59
5/1	23.00	4.09	24.00	2.84
8/1	9.00	1.60	11.50	1.36
5/5	3.00	0.53	2.50	0.30
8/5	48.00	8.54	156.50	18.54
12/5	9.00	1.60	11.00	1.30
8/8	3.00	0.53	5.00	0.59
12/8	11.00	1.96	22.00	2.61
	109.00	19.40	237.50	28.14
IMPERFECT CONSONANCES				
3/1	14.00	2.49	22.00	2.61
6/1	29.00	5.16	39.00	4.62
10/1	1.00	0.18	2.00	0.24
3/3	8.00	1.42	14.00	1.66
5/3	67.00	11.92	81.50	9.66
6/3	122.00	21.71	173.00	20.50
8/3	53.00	9.43	72.00	8.53
10/3	8.00	1.42	17.00	2.01
12/3	1.00	0.18	2.00	0.24
10/5	18.00	3.20	36.00	4.27
8/6	8.00	1.42	11.00	1.30
10/6	11.00	1.96	13.50	1.60
10/8	14.00	2.49	23.00	2.73
13/8	1.00	0.18	1.00	0.12
	355.00	63.17	507.00	60.07

DUNSTABLE CRUX 39

	NO.	%	DURATION	%
Single notes	11.00	1.68	20.00	2.11
2-note chords	305.00	46.56	414.00	43.76
3-note chords	339.00	51.76	512.00	54.12
Dissonance	104.00	15.88	91.17	9.64
Perf. Cons.	177.00	27.02	335.16	35.43
Imp. Cons.	374.00	57.10	519.67	54.93
Full triads	153.00	23.36	211.17	22.32
Chords with crossed voices	50.00	7.63	94.00	9.94
DISSONANCES				
7/1	1.00	0.29	1.00	0.20
5/2	6.00	1.77	4.84	0.95
6/2	3.00	0.88	2.33	0.46
7/2	1.00	0.29	0.50	0.10
8/2	1.00	0.29	1.00	0.20
4/3	2.00	0.59	1.00	0.20
7/3	14.00	4.13	11.50	2.25
9/3	1.00	0.29	1.00	0.20
5/4	1.00	0.29	1.00	0.20
6/4	3.00	0.88	4.00	0.78
7/4	4.00	1.18	4.00	0.78
8/4	1.00	0.29	1.00	0.20
6/5	1.00	0.29	1.00	0.20
7/5	2.00	0.59	1.50	0.29
9/5	7.00	2.06	5.00	0.98
11/5	3.00	0.88	2.50	0.49
9/6	2.00	0.59	2.00	0.39
11/6	2.00	0.59	2.00	0.39
12/6	1.00	0.29	1.00	0.20
10/7	1.00	0.29	1.00	0.20
9/8	4.00	1.18	4.50	0.88
11/8	5.00	1.47	5.00	0.98
	66.00	19.47	58.67	11.46
PERFECT CONSONANCES				
1/1	2.00	0.59	4.00	0.78
5/1	10.00	2.95	20.66	4.04
8/1	5.00	1.47	13.00	2.54
5/5	3.00	0.88	2.50	0.49
8/5	26.00	7.67	79.00	15.43
12/5	6.00	1.77	10.50	2.05
8/8	1.00	0.29	1.50	0.29
12/8	13.00	3.83	30.00	5.86
	66.00	19.47	161.16	31.48
IMPERFECT CONSONANCES				
3/1	2.00	0.59	3.00	0.59
6/1	7.00	2.06	9.50	1.86
3/3	4.00	1.18	4.00	0.78
5/3	40.00	11.80	71.50	13.96
6/3	61.00	17.99	64.17	12.53
8/3	16.00	4.72	20.50	4.00
10/3	7.00	2.06	11.00	2.15
10/5	31.00	9.14	43.50	8.50
8/6	5.00	1.47	6.00	1.17
10/6	16.00	4.72	26.00	5.08
10/8	14.00	4.13	26.00	5.08
13/8	4.00	1.18	7.00	1.37
	207.00	61.06	292.17	57.06

DUNSTABLE GLORIA SANCTORUM 43

	NO.	%	DURATION	%
Single notes	13.00	3.24	21.00	3.06
2-note chords	135.00	33.67	237.00	34.55
3-note chords	253.00	63.09	428.00	62.39
Dissonance	73.00	18.20	88.17	12.85
Perf. Cons.	122.00	30.42	256.16	37.34
Imp. Cons.	206.00	51.37	341.67	49.81
Full triads	94.00	23.44	147.00	21.43
Chords with crossed voices	72.00	17.96	127.00	18.51
DISSONANCES				
4/1	2.00	0.79	4.00	0.93
7/1	4.00	1.58	3.33	0.78
3/2	1.00	0.40	2.00	0.47
5/2	1.00	0.40	1.00	0.23
6/2	1.00	0.40	1.00	0.23
7/2	2.00	0.79	3.00	0.70
7/3	13.00	5.14	15.00	3.50
9/3	1.00	0.40	1.00	0.23
6/4	4.00	1.58	5.00	1.17
7/4	3.00	1.19	4.00	0.93
8/4	5.00	1.98	5.00	1.17
6/5	2.00	0.79	3.00	0.70
7/5	5.00	1.98	5.67	1.32
9/5	2.00	0.79	2.00	0.47
9/6	2.00	0.79	2.00	0.47
11/6	2.00	0.79	3.00	0.70
12/6	1.00	0.40	1.00	0.23
11/8	2.00	0.79	2.00	0.47
	53.00	20.95	63.00	14.72
PERFECT CONSONANCES				
1/1	1.00	0.40	1.00	0.23
5/1	10.00	3.95	17.00	3.97
8/1	5.00	1.98	15.00	3.50
5/5	3.00	1.19	5.00	1.17
8/5	23.00	9.09	69.33	16.20
12/5	1.00	0.40	2.00	0.47
8/8	1.00	0.40	1.00	0.23
12/8	6.00	2.37	11.50	2.69
	50.00	19.76	121.83	28.46
IMPERFECT CONSONANCES				
3/1	9.00	3.56	19.00	4.44
6/1	12.00	4.74	15.67	3.66
3/3	4.00	1.58	7.00	1.64
5/3	35.00	13.83	54.17	12.66
6/3	41.00	16.21	61.83	14.45
8/3	21.00	8.30	37.00	8.64
10/5	5.00	1.98	12.00	2.80
6/6	2.00	0.79	2.00	0.47
8/6	6.00	2.37	10.00	2.34
10/6	7.00	2.77	11.00	2.57
10/8	8.00	3.16	13.50	3.15
	150.00	59.29	243.17	56.82

DUNSTABLE QUAM 44

	NO.	%	DURATION	%
Single notes	1.00	0.47	2.00	0.58
2-note chords	29.00	13.62	49.00	14.16
3-note chords	183.00	85.92	295.00	85.26
Dissonance	13.00	6.10	15.50	4.48
Perf. Cons.	51.00	23.94	104.00	30.06
Imp. Cons.	149.00	69.95	226.50	65.46
Full triads	90.00	42.25	134.50	38.87
Chords with crossed voices	50.00	23.47	92.00	26.59
DISSONANCES				
4/3	1.00	0.55	1.00	0.34
7/3	6.00	3.28	6.50	2.20
6/4	1.00	0.55	2.00	0.68
7/4	1.00	0.55	2.00	0.68
9/4	1.00	0.55	1.00	0.34
10/4	1.00	0.55	1.00	0.34
11/6	1.00	0.55	1.00	0.34
	12.00	6.56	14.50	4.92
PERFECT CONSONANCES				
1/1	1.00	0.55	4.00	1.36
5/1	2.00	1.09	2.00	0.68
8/1	1.00	0.55	1.00	0.34
5/5	1.00	0.55	1.00	0.34
8/5	20.00	10.93	51.00	17.29
12/5	7.00	3.83	12.00	4.07
12/8	5.00	2.73	8.00	2.71
	37.00	20.22	79.00	26.78
IMPERFECT CONSONANCES				
3/1	4.00	2.19	6.00	2.03
6/1	3.00	1.64	3.00	1.02
3/3	2.00	1.09	4.00	1.36
5/3	14.00	7.65	14.00	4.75
6/3	44.00	24.04	60.50	20.51
8/3	20.00	10.93	30.00	10.17
10/3	3.00	1.64	3.00	1.02
12/3	1.00	0.55	1.00	0.34
10/5	23.00	12.57	48.00	16.27
8/6	1.00	0.55	1.00	0.34
10/6	6.00	3.28	8.00	2.71
10/8	11.00	6.01	19.00	6.44
13/8	2.00	1.09	4.00	1.36
	134.00	73.22	201.50	68.31

DUNSTABLE SALVE 45

	NO.	%	DURATION	%
Single notes	4.00	0.89	6.00	0.87
2-note chords	151.00	33.48	219.00	31.83
3-note chords	296.00	65.63	463.00	67.30
Dissonance	77.00	17.07	73.00	10.61
Perf. Cons.	125.00	27.72	253.00	36.77
Imp. Cons.	249.00	55.21	362.00	52.62
Full triads	122.00	27.05	174.50	25.36
Chords with crossed voices	40.00	8.87	76.00	11.05
DISSONANCES				
7/1	1.00	0.34	0.50	0.11
3/2	1.00	0.34	1.00	0.22
5/2	4.00	1.35	3.50	0.76
6/2	7.00	2.36	4.50	0.97
7/2	1.00	0.34	0.50	0.11
4/3	3.00	1.01	2.00	0.43
7/3	15.00	5.07	15.00	3.24
5/4	1.00	0.34	1.00	0.22
6/4	3.00	1.01	4.00	0.86
7/4	2.00	0.68	2.00	0.43
8/4	2.00	0.68	2.00	0.43
6/5	3.00	1.01	3.00	0.65
7/5	5.00	1.69	6.50	1.40
9/5	4.00	1.35	4.00	0.86
11/5	1.00	0.34	1.00	0.22
7/6	1.00	0.34	1.00	0.22
12/6	2.00	0.68	2.00	0.43
10/7	1.00	0.34	1.00	0.22
12/7	1.00	0.34	1.00	0.22
9/8	1.00	0.34	1.00	0.22
	59.00	19.93	56.50	12.20
PERFECT CONSONANCES				
5/1	7.00	2.36	11.50	2.48
8/1	2.00	0.68	8.00	1.73
5/5	3.00	1.01	4.00	0.86
8/5	29.00	9.80	77.50	16.74
12/5	1.00	0.34	4.00	0.86
8/8	3.00	1.01	7.00	1.51
12/8	16.00	5.41	31.00	6.70
	61.00	20.61	143.00	30.89
IMPERFECT CONSONANCES				
3/1	7.00	2.36	10.00	2.16
6/1	7.00	2.36	8.50	1.84
3/3	4.00	1.35	7.00	1.51
5/3	44.00	14.86	69.00	14.90
6/3	52.00	17.57	64.50	13.93
8/3	11.00	3.72	12.50	2.70
10/3	2.00	0.68	3.00	0.65
12/3	1.00	0.34	2.00	0.43
10/5	15.00	5.07	26.00	5.62
6/6	1.00	0.34	1.00	0.22
8/6	6.00	2.03	11.00	2.38
10/6	7.00	2.36	9.00	1.94
10/8	18.00	6.08	38.00	8.21
13/8	1.00	0.34	2.00	0.43
	176.00	59.46	263.50	56.91

DUNSTABLE SALVE 46

	NO.	%	DURATION	%
Single notes	27.00	2.69	51.00	3.28
2-note chords	507.00	50.50	767.00	49.29
3-note chords	470.00	46.81	738.00	47.43
Dissonance	178.00	17.73	175.85	11.30
Perf. Cons.	309.00	30.78	592.16	38.06
Imp. Cons.	517.00	51.49	787.99	50.64
Full triads	168.00	16.73	241.81	15.54
Chords with crossed voices	173.00	17.23	284.00	18.25
DISSONANCES				
4/1	1.00	0.21	0.50	0.07
7/1	5.00	1.06	6.33	0.86
5/2	10.00	2.13	6.17	0.84
6/2	7.00	1.49	3.50	0.47
4/3	4.00	0.85	2.50	0.34
7/3	19.00	4.04	25.34	3.43
9/3	4.00	0.85	2.50	0.34
11/3	2.00	0.43	1.50	0.20
5/4	5.00	1.06	4.00	0.54
6/4	2.00	0.43	2.00	0.27
7/4	4.00	0.85	7.00	0.95
8/4	4.00	0.85	4.67	0.63
6/5	7.00	1.49	5.51	0.75
7/5	13.00	2.77	12.49	1.69
9/5	6.00	1.28	5.50	0.75
11/5	6.00	1.28	5.00	0.68
13/5	2.00	0.43	2.00	0.27
7/6	1.00	0.21	1.00	0.14
11/6	2.00	0.43	2.00	0.27
12/6	1.00	0.21	1.00	0.14
9/7	1.00	0.21	0.50	0.07
10/7	2.00	0.43	2.50	0.34
12/7	2.00	0.43	2.00	0.27
9/8	2.00	0.43	2.00	0.27
11/8	3.00	0.64	4.00	0.54
	115.00	24.47	111.51	15.11
PERFECT CONSONANCES				
1/1	1.00	0.21	1.00	0.14
5/1	8.00	1.70	14.00	1.90
8/1	2.00	0.43	3.00	0.41
5/5	7.00	1.49	11.50	1.56
8/5	38.00	8.09	126.17	17.10
12/5	11.00	2.34	19.50	2.64
8/8	2.00	0.43	4.00	0.54
12/8	16.00	3.40	29.34	3.98
	85.00	18.09	208.51	28.25
IMPERFECT CONSONANCES				
3/1	15.00	3.19	24.16	3.27
6/1	10.00	2.13	14.67	1.99
10/1	1.00	0.21	1.00	0.14
3/3	9.00	1.91	12.68	1.72
5/3	53.00	11.28	68.10	9.23
6/3	81.00	17.23	117.55	15.93
8/3	25.00	5.32	39.00	5.28
10/3	8.00	1.70	8.00	1.08
12/3	2.00	0.43	2.50	0.34
10/5	20.00	4.26	35.66	4.83
8/6	9.00	1.91	14.00	1.90
10/6	6.00	1.28	10.00	1.36
10/8	20.00	4.26	45.00	6.10
13/8	8.00	1.70	19.66	2.66
12/10	1.00	0.21	2.00	0.27
13/10	1.00	0.21	2.00	0.27
15/10	1.00	0.21	2.00	0.27
	270.00	57.45	417.98	56.64

DUNSTABLE SANCTA 47

	NO.	%	DURATION	%
Single notes	2.00	0.32	4.00	0.38
2-note chords	87.00	13.79	167.00	15.84
3-note chords	542.00	85.90	883.00	83.78
Dissonance	118.00	18.70	117.67	11.16
Perf. Cons.	106.00	16.80	244.00	23.15
Imp. Cons.	407.00	64.50	692.33	65.69
Full triads	255.00	40.41	413.33	39.22
Chords with crossed voices	204.00	32.33	362.00	34.35
DISSONANCES				
4/1	1.00	0.18	1.00	0.11
4/2	1.00	0.18	2.00	0.23
5/2	9.00	1.66	6.84	0.77
6/2	7.00	1.29	4.33	0.49
4/3	9.00	1.66	7.00	0.79
7/3	20.00	3.69	21.50	2.43
9/3	7.00	1.29	6.00	0.68
11/3	3.00	0.55	3.50	0.40
6/4	6.00	1.11	5.50	0.62
7/4	2.00	0.37	3.00	0.34
8/4	2.00	0.37	2.00	0.23
10/4	2.00	0.37	3.00	0.34
6/5	7.00	1.29	8.50	0.96
7/5	5.00	0.92	4.50	0.51
9/5	12.00	2.21	11.50	1.30
11/5	9.00	1.66	10.00	1.13
12/6	2.00	0.37	2.00	0.23
9/8	3.00	0.55	3.00	0.34
11/8	4.00	0.74	5.00	0.57
	111.00	20.48	110.17	12.48
PERFECT CONSONANCES				
5/1	2.00	0.37	3.00	0.34
8/1	2.00	0.37	2.00	0.23
5/5	6.00	1.11	7.50	0.85
8/5	40.00	7.38	111.00	12.57
12/5	6.00	1.11	13.50	1.53
8/8	6.00	1.11	12.00	1.36
12/8	3.00	0.55	5.00	0.57
	65.00	11.99	154.00	17.44
IMPERFECT CONSONANCES				
3/1	2.00	0.37	3.00	0.34
6/1	7.00	1.29	10.00	1.13
10/1	2.00	0.37	2.00	0.23
3/3	9.00	1.66	15.00	1.70
5/3	88.00	16.24	145.67	16.50
6/3	93.00	17.16	132.66	15.02
8/3	45.00	8.30	78.00	8.83
10/3	17.00	3.14	29.50	3.34
12/3	6.00	1.11	10.50	1.19
10/5	51.00	9.41	106.75	12.09
8/6	8.00	1.48	9.50	1.08
10/6	11.00	2.03	12.25	1.39
10/8	25.00	4.61	62.00	7.02
13/8	2.00	0.37	2.00	0.23
	366.00	67.53	618.83	70.08

DUNSTABLE SANCTA 48

	NO.	%	DURATION	%
Single notes	4.00	1.71	8.00	2.19
2-note chords	100.00	42.74	159.00	43.44
3-note chords	130.00	55.56	199.00	54.37
Dissonance	27.00	11.54	27.33	7.47
Perf. Cons.	57.00	24.36	109.00	29.78
Imp. Cons.	150.00	64.10	229.67	62.75
Full triads	63.00	26.92	82.67	22.59
Chords with crossed voices	38.00	16.24	74.00	20.22
DISSONANCES				
4/1	1.00	0.77	0.50	0.25
4/3	2.00	1.54	2.00	1.01
7/3	4.00	3.08	3.33	1.67
9/3	1.00	0.77	0.50	0.25
6/4	3.00	2.31	3.00	1.51
7/4	4.00	3.08	5.00	2.51
8/4	1.00	0.77	1.00	0.50
6/5	1.00	0.77	2.00	1.01
11/8	2.00	1.54	2.00	1.01
	19.00	14.62	19.33	9.71
PERFECT CONSONANCES				
1/1	1.00	0.77	1.00	0.50
5/1	2.00	1.54	2.00	1.01
8/1	1.00	0.77	2.00	1.01
5/5	1.00	0.77	2.00	1.01
8/5	9.00	6.92	25.00	12.56
8/8	1.00	0.77	6.00	3.02
12/8	5.00	3.85	9.00	4.52
	20.00	15.38	47.00	23.62
IMPERFECT CONSONANCES				
3/1	4.00	3.08	3.50	1.76
6/1	4.00	3.08	4.00	2.01
3/3	5.00	3.85	7.00	3.52
5/3	25.00	19.23	31.17	15.66
6/3	27.00	20.77	33.50	16.83
8/3	6.00	4.62	9.00	4.52
10/3	2.00	1.54	2.50	1.26
10/5	6.00	4.62	11.00	5.53
10/6	2.00	1.54	4.00	2.01
10/8	9.00	6.92	26.00	13.07
13/8	1.00	0.77	1.00	0.50
	91.00	70.00	132.67	66.67

DUNSTABLE SANCTA 49

	NO.	%	DURATION	%
Single notes	3.00	0.79	6.00	1.02
2-note chords	131.00	34.47	182.00	30.95
3-note chords	246.00	64.74	400.00	68.03
Dissonance	59.00	15.53	57.50	9.78
Perf. Cons.	102.00	26.84	203.00	34.52
Imp. Cons.	219.00	57.63	327.50	55.70
Full triads	95.00	25.00	138.00	23.47
Chords with crossed voices	86.00	22.63	146.00	24.83
DISSONANCES				
4/1	2.00	0.81	1.00	0.25
5/2	2.00	0.81	2.00	0.50
6/2	3.00	1.22	3.00	0.75
4/3	1.00	0.41	1.00	0.25
7/3	5.00	2.03	7.00	1.75
9/3	1.00	0.41	1.00	0.25
11/3	1.00	0.41	1.00	0.25
5/4	1.00	0.41	1.00	0.25
6/4	2.00	0.81	1.00	0.25
7/4	8.00	3.25	9.50	2.37
10/4	1.00	0.41	1.00	0.25
7/5	1.00	0.41	1.00	0.25
9/5	2.00	0.81	2.00	0.50
11/5	1.00	0.41	1.00	0.25
11/6	2.00	0.81	2.00	0.50
10/7	2.00	0.81	3.00	0.75
9/8	2.00	0.81	2.00	0.50
11/8	3.00	1.22	2.50	0.62
	40.00	16.26	42.00	10.50
PERFECT CONSONANCES				
5/1	5.00	2.03	6.50	1.62
8/1	1.00	0.41	2.00	0.50
5/5	3.00	1.22	6.00	1.50
8/5	22.00	8.94	55.00	13.75
12/5	6.00	2.44	11.00	2.75
8/8	2.00	0.81	8.00	2.00
12/8	14.00	5.69	26.50	6.62
	53.00	21.54	115.00	28.75
IMPERFECT CONSONANCES				
3/1	6.00	2.44	11.00	2.75
6/1	5.00	2.03	7.00	1.75
10/1	1.00	0.41	1.00	0.25
3/3	3.00	1.22	5.00	1.25
5/3	26.00	10.57	41.50	10.37
6/3	42.00	17.07	57.50	14.37
8/3	18.00	7.32	25.00	6.25
10/3	4.00	1.63	6.00	1.50
12/3	1.00	0.41	3.00	0.75
10/5	13.00	5.28	20.50	5.12
8/6	6.00	2.44	12.00	3.00
10/6	8.00	3.25	11.50	2.87
10/8	15.00	6.10	33.00	8.25
13/8	4.00	1.63	8.00	2.00
12/10	1.00	0.41	1.00	0.25
	153.00	62.20	243.00	60.75

DUNSTABLE SPECIOSA 50

	NO.	%	DURATION	%
Single notes	0.00	0.00	0.00	0.00
2-note chords	64.00	28.19	89.00	26.49
3-note chords	163.00	71.81	247.00	73.51
Dissonance	29.00	12.78	28.00	8.33
Perf. Cons.	52.00	22.91	102.00	30.36
Imp. Cons.	146.00	64.32	206.00	61.31
Full triads	78.00	34.36	106.17	31.60
Chords with crossed voices	50.00	22.03	67.00	19.94
DISSONANCES				
7/1	1.00	0.61	1.00	0.40
4/3	1.00	0.61	1.00	0.40
7/3	6.00	3.68	7.00	2.83
6/4	2.00	1.23	1.67	0.68
7/4	4.00	2.45	3.33	1.35
6/5	2.00	1.23	1.50	0.61
11/5	1.00	0.61	1.00	0.40
12/6	2.00	1.23	2.00	0.81
11/7	1.00	0.61	1.00	0.40
13/7	1.00	0.61	1.00	0.40
11/8	1.00	0.61	1.00	0.40
	22.00	13.50	21.50	8.70
PERFECT CONSONANCES				
1/1	1.00	0.61	10.00	4.05
5/1	2.00	1.23	3.00	1.21
8/5	12.00	7.36	31.00	12.55
12/5	4.00	2.45	8.00	3.24
12/8	10.00	6.13	17.00	6.88
	29.00	17.79	69.00	27.94
IMPERFECT CONSONANCES				
3/1	9.00	5.52	14.00	5.67
6/1	5.00	3.07	6.00	2.43
3/3	3.00	1.84	2.50	1.01
5/3	28.00	17.18	35.67	14.44
6/3	41.00	25.15	55.83	22.60
8/3	4.00	2.45	5.00	2.02
10/3	1.00	0.61	2.00	0.81
10/5	4.00	2.45	7.00	2.83
8/6	2.00	1.23	1.50	0.61
10/6	3.00	1.84	6.00	2.43
10/8	12.00	7.36	21.00	8.50
	112.00	68.71	156.50	63.36

DUNSTABLE SUB TUAM 51

	NO.	%	DURATION	%
Single notes	4.00	0.95	8.00	1.03
2-note chords	148.00	35.32	303.00	38.85
3-note chords	267.00	63.72	469.00	60.13
Dissonance	64.00	15.27	82.50	10.58
Perf. Cons.	102.00	24.34	243.50	31.22
Imp. Cons.	253.00	60.38	454.00	58.21
Full triads	109.00	26.01	177.50	22.76
Chords with crossed voices	66.00	15.75	137.00	17.56
DISSONANCES				
2/1	1.00	0.37	0.50	0.11
4/1	3.00	1.12	5.00	1.07
7/1	2.00	0.75	2.00	0.43
5/2	2.00	0.75	2.00	0.43
4/3	1.00	0.37	1.00	0.21
7/3	6.00	2.25	8.00	1.71
9/3	1.00	0.37	1.00	0.21
5/4	1.00	0.37	1.00	0.21
6/4	4.00	1.50	4.00	0.85
7/4	13.00	4.87	17.00	3.62
8/4	3.00	1.12	3.00	0.64
7/5	2.00	0.75	3.00	0.64
9/5	1.00	0.37	2.00	0.43
11/5	1.00	0.37	1.00	0.21
7/6	1.00	0.37	0.50	0.11
11/6	2.00	0.75	2.00	0.43
9/7	1.00	0.37	1.00	0.21
11/8	2.00	0.75	1.50	0.32
	47.00	17.60	55.50	11.83
PERFECT CONSONANCES				
1/1	1.00	0.37	2.00	0.43
5/1	8.00	3.00	12.50	2.67
8/1	3.00	1.12	5.00	1.07
5/5	2.00	0.75	4.00	0.85
8/5	25.00	9.36	74.00	15.78
12/5	2.00	0.75	4.00	0.85
8/8	1.00	0.37	2.00	0.43
12/8	6.00	2.25	13.00	2.77
	48.00	17.98	116.50	24.84
IMPERFECT CONSONANCES				
3/1	8.00	3.00	11.50	2.45
6/1	8.00	3.00	11.50	2.45
3/3	5.00	1.87	8.00	1.71
5/3	21.00	7.87	24.00	5.12
6/3	63.00	23.60	90.50	19.30
8/3	18.00	6.74	27.00	5.76
10/3	2.00	0.75	4.00	0.85
12/3	1.00	0.37	4.00	0.85
10/5	13.00	4.87	44.00	9.38
8/6	5.00	1.87	8.00	1.71
10/6	4.00	1.50	7.00	1.49
10/8	16.00	5.99	42.50	9.06
13/8	7.00	2.62	13.00	2.77
12/10	1.00	0.37	2.00	0.43
	172.00	64.42	297.00	63.33

DUNSTABLE GAUDE 52

	NO.	%	DURATION	%
Single notes	7.00	1.47	13.00	1.79
2-note chords	219.00	45.91	301.00	41.35
3-note chords	251.00	52.62	414.00	56.87
Dissonance	67.00	14.05	55.50	7.62
Perf. Cons.	136.00	28.51	274.50	37.71
Imp. Cons.	274.00	57.44	398.00	54.67
Full triads	100.00	20.96	153.50	21.09
Chords with crossed voices	43.00	9.01	65.00	8.93
DISSONANCES				
4/1	2.00	0.80	2.00	0.48
7/1	1.00	0.40	1.00	0.24
4/2	1.00	0.40	0.50	0.12
5/2	8.00	3.19	7.00	1.69
6/2	5.00	1.99	4.00	0.97
4/3	4.00	1.59	2.50	0.60
7/3	14.00	5.58	12.00	2.90
9/3	1.00	0.40	1.00	0.24
5/4	3.00	1.20	3.00	0.72
7/4	1.00	0.40	1.00	0.24
6/5	2.00	0.80	1.50	0.36
7/5	1.00	0.40	0.50	0.12
11/5	2.00	0.80	2.00	0.48
9/7	1.00	0.40	0.50	0.12
9/8	1.00	0.40	0.50	0.12
11/8	3.00	1.20	2.50	0.60
	50.00	19.92	41.50	10.02
PERFECT CONSONANCES				
5/5	1.00	0.40	1.00	0.24
8/5	27.00	10.76	89.00	21.50
12/5	1.00	0.40	1.00	0.24
8/8	1.00	0.40	2.00	0.48
12/8	13.00	5.18	27.50	6.64
	43.00	17.13	120.50	29.11
IMPERFECT CONSONANCES				
3/1	14.00	5.58	23.50	5.68
6/1	3.00	1.20	5.00	1.21
3/3	6.00	2.39	8.00	1.93
5/3	36.00	14.34	54.00	13.04
6/3	52.00	20.72	78.50	18.96
8/3	18.00	7.17	24.00	5.80
10/3	3.00	1.20	3.00	0.72
10/5	7.00	2.79	9.00	2.17
8/6	2.00	0.80	4.00	0.97
10/6	5.00	1.99	12.00	2.90
10/8	9.00	3.59	26.00	6.28
13/8	3.00	1.20	5.00	1.21
	158.00	62.95	252.00	60.87

DUNSTABLE O CRUX 53

	NO.	%	DURATION	%
Single notes	9.00	1.59	16.00	2.00
2-note chords	223.00	39.47	304.00	38.00
3-note chords	333.00	58.94	480.00	60.00
Dissonance	109.00	19.29	95.68	11.96
Perf. Cons.	158.00	27.96	290.18	36.27
Imp. Cons.	298.00	52.74	414.14	51.77
Full triads	124.00	21.95	168.66	21.08
Chords with crossed voices	80.00	14.16	107.00	13.37
DISSONANCES				
4/1	1.00	0.30	1.00	0.21
7/1	1.00	0.30	0.50	0.10
4/2	1.00	0.30	1.00	0.21
5/2	8.00	2.40	7.00	1.46
6/2	3.00	0.90	2.00	0.42
4/3	2.00	0.60	2.00	0.42
7/3	12.00	3.60	9.67	2.01
5/4	1.00	0.30	0.33	0.07
6/4	6.00	1.80	6.34	1.32
7/4	6.00	1.80	5.32	1.11
8/4	5.00	1.50	5.34	1.11
10/4	1.00	0.30	0.50	0.10
6/5	1.00	0.30	1.00	0.21
9/5	7.00	2.10	5.83	1.21
11/5	2.00	0.60	2.00	0.42
7/6	1.00	0.30	1.00	0.21
9/6	5.00	1.50	3.84	0.80
11/6	2.00	0.60	2.00	0.42
12/6	1.00	0.30	1.00	0.21
10/7	2.00	0.60	0.83	0.17
11/7	4.00	1.20	4.67	0.97
9/8	3.00	0.90	2.34	0.49
11/8	4.00	1.20	3.50	0.73
	79.00	23.72	69.01	14.38
PERFECT CONSONANCES				
5/1	10.00	3.00	14.00	2.92
8/1	5.00	1.50	11.50	2.40
5/5	3.00	0.90	3.17	0.66
8/5	13.00	3.90	52.34	10.90
12/5	10.00	3.00	17.00	3.54
8/8	7.00	2.10	13.00	2.71
12/8	20.00	6.01	39.00	8.12
	68.00	20.42	150.01	31.25
IMPERFECT CONSONANCES				
3/1	6.00	1.80	9.00	1.87
6/1	7.00	2.10	8.00	1.67
10/1	1.00	0.30	2.00	0.42
3/3	2.00	0.60	2.00	0.42
5/3	37.00	11.11	61.33	12.78
6/3	42.00	12.61	47.50	9.90
8/3	18.00	5.41	24.00	5.00
10/5	22.00	6.61	36.33	7.57
6/6	1.00	0.30	1.00	0.21
8/6	7.00	2.10	8.50	1.77
10/6	15.00	4.50	15.16	3.16
10/8	23.00	6.91	38.16	7.95
13/8	5.00	1.50	8.00	1.67
	186.00	55.86	260.98	54.37

LEONEL SALVE 10

	NO.	%	DURATION	%
Single notes	23.00	3.33	29.00	2.55
2-note chords	389.00	56.38	549.00	48.24
3-note chords	278.00	40.29	560.00	49.21
Dissonance	123.00	17.83	143.50	12.61
Perf. Cons.	195.00	28.26	416.00	36.56
Imp. Cons.	372.00	53.91	578.50	50.83
Full triads	121.00	17.54	220.50	19.38
Chords with crossed voices	76.00	11.01	130.00	11.42
DISSONANCES				
2/1	1.00	0.36	1.00	0.18
4/1	1.00	0.36	1.00	0.18
4/2	2.00	0.72	4.00	0.71
6/2	1.00	0.36	1.00	0.18
7/3	18.00	6.47	28.00	5.00
9/3	1.00	0.36	1.00	0.18
5/4	2.00	0.72	2.00	0.36
6/4	4.00	1.44	7.50	1.34
7/4	8.00	2.88	11.50	2.05
8/4	1.00	0.36	2.00	0.36
11/4	1.00	0.36	1.00	0.18
9/5	5.00	1.80	7.00	1.25
7/6	2.00	0.72	3.00	0.54
11/6	1.00	0.36	1.00	0.18
12/6	2.00	0.72	3.00	0.54
9/7	2.00	0.72	3.00	0.54
10/7	1.00	0.36	1.00	0.18
12/7	1.00	0.36	1.00	0.18
13/7	1.00	0.36	1.00	0.18
9/8	1.00	0.36	1.00	0.18
11/8	3.00	1.08	4.00	0.71
	59.00	21.22	85.00	15.18
PERFECT CONSONANCES				
1/1	2.00	0.72	10.00	1.79
5/1	8.00	2.88	14.00	2.50
8/1	2.00	0.72	4.00	0.71
5/5	1.00	0.36	1.00	0.18
8/5	30.00	10.79	124.00	22.14
12/5	5.00	1.80	10.00	1.79
12/8	6.00	2.16	12.00	2.14
	54.00	19.42	175.00	31.25
IMPERFECT CONSONANCES				
3/1	15.00	5.40	35.00	6.25
6/1	4.00	1.44	6.00	1.07
3/3	7.00	2.52	12.00	2.14
5/3	32.00	11.51	56.00	10.00
6/3	70.00	25.18	130.00	23.21
8/3	13.00	4.68	19.00	3.39
10/3	1.00	0.36	2.00	0.36
10/5	11.00	3.96	21.00	3.75
8/6	3.00	1.08	5.00	0.89
10/6	3.00	1.08	5.00	0.89
10/8	3.00	1.08	4.00	0.71
13/8	3.00	1.08	5.00	0.89
	165.00	59.35	300.00	53.57

LEONEL SALVE 14

	NO.	%	DURATION	%
Single notes	10.00	3.65	14.00	3.24
2-note chords	135.00	49.27	203.00	46.99
3-note chords	129.00	47.08	215.00	49.77
Dissonance	37.00	13.50	35.50	8.22
Perf. Cons.	81.00	29.56	151.00	34.95
Imp. Cons.	156.00	56.93	245.50	56.83
Full triads	65.00	23.72	107.00	24.77
Chords with crossed voices	50.00	18.25	78.00	18.06
DISSONANCES				
4/1	2.00	1.55	2.00	0.93
7/1	1.00	0.78	1.00	0.47
5/2	3.00	2.33	3.00	1.40
8/2	1.00	0.78	1.00	0.47
4/3	1.00	0.78	1.00	0.47
7/3	4.00	3.10	5.00	2.33
6/4	4.00	3.10	4.00	1.86
7/4	3.00	2.33	3.00	1.40
8/4	1.00	0.78	1.00	0.47
9/5	1.00	0.78	1.00	0.47
11/8	1.00	0.78	1.00	0.47
	22.00	17.05	23.00	10.70
PERFECT CONSONANCES				
5/1	4.00	3.10	6.00	2.79
5/5	2.00	1.55	2.00	0.93
8/5	9.00	6.98	32.00	14.88
12/5	1.00	0.78	2.00	0.93
8/8	1.00	0.78	2.00	0.93
	17.00	13.18	44.00	20.47
IMPERFECT CONSONANCES				
3/1	2.00	1.55	3.00	1.40
6/1	8.00	6.20	12.00	5.58
10/1	1.00	0.78	2.00	0.93
3/3	2.00	1.55	4.00	1.86
5/3	19.00	14.73	24.00	11.16
6/3	34.00	26.36	54.00	25.12
8/3	12.00	9.30	18.00	8.37
12/3	1.00	0.78	2.00	0.93
10/5	7.00	5.43	23.00	10.70
8/6	1.00	0.78	2.00	0.93
10/8	3.00	2.33	4.00	1.86
	90.00	69.77	148.00	68.84

LEONEL ANIMA 18

	NO.	%	DURATION	%
Single notes	6.00	1.43	10.00	1.61
2-note chords	180.00	42.76	288.00	46.30
3-note chords	235.00	55.82	324.00	52.09
Dissonance	65.00	15.44	61.00	9.81
Perf. Cons.	133.00	31.59	235.50	37.86
Imp. Cons.	223.00	52.97	325.50	52.33
Full triads	87.00	20.67	112.50	18.09
Chords with crossed voices	73.00	17.34	94.00	15.11
DISSONANCES				
4/1	2.00	0.85	1.50	0.46
7/1	3.00	1.28	3.00	0.93
9/1	1.00	0.43	1.00	0.31
5/2	1.00	0.43	1.00	0.31
6/2	1.00	0.43	0.50	0.15
7/2	2.00	0.85	2.00	0.62
4/3	1.00	0.43	1.00	0.31
7/3	4.00	1.70	4.50	1.39
5/4	1.00	0.43	1.00	0.31
6/4	3.00	1.28	2.00	0.62
7/4	2.00	0.85	2.50	0.77
8/4	1.00	0.43	0.50	0.15
6/5	1.00	0.43	0.50	0.15
7/5	5.00	2.13	5.50	1.70
9/5	3.00	1.28	3.00	0.93
11/5	7.00	2.98	6.50	2.01
9/6	2.00	0.85	2.00	0.62
11/6	2.00	0.85	2.00	0.62
10/7	1.00	0.43	0.50	0.15
12/7	1.00	0.43	1.00	0.31
11/8	2.00	0.85	2.00	0.62
	46.00	19.57	43.50	13.43
PERFECT CONSONANCES				
5/1	10.00	4.26	15.50	4.78
8/1	6.00	2.55	7.00	2.16
8/5	22.00	9.36	52.00	16.05
12/5	10.00	4.26	15.00	4.63
8/8	3.00	1.28	4.00	1.23
12/8	3.00	1.28	4.00	1.23
	54.00	22.98	97.50	30.09
IMPERFECT CONSONANCES				
3/1	1.00	0.43	2.00	0.62
6/1	8.00	3.40	12.00	3.70
3/3	2.00	0.85	2.00	0.62
5/3	29.00	12.34	40.50	12.50
6/3	28.00	11.91	31.00	9.57
8/3	19.00	8.09	23.50	7.25
10/3	3.00	1.28	3.50	1.08
12/3	1.00	0.43	2.00	0.62
10/5	17.00	7.23	25.50	7.87
6/6	1.00	0.43	0.50	0.15
8/6	6.00	2.55	10.00	3.09
10/6	6.00	2.55	6.50	2.01
10/8	10.00	4.26	17.00	5.25
13/8	2.00	0.85	3.00	0.93
10/10	1.00	0.43	1.00	0.31
12/10	1.00	0.43	3.00	0.93
	135.00	57.45	183.00	56.48

LEONEL REGINA 19

	NO.	%	DURATION	%
Single notes	10.00	2.87	26.00	4.14
2-note chords	167.00	47.99	292.00	46.50
3-note chords	171.00	49.14	310.00	49.36
Dissonance	60.00	17.24	62.50	9.95
Perf. Cons.	104.00	29.89	252.50	40.21
Imp. Cons.	184.00	52.87	313.00	49.84
Full triads	68.00	19.54	107.50	17.12
Chords with crossed voices	15.00	4.31	34.00	5.41
DISSONANCES				
4/2	1.00	0.58	2.00	0.65
5/2	5.00	2.92	4.50	1.45
7/2	1.00	0.58	0.50	0.16
8/2	1.00	0.58	1.00	0.32
7/3	3.00	1.75	4.00	1.29
9/3	1.00	0.58	1.00	0.32
11/3	1.00	0.58	1.00	0.32
6/4	3.00	1.75	3.00	0.97
7/4	1.00	0.58	1.00	0.32
8/4	2.00	1.17	2.00	0.65
10/4	1.00	0.58	1.00	0.32
6/5	1.00	0.58	0.50	0.16
7/5	2.00	1.17	1.50	0.48
9/5	2.00	1.17	2.00	0.65
11/5	2.00	1.17	2.00	0.65
9/6	1.00	0.58	0.50	0.16
11/6	3.00	1.75	3.00	0.97
12/6	2.00	1.17	3.00	0.97
9/7	2.00	1.17	2.00	0.65
12/7	2.00	1.17	3.00	0.97
11/8	2.00	1.17	3.00	0.97
	39.00	22.81	41.50	13.39
PERFECT CONSONANCES				
5/1	6.00	3.51	12.50	4.03
8/1	4.00	2.34	10.00	3.23
8/5	11.00	6.43	54.00	17.42
12/5	4.00	2.34	5.00	1.61
12/8	9.00	5.26	18.00	5.81
	34.00	19.88	99.50	32.10
IMPERFECT CONSONANCES				
6/1	6.00	3.51	7.50	2.42
3/3	1.00	0.58	4.00	1.29
5/3	16.00	9.36	27.50	8.87
6/3	32.00	18.71	52.50	16.94
8/3	14.00	8.19	25.00	8.06
10/3	2.00	1.17	3.00	0.97
10/5	9.00	5.26	14.00	4.52
8/6	1.00	0.58	1.00	0.32
10/6	5.00	2.92	7.50	2.42
13/6	1.00	0.58	1.00	0.32
10/8	7.00	4.09	18.00	5.81
13/8	4.00	2.34	8.00	2.58
	98.00	57.31	169.00	54.52

LEONEL MATER 23

	NO.	%	DURATION	%
Single notes	6.00	1.97	12.00	3.23
2-note chords	143.00	46.89	167.00	44.89
3-note chords	156.00	51.15	193.00	51.88
Dissonance	23.00	7.54	18.50	4.97
Perf. Cons.	77.00	25.25	118.50	31.85
Imp. Cons.	205.00	67.21	235.00	63.17
Full triads	69.00	22.62	83.00	22.31
Chords with crossed voices	58.00	19.02	64.00	17.20
DISSONANCES				
7/3	3.00	1.92	3.00	1.55
9/3	1.00	0.64	0.50	0.26
4/4	1.00	0.64	1.00	0.52
6/4	2.00	1.28	1.50	0.78
8/4	1.00	0.64	1.00	0.52
10/7	1.00	0.64	0.50	0.26
11/8	3.00	1.92	3.00	1.55
	12.00	7.69	10.50	5.44
PERFECT CONSONANCES				
5/1	7.00	4.49	7.00	3.63
8/1	2.00	1.28	2.00	1.04
8/5	9.00	5.77	28.00	14.51
12/5	1.00	0.64	1.00	0.52
12/8	3.00	1.92	3.00	1.55
	22.00	14.10	41.00	21.24
IMPERFECT CONSONANCES				
3/1	7.00	4.49	7.00	3.63
6/1	9.00	5.77	10.00	5.18
10/1	1.00	0.64	1.00	0.52
3/3	3.00	1.92	3.00	1.55
5/3	20.00	12.82	21.50	11.14
6/3	30.00	19.23	33.00	17.10
8/3	17.00	10.90	17.50	9.07
10/3	3.00	1.92	3.00	1.55
12/3	1.00	0.64	1.00	0.52
10/5	13.00	8.33	23.00	11.92
8/6	1.00	0.64	1.00	0.52
10/6	3.00	1.92	3.00	1.55
10/8	11.00	7.05	14.50	7.51
13/8	3.00	1.92	3.00	1.55
	122.00	78.21	141.50	73.32

LEONEL IBO MICHI 24

	NO.	%	DURATION	%
Single notes	2.00	0.61	3.00	0.60
2-note chords	59.00	18.04	83.00	16.47
3-note chords	266.00	81.35	418.00	82.94
Dissonance	28.00	8.56	22.00	4.37
Perf. Cons.	63.00	19.27	113.00	22.42
Imp. Cons.	236.00	72.17	369.00	73.21
Full triads	117.00	35.78	179.00	35.52
Chords with crossed voices	93.00	28.44	146.00	28.97
DISSONANCES				
4/1	1.00	0.38	0.50	0.12
9/1	1.00	0.38	1.00	0.24
4/2	1.00	0.38	1.00	0.24
6/2	1.00	0.38	0.50	0.12
7/3	1.00	0.38	1.00	0.24
6/4	5.00	1.88	3.00	0.72
7/4	9.00	3.38	8.50	2.03
8/4	2.00	0.75	1.50	0.36
9/4	1.00	0.38	0.50	0.12
10/4	1.00	0.38	0.50	0.12
7/5	1.00	0.38	0.50	0.12
11/6	1.00	0.38	1.00	0.24
12/6	1.00	0.38	1.00	0.24
	26.00	9.77	20.50	4.90
PERFECT CONSONANCES				
5/1	6.00	2.26	8.50	2.03
8/1	2.00	0.75	3.00	0.72
5/5	2.00	0.75	3.00	0.72
8/5	17.00	6.39	49.50	11.84
12/5	4.00	1.50	5.00	1.20
12/8	6.00	2.26	11.00	2.63
	37.00	13.91	80.00	19.14
IMPERFECT CONSONANCES				
3/1	11.00	4.14	18.00	4.31
6/1	10.00	3.76	16.00	3.83
10/1	4.00	1.50	6.00	1.44
3/3	8.00	3.01	7.00	1.67
5/3	45.00	16.92	72.50	17.34
6/3	34.00	12.78	45.00	10.77
8/3	19.00	7.14	28.50	6.82
10/3	3.00	1.13	4.00	0.96
12/3	1.00	0.38	2.00	0.48
10/5	19.00	7.14	34.00	8.13
6/6	3.00	1.13	3.50	0.84
8/6	14.00	5.26	21.50	5.14
10/6	8.00	3.01	10.50	2.51
13/6	1.00	0.38	1.00	0.24
10/8	16.00	6.02	34.00	8.13
13/8	3.00	1.13	3.00	0.72
12/10	4.00	1.50	11.00	2.63
	203.00	76.32	317.50	75.96

LEONEL ANIMA 25

	NO.	%	DURATION	%
Single notes	20.00	4.52	25.00	5.00
2-note chords	217.00	49.10	236.00	47.20
3-note chords	205.00	46.38	239.00	47.80
Dissonance	44.00	9.95	29.50	5.90
Perf. Cons.	132.00	29.86	172.00	34.40
Imp. Cons.	266.00	60.18	298.50	59.70
Full triads	102.00	23.08	111.50	22.30
Chords with crossed voices	67.00	15.16	85.00	17.00
DISSONANCES				
4/1	1.00	0.49	0.50	0.21
6/2	4.00	1.95	2.00	0.84
8/2	1.00	0.49	0.50	0.21
7/3	8.00	3.90	7.00	2.93
9/3	1.00	0.49	0.50	0.21
6/4	1.00	0.49	1.00	0.42
8/4	1.00	0.49	0.50	0.21
6/5	2.00	0.98	1.00	0.42
11/5	1.00	0.49	0.50	0.21
	20.00	9.76	13.50	5.65
PERFECT CONSONANCES				
5/1	7.00	3.41	7.00	2.93
8/5	15.00	7.32	34.00	14.23
12/5	5.00	2.44	5.50	2.30
8/8	1.00	0.49	1.00	0.42
12/8	6.00	2.93	6.00	2.51
	34.00	16.59	53.50	22.38
IMPERFECT CONSONANCES				
3/1	7.00	3.41	7.50	3.14
6/1	2.00	0.98	2.00	0.84
3/3	2.00	0.98	3.00	1.26
5/3	36.00	17.56	36.50	15.27
6/3	37.00	18.05	36.50	15.27
8/3	12.00	5.85	11.00	4.60
10/3	3.00	1.46	2.50	1.05
12/3	1.00	0.49	1.00	0.42
10/5	16.00	7.80	24.00	10.04
8/6	6.00	2.93	6.00	2.51
10/6	7.00	3.41	8.50	3.56
10/8	16.00	7.80	27.50	11.51
13/8	2.00	0.98	2.00	0.84
12/10	2.00	0.98	2.00	0.84
13/10	2.00	0.98	2.00	0.84
	151.00	73.66	172.00	71.97

LEONEL QUAM 26

	NO.	%	DURATION	%
Single notes	4.00	1.02	7.00	1.49
2-note chords	162.00	41.22	201.00	42.77
3-note chords	227.00	57.76	262.00	55.74
Dissonance	68.00	17.30	57.25	12.18
Perf. Cons.	97.00	24.68	128.75	27.39
Imp. Cons.	228.00	58.02	284.00	60.43
Full triads	94.00	23.92	109.00	23.19
Chords with crossed voices	103.00	26.21	122.00	25.96
DISSONANCES				
4/1	1.00	0.44	1.00	0.38
5/2	1.00	0.44	0.50	0.19
7/2	1.00	0.44	1.00	0.38
4/3	1.00	0.44	1.00	0.38
7/3	8.00	3.52	7.50	2.86
9/3	1.00	0.44	1.00	0.38
5/4	3.00	1.32	3.00	1.15
6/4	1.00	0.44	0.50	0.19
7/4	8.00	3.52	6.00	2.29
8/4	1.00	0.44	0.50	0.19
9/4	1.00	0.44	1.00	0.38
9/5	6.00	2.64	5.00	1.91
11/5	3.00	1.32	3.00	1.15
9/6	3.00	1.32	2.00	0.76
11/6	2.00	0.88	2.00	0.76
9/7	2.00	0.88	1.50	0.57
10/7	1.00	0.44	0.50	0.19
11/7	1.00	0.44	1.00	0.38
12/7	1.00	0.44	1.00	0.38
9/8	1.00	0.44	0.50	0.19
11/8	2.00	0.88	0.75	0.29
11/9	1.00	0.44	1.00	0.38
	50.00	22.03	41.25	15.74
PERFECT CONSONANCES				
5/1	1.00	0.44	1.00	0.38
5/5	1.00	0.44	1.00	0.38
8/5	17.00	7.49	35.00	13.36
12/5	4.00	1.76	5.00	1.91
8/8	1.00	0.44	2.00	0.76
12/8	12.00	5.29	10.75	4.10
	36.00	15.86	54.75	20.90
IMPERFECT CONSONANCES				
3/1	1.00	0.44	1.00	0.38
6/1	3.00	1.32	3.00	1.15
3/3	1.00	0.44	1.00	0.38
5/3	20.00	8.81	27.50	10.50
6/3	28.00	12.33	27.00	10.31
8/3	10.00	4.41	10.50	4.01
10/3	7.00	3.08	6.50	2.48
12/3	2.00	0.88	2.00	0.76
10/5	28.00	12.33	34.00	12.98
6/6	1.00	0.44	2.00	0.76
8/6	7.00	3.08	7.00	2.67
10/6	10.00	4.41	11.00	4.20
10/8	19.00	8.37	27.50	10.50
13/8	1.00	0.44	1.00	0.38
12/10	2.00	0.88	4.50	1.72
13/10	1.00	0.44	0.50	0.19
	141.00	62.11	166.00	63.36

LEONEL GLORIA 10

	NO.	%	DURATION	%
Single notes	0.00	0.00	0.00	0.00
2-note chords	92.00	17.90	118.50	16.32
3-note chords	422.00	82.10	607.50	83.68
Dissonance	84.00	16.34	81.83	11.27
Perf. Cons.	128.00	24.90	243.25	33.51
Imp. Cons.	302.00	58.75	400.92	55.22
Full triads	190.00	36.96	264.17	36.39
Chords with crossed voices	54.00	10.51	75.00	10.33
DISSONANCES				
4/1	4.00	0.95	4.00	0.66
7/1	1.00	0.24	0.50	0.08
5/2	2.00	0.47	2.00	0.33
6/2	1.00	0.24	1.00	0.16
4/3	3.00	0.71	3.00	0.49
7/3	20.00	4.74	19.25	3.17
5/4	1.00	0.24	1.00	0.16
6/4	4.00	0.95	3.25	0.53
7/4	1.00	0.24	0.75	0.12
8/4	1.00	0.24	1.00	0.16
6/5	4.00	0.95	4.00	0.66
7/5	13.00	3.08	13.00	2.14
9/5	8.00	1.90	8.00	1.32
11/5	5.00	1.18	5.08	0.84
9/8	1.00	0.24	1.00	0.16
11/8	2.00	0.47	2.00	0.33
	71.00	16.82	68.83	11.33
PERFECT CONSONANCES				
5/1	10.00	2.37	9.75	1.60
8/1	1.00	0.24	1.00	0.16
5/5	7.00	1.66	12.00	1.98
8/5	58.00	13.74	138.50	22.80
12/5	3.00	0.71	3.50	0.58
12/8	13.00	3.08	27.00	4.44
	92.00	21.80	191.75	31.56
IMPERFECT CONSONANCES				
3/1	21.00	4.98	25.00	4.12
6/1	8.00	1.90	7.75	1.28
3/3	5.00	1.18	5.00	0.82
5/3	69.00	16.35	97.75	16.09
6/3	94.00	22.27	122.75	20.21
8/3	15.00	3.55	17.25	2.84
10/3	2.00	0.47	2.00	0.33
10/5	17.00	4.03	30.42	5.01
8/6	7.00	1.66	11.00	1.81
10/6	6.00	1.42	10.00	1.65
10/8	13.00	3.08	16.00	2.63
13/8	2.00	0.47	2.00	0.33
	259.00	61.37	346.92	57.11

LEONEL CREDO 11

	NO.	%	DURATION	%
Single notes	0.00	0.00	0.00	0.00
2-note chords	313.00	47.79	390.00	40.12
3-note chords	342.00	52.21	582.00	59.88
Dissonance	160.00	24.43	161.00	16.56
Perf. Cons.	186.00	28.40	332.00	34.16
Imp. Cons.	309.00	47.18	479.00	49.28
Full triads	103.00	15.73	183.00	18.83
Chords with crossed voices	287.00	43.82	454.00	46.71
DISSONANCES				
4/1	2.00	0.58	2.00	0.34
7/1	4.00	1.17	4.00	0.69
9/1	2.00	0.58	2.00	0.34
3/2	3.00	0.88	3.00	0.52
4/2	5.00	1.46	5.00	0.86
5/2	2.00	0.58	2.00	0.34
6/2	5.00	1.46	5.00	0.86
7/2	2.00	0.58	2.00	0.34
8/2	2.00	0.58	2.00	0.34
9/2	1.00	0.29	1.00	0.17
4/3	4.00	1.17	4.00	0.69
7/3	5.00	1.46	5.00	0.86
9/3	2.00	0.58	2.00	0.34
11/3	1.00	0.29	1.00	0.17
4/4	2.00	0.58	2.00	0.34
5/4	2.00	0.58	2.00	0.34
6/4	9.00	2.63	9.00	1.55
7/4	2.00	0.58	2.00	0.34
8/4	4.00	1.17	4.00	0.69
9/4	6.00	1.75	6.00	1.03
10/4	5.00	1.46	5.00	0.86
11/4	3.00	0.88	3.00	0.52
6/5	1.00	0.29	1.00	0.17
7/5	1.00	0.29	1.00	0.17
9/5	10.00	2.92	10.00	1.72
11/5	4.00	1.17	5.00	0.86
10/7	2.00	0.58	2.00	0.34
9/8	2.00	0.58	2.00	0.34
11/8	9.00	2.63	9.00	1.55
11/10	1.00	0.29	1.00	0.17
	103.00	30.12	104.00	17.87
PERFECT CONSONANCES				
1/1	1.00	0.29	2.00	0.34
5/1	5.00	1.46	10.00	1.72
8/1	15.00	4.39	40.00	6.87
5/5	2.00	0.58	4.00	0.69
8/5	27.00	7.89	82.00	14.09
12/5	9.00	2.63	17.00	2.92
8/8	2.00	0.58	7.00	1.20
12/8	16.00	4.68	28.00	4.81
	77.00	22.51	190.00	32.65
IMPERFECT CONSONANCES				
3/1	7.00	2.05	11.00	1.89
6/1	5.00	1.46	6.00	1.03
10/1	2.00	0.58	3.00	0.52
3/3	6.00	1.75	10.00	1.72
5/3	37.00	10.82	80.00	13.75
6/3	19.00	5.56	31.00	5.33
8/3	20.00	5.85	40.00	6.87
10/3	10.00	2.92	15.00	2.58
12/3	3.00	0.88	5.00	0.86
10/5	23.00	6.73	38.00	6.53
8/6	3.00	0.88	7.00	1.20
10/6	9.00	2.63	15.00	2.58
10/8	12.00	3.51	19.00	3.26
13/8	3.00	0.88	3.00	0.52
12/10	2.00	0.58	4.00	0.69
13/10	1.00	0.29	1.00	0.17
	162.00	47.37	288.00	49.48

LEONEL CREDO 13

	NO.	%	DURATION	%
Single notes	1.00	0.11	1.34	0.15
2-note chords	157.00	17.14	172.66	19.38
3-note chords	758.00	82.75	717.00	80.47
Dissonance	197.00	21.51	124.86	14.01
Perf. Cons.	177.00	19.32	243.42	27.32
Imp. Cons.	542.00	59.17	522.72	58.67
Full triads	346.00	37.77	322.74	36.22
Chords with crossed voices	155.00	16.92	136.00	15.26
DISSONANCES				
4/1	6.00	0.79	2.49	0.35
7/1	1.00	0.13	0.50	0.07
2/2	1.00	0.13	1.00	0.14
3/2	1.00	0.13	1.00	0.14
4/2	1.00	0.13	0.50	0.07
5/2	7.00	0.92	5.00	0.70
6/2	8.00	1.06	6.34	0.88
7/2	3.00	0.40	2.17	0.30
8/2	1.00	0.13	0.50	0.07
4/3	5.00	0.66	2.83	0.39
7/3	61.00	8.05	38.87	5.42
9/3	5.00	0.66	3.67	0.51
11/3	1.00	0.13	0.50	0.07
5/4	3.00	0.40	1.50	0.21
6/4	10.00	1.32	7.04	0.98
7/4	5.00	0.66	3.37	0.47
8/4	3.00	0.40	1.25	0.17
6/5	8.00	1.06	4.75	0.66
7/5	21.00	2.77	12.00	1.67
9/5	14.00	1.85	9.83	1.37
11/5	4.00	0.53	2.66	0.37
9/6	2.00	0.26	0.67	0.09
8/7	2.00	0.26	1.50	0.21
9/7	1.00	0.13	1.00	0.14
11/7	1.00	0.13	0.50	0.07
12/7	1.00	0.13	0.50	0.07
9/8	1.00	0.13	0.25	0.03
11/8	3.00	0.40	2.00	0.28
	180.00	23.75	114.19	15.93
PERFECT CONSONANCES				
1/1	2.00	0.26	3.00	0.42
5/1	19.00	2.51	16.75	2.34
8/1	4.00	0.53	3.50	0.49
5/5	6.00	0.79	5.00	0.70
8/5	73.00	9.63	126.09	17.59
12/5	7.00	0.92	9.50	1.32
8/8	4.00	0.53	5.00	0.70
12/8	4.00	0.53	5.67	0.79
	119.00	15.70	174.51	24.34
IMPERFECT CONSONANCES				
3/1	17.00	2.24	17.00	2.37
6/1	20.00	2.64	14.42	2.01
3/3	18.00	2.37	14.59	2.03
5/3	125.00	16.49	112.32	15.67
6/3	186.00	24.54	176.06	24.56
8/3	46.00	6.07	40.67	5.67
10/3	5.00	0.66	5.33	0.74
12/3	2.00	0.26	4.16	0.58
10/5	20.00	2.64	20.17	2.81
8/6	7.00	0.92	7.83	1.09
10/6	3.00	0.40	3.00	0.42
10/8	10.00	1.32	12.75	1.78
	459.00	60.55	428.30	59.74

LEONEL CREDO 14

	NO.	%	DURATION	%
Single notes	0.00	0.00	0.00	0.00
2-note chords	87.00	13.62	105.67	16.93
3-note chords	552.00	86.38	518.33	83.07
Dissonance	150.00	23.47	94.83	15.20
Perf. Cons.	144.00	22.54	221.39	35.48
Imp. Cons.	345.00	53.99	307.78	49.32
Full triads	239.00	37.40	204.23	32.73
Chords with crossed voices	133.00	20.81	88.00	14.10
DISSONANCES				
2/1	1.00	0.18	0.50	0.10
4/1	7.00	1.27	4.08	0.79
7/1	3.00	0.54	2.00	0.39
3/2	2.00	0.36	1.00	0.19
4/2	1.00	0.18	1.00	0.19
5/2	6.00	1.09	3.34	0.64
6/2	9.00	1.63	4.99	0.96
7/2	1.00	0.18	0.33	0.06
9/2	2.00	0.36	1.50	0.29
4/3	3.00	0.54	1.75	0.34
7/3	40.00	7.25	28.25	5.45
5/4	5.00	0.91	2.50	0.48
6/4	13.00	2.36	9.83	1.90
7/4	6.00	1.09	4.17	0.80
8/4	4.00	0.72	2.50	0.48
9/4	1.00	0.18	0.50	0.10
12/4	1.00	0.18	0.50	0.10
6/5	1.00	0.18	0.50	0.10
7/5	2.00	0.36	0.83	0.16
9/5	6.00	1.09	3.00	0.58
11/5	9.00	1.63	4.92	0.95
11/6	2.00	0.36	1.00	0.19
10/7	1.00	0.18	0.34	0.07
11/7	1.00	0.18	0.66	0.13
9/8	2.00	0.36	1.00	0.19
11/8	10.00	1.81	5.84	1.13
	139.00	25.18	86.83	16.75
PERFECT CONSONANCES				
1/1	3.00	0.54	2.50	0.48
5/1	17.00	3.08	17.40	3.36
8/1	4.00	0.72	3.50	0.68
5/5	2.00	0.36	1.33	0.26
8/5	47.00	8.51	106.67	20.58
12/5	12.00	2.17	12.83	2.48
8/8	1.00	0.18	1.00	0.19
12/8	15.00	2.72	14.33	2.76
	101.00	18.30	159.56	30.78
IMPERFECT CONSONANCES				
3/1	17.00	3.08	15.18	2.93
6/1	10.00	1.81	7.01	1.35
3/3	13.00	2.36	11.01	2.12
5/3	84.00	15.22	71.66	13.83
6/3	118.00	21.38	98.49	19.00
8/3	27.00	4.89	25.01	4.83
10/3	1.00	0.18	1.00	0.19
12/3	1.00	0.18	0.50	0.10
10/5	14.00	2.54	15.25	2.94
8/6	4.00	0.72	4.00	0.77
10/6	7.00	1.27	7.50	1.45
10/8	14.00	2.54	12.33	2.38
13/8	2.00	0.36	3.00	0.58
	312.00	56.52	271.94	52.46

LEONEL SANCTUS 15

	NO.	%	DURATION	%
Single notes	0.00	0.00	0.00	0.00
2-note chords	163.00	27.72	180.00	25.10
3-note chords	425.00	72.28	537.00	74.90
Dissonance	114.00	19.39	99.50	13.88
Perf. Cons.	138.00	23.47	233.50	32.57
Imp. Cons.	336.00	57.14	384.00	53.56
Full triads	168.00	28.57	192.50	26.85
Chords with crossed voices	79.00	13.44	89.00	12.41
DISSONANCES				
4/1	3.00	0.71	3.00	0.56
7/1	2.00	0.47	2.00	0.37
9/1	1.00	0.24	1.00	0.19
3/2	1.00	0.24	1.00	0.19
5/2	2.00	0.47	1.00	0.19
6/2	3.00	0.71	2.50	0.47
7/2	3.00	0.71	3.00	0.56
8/2	1.00	0.24	1.00	0.19
4/3	5.00	1.18	3.50	0.65
7/3	36.00	8.47	30.50	5.68
9/3	2.00	0.47	1.50	0.28
11/3	1.00	0.24	1.00	0.19
4/4	1.00	0.24	1.00	0.19
5/4	2.00	0.47	1.50	0.28
6/4	2.00	0.47	2.00	0.37
7/4	2.00	0.47	2.00	0.37
10/4	1.00	0.24	1.00	0.19
6/5	6.00	1.41	5.50	1.02
7/5	5.00	1.18	4.50	0.84
9/5	8.00	1.88	8.50	1.58
11/5	1.00	0.24	1.00	0.19
11/8	6.00	1.41	5.00	0.93
	94.00	22.12	83.00	15.46
PERFECT CONSONANCES				
1/1	3.00	0.71	5.00	0.93
5/1	17.00	4.00	25.50	4.75
5/5	6.00	1.41	7.50	1.40
8/5	39.00	9.18	103.00	19.18
12/5	6.00	1.41	8.00	1.49
12/8	9.00	2.12	13.00	2.42
	80.00	18.82	162.00	30.17
IMPERFECT CONSONANCES				
3/1	12.00	2.82	12.50	2.33
6/1	12.00	2.82	14.00	2.61
3/3	10.00	2.35	13.50	2.51
5/3	58.00	13.65	67.84	12.63
6/3	90.00	21.18	101.66	18.93
8/3	31.00	7.29	36.50	6.80
10/3	5.00	1.18	5.00	0.93
10/5	12.00	2.82	14.00	2.61
8/6	2.00	0.47	3.00	0.56
10/6	6.00	1.41	7.00	1.30
10/8	10.00	2.35	13.00	2.42
13/8	3.00	0.71	4.00	0.74
	251.00	59.06	292.00	54.38

LEONEL GLORIA 16

	NO.	%	DURATION	%
Single notes	0.00	0.00	0.00	0.00
2-note chords	98.00	16.09	111.34	17.48
3-note chords	511.00	83.91	525.66	82.52
Dissonance	142.00	23.32	100.34	15.75
Perf. Cons.	107.00	17.57	171.39	26.91
Imp. Cons.	360.00	59.11	365.27	57.34
Full triads	213.00	34.98	209.44	32.88
Chords with crossed voices	121.00	19.87	119.00	18.68
DISSONANCES				
4/1	3.00	0.59	2.17	0.41
7/1	4.00	0.78	2.25	0.43
5/2	8.00	1.57	5.11	0.97
6/2	11.00	2.15	8.39	1.60
8/2	1.00	0.20	0.50	0.10
4/3	10.00	1.96	4.23	0.80
7/3	37.00	7.24	29.30	5.57
9/3	2.00	0.39	1.50	0.29
4/4	1.00	0.20	1.00	0.19
5/4	3.00	0.59	2.00	0.38
6/4	13.00	2.54	10.50	2.00
7/4	4.00	0.78	3.00	0.57
8/4	3.00	0.59	1.50	0.29
10/4	1.00	0.20	0.50	0.10
11/4	1.00	0.20	1.00	0.19
6/5	1.00	0.20	1.00	0.19
7/5	6.00	1.17	4.67	0.89
9/5	4.00	0.78	2.22	0.42
11/5	4.00	0.78	2.50	0.48
11/6	2.00	0.39	1.50	0.29
12/6	1.00	0.20	0.50	0.10
9/7	1.00	0.20	1.00	0.19
10/7	2.00	0.39	2.00	0.38
12/7	1.00	0.20	0.50	0.10
11/8	1.00	0.20	1.00	0.19
	125.00	24.46	89.84	17.09
PERFECT CONSONANCES				
5/1	19.00	3.72	22.28	4.24
8/1	2.00	0.39	1.50	0.29
5/5	2.00	0.39	2.00	0.38
8/5	42.00	8.22	87.27	16.60
12/5	4.00	0.78	3.50	0.67
12/8	2.00	0.39	1.50	0.29
	71.00	13.89	118.05	22.46
IMPERFECT CONSONANCES				
3/1	9.00	1.76	8.23	1.57
6/1	26.00	5.09	18.92	3.60
3/3	13.00	2.54	10.83	2.06
5/3	67.00	13.11	70.79	13.47
6/3	113.00	22.11	102.65	19.53
8/3	37.00	7.24	33.85	6.44
10/3	7.00	1.37	7.00	1.33
10/5	13.00	2.54	17.00	3.23
6/6	1.00	0.20	0.50	0.10
8/6	7.00	1.37	6.50	1.24
10/6	5.00	0.98	7.00	1.33
10/8	14.00	2.74	32.00	6.09
13/8	3.00	0.59	2.50	0.48
	315.00	61.64	317.77	60.45

LEONEL GLORIA 18

	NO.	%	DURATION	%
Single notes	2.00	0.40	3.00	0.43
2-note chords	154.00	31.11	211.00	30.49
3-note chords	339.00	68.48	478.00	69.08
Dissonance	91.00	18.38	93.50	13.51
Perf. Cons.	138.00	27.88	240.00	34.68
Imp. Cons.	266.00	53.74	358.50	51.81
Full triads	128.00	25.86	166.00	23.99
Chords with crossed voices	116.00	23.43	153.00	22.11
DISSONANCES				
4/1	4.00	1.18	4.00	0.84
3/2	1.00	0.29	1.00	0.21
5/2	2.00	0.59	2.00	0.42
6/2	1.00	0.29	1.00	0.21
4/3	1.00	0.29	0.50	0.10
7/3	15.00	4.42	15.50	3.24
9/3	5.00	1.47	5.00	1.05
11/3	1.00	0.29	1.00	0.21
4/4	2.00	0.59	2.00	0.42
5/4	2.00	0.59	2.00	0.42
6/4	5.00	1.47	7.00	1.46
8/4	1.00	0.29	1.00	0.21
6/5	1.00	0.29	1.00	0.21
7/5	2.00	0.59	3.00	0.63
9/5	6.00	1.77	6.00	1.26
11/5	6.00	1.77	6.00	1.26
11/6	2.00	0.59	2.00	0.42
12/6	1.00	0.29	1.00	0.21
8/7	1.00	0.29	1.00	0.21
10/7	1.00	0.29	1.00	0.21
12/7	1.00	0.29	1.00	0.21
9/8	1.00	0.29	1.00	0.21
11/8	5.00	1.47	5.50	1.15
11/9	1.00	0.29	1.00	0.21
12/9	1.00	0.29	1.00	0.21
	69.00	20.35	72.50	15.17
PERFECT CONSONANCES				
1/1	1.00	0.29	4.00	0.84
5/1	14.00	4.13	22.00	4.60
8/1	5.00	1.47	7.00	1.46
5/5	3.00	0.88	3.00	0.63
8/5	22.00	6.49	51.00	10.67
12/5	11.00	3.24	15.00	3.14
8/8	5.00	1.47	6.00	1.26
12/8	13.00	3.83	27.50	5.75
	74.00	21.83	135.50	28.35
IMPERFECT CONSONANCES				
3/1	11.00	3.24	18.00	3.77
6/1	12.00	3.54	13.00	2.72
3/3	1.00	0.29	2.00	0.42
5/3	40.00	11.80	46.50	9.73
6/3	47.00	13.86	54.50	11.40
8/3	20.00	5.90	26.00	5.44
10/3	7.00	2.06	10.00	2.09
10/5	24.00	7.08	40.00	8.37
8/6	4.00	1.18	5.00	1.05
10/6	5.00	1.47	8.00	1.67
13/6	1.00	0.29	1.00	0.21
10/8	16.00	4.72	30.00	6.28
13/8	3.00	0.88	8.00	1.67
12/10	3.00	0.88	5.00	1.05
13/10	2.00	0.59	3.00	0.63
	196.00	57.82	270.00	56.49

LEONEL CREDO 18

	NO.	%	DURATION	%
Single notes	12.00	1.69	22.00	2.23
2-note chords	352.00	49.51	512.00	51.93
3-note chords	347.00	48.80	452.00	45.84
Dissonance	130.00	18.28	121.49	12.32
Perf. Cons.	225.00	31.65	372.17	37.75
Imp. Cons.	356.00	50.07	492.34	49.93
Full triads	113.00	15.89	141.68	14.37
Chords with crossed voices	131.00	18.42	147.00	14.91
DISSONANCES				
4/1	7.00	2.02	5.17	1.14
7/1	2.00	0.58	2.00	0.44
3/2	1.00	0.29	1.00	0.22
4/2	1.00	0.29	1.00	0.22
5/2	1.00	0.29	1.00	0.22
7/2	1.00	0.29	1.00	0.22
4/3	2.00	0.58	2.00	0.44
7/3	13.00	3.75	11.82	2.62
9/3	1.00	0.29	1.00	0.22
11/3	2.00	0.58	2.00	0.44
5/4	1.00	0.29	1.00	0.22
6/4	2.00	0.58	2.00	0.44
8/4	1.00	0.29	1.00	0.22
9/4	1.00	0.29	1.00	0.22
10/4	1.00	0.29	1.00	0.22
7/5	1.00	0.29	0.50	0.11
9/5	8.00	2.31	7.00	1.55
11/5	17.00	4.90	15.00	3.32
13/5	2.00	0.58	1.50	0.33
7/6	1.00	0.29	0.50	0.11
11/6	3.00	0.86	3.00	0.66
9/7	1.00	0.29	1.00	0.22
10/7	2.00	0.58	1.50	0.33
12/7	2.00	0.58	1.50	0.33
11/8	2.00	0.58	1.00	0.22
11/9	1.00	0.29	1.00	0.22
12/9	2.00	0.58	3.00	0.66
	79.00	22.77	70.49	15.60
PERFECT CONSONANCES				
1/1	1.00	0.29	2.00	0.44
5/1	21.00	6.05	25.17	5.57
8/1	3.00	0.86	13.00	2.88
8/5	15.00	4.32	30.50	6.75
12/5	20.00	5.76	27.00	5.97
8/8	4.00	1.15	6.00	1.33
12/8	17.00	4.90	24.00	5.31
	81.00	23.34	127.67	28.25
IMPERFECT CONSONANCES				
3/1	6.00	1.73	8.66	1.92
6/1	11.00	3.17	14.00	3.10
3/3	4.00	1.15	10.00	2.21
5/3	32.00	9.22	39.66	8.77
6/3	31.00	8.93	35.52	7.86
8/3	27.00	7.78	34.00	7.52
10/3	6.00	1.73	7.00	1.55
12/3	1.00	0.29	3.00	0.66
10/5	38.00	10.95	48.50	10.73
8/6	4.00	1.15	5.50	1.22
10/6	3.00	0.86	3.00	0.66
13/6	2.00	0.58	2.00	0.44
10/8	16.00	4.61	31.00	6.86
13/8	3.00	0.86	5.00	1.11
12/10	2.00	0.58	5.00	1.11
13/10	1.00	0.29	2.00	0.44
	187.00	53.89	253.84	56.16

LEONEL CREDO 19

	NO.	%	DURATION	%
Single notes	18.00	3.78	21.00	4.90
2-note chords	258.00	54.20	225.00	52.45
3-note chords	200.00	42.02	183.00	42.66
Dissonance	74.00	15.55	48.50	11.31
Perf. Cons.	155.00	32.56	176.00	41.03
Imp. Cons.	247.00	51.89	204.50	47.67
Full triads	89.00	18.70	70.00	16.32
Chords with crossed voices	63.00	13.24	39.00	9.09
DISSONANCES				
4/1	4.00	2.00	2.00	1.09
7/1	1.00	0.50	0.50	0.27
3/2	1.00	0.50	0.50	0.27
4/2	1.00	0.50	1.00	0.55
4/3	1.00	0.50	0.50	0.27
7/3	4.00	2.00	3.00	1.64
9/3	1.00	0.50	0.50	0.27
5/4	2.00	1.00	1.00	0.55
6/4	4.00	2.00	2.50	1.37
7/4	3.00	1.50	2.00	1.09
8/4	3.00	1.50	2.00	1.09
6/5	3.00	1.50	1.50	0.82
7/5	3.00	1.50	1.50	0.82
9/5	1.00	0.50	0.50	0.27
11/5	2.00	1.00	1.50	0.82
9/8	1.00	0.50	0.50	0.27
11/8	1.00	0.50	0.50	0.27
	36.00	18.00	21.50	11.75
PERFECT CONSONANCES				
1/1	2.00	1.00	2.00	1.09
5/1	4.00	2.00	2.50	1.37
8/1	2.00	1.00	2.50	1.37
5/5	4.00	2.00	3.00	1.64
8/5	19.00	9.50	41.00	22.40
12/5	4.00	2.00	4.50	2.46
8/8	1.00	0.50	1.00	0.55
12/8	3.00	1.50	4.50	2.46
	39.00	19.50	61.00	33.33
IMPERFECT CONSONANCES				
3/1	12.00	6.00	9.50	5.19
6/1	4.00	2.00	4.00	2.19
3/3	7.00	3.50	5.50	3.01
5/3	42.00	21.00	34.25	18.72
6/3	32.00	16.00	23.75	12.98
8/3	11.00	5.50	7.50	4.10
10/3	1.00	0.50	1.00	0.55
12/3	1.00	0.50	1.00	0.55
10/5	9.00	4.50	7.50	4.10
8/6	3.00	1.50	3.00	1.64
10/6	1.00	0.50	1.00	0.55
10/8	2.00	1.00	2.50	1.37
	125.00	62.50	100.50	54.92

LEONEL SANCTUS 20

	NO.	%	DURATION	%
Single notes	6.00	1.78	14.00	2.11
2-note chords	155.00	45.99	281.00	42.32
3-note chords	176.00	52.23	369.00	55.57
Dissonance	77.00	22.85	102.33	15.41
Perf. Cons.	93.00	27.60	257.00	38.70
Imp. Cons.	167.00	49.55	304.67	45.88
Full triads	75.00	22.26	137.67	20.73
Chords with crossed voices	42.00	12.46	80.00	12.05
DISSONANCES				
2/1	1.00	0.57	1.00	0.27
4/1	1.00	0.57	1.00	0.27
3/2	2.00	1.14	2.00	0.54
6/2	4.00	2.27	5.00	1.36
7/3	10.00	5.68	17.00	4.61
9/3	1.00	0.57	2.00	0.54
5/4	2.00	1.14	2.00	0.54
6/4	4.00	2.27	3.67	0.99
7/4	5.00	2.84	6.33	1.72
8/4	1.00	0.57	2.00	0.54
7/5	3.00	1.70	5.00	1.36
9/5	3.00	1.70	5.00	1.36
11/5	2.00	1.14	2.00	0.54
9/6	2.00	1.14	2.00	0.54
11/6	1.00	0.57	2.00	0.54
11/7	1.00	0.57	2.00	0.54
11/8	2.00	1.14	2.00	0.54
	45.00	25.57	62.00	16.80
PERFECT CONSONANCES				
5/1	4.00	2.27	8.00	2.17
8/5	17.00	9.66	85.00	23.04
12/5	5.00	2.84	12.00	3.25
12/8	6.00	3.41	15.00	4.07
	32.00	18.18	120.00	32.52
IMPERFECT CONSONANCES				
3/1	2.00	1.14	3.00	0.81
6/1	1.00	0.57	1.00	0.27
3/3	7.00	3.98	10.00	2.71
5/3	21.00	11.93	33.00	8.94
6/3	40.00	22.73	80.00	21.68
8/3	12.00	6.82	28.00	7.59
10/3	2.00	1.14	4.00	1.08
10/5	7.00	3.98	15.00	4.07
8/6	1.00	0.57	2.00	0.54
10/6	2.00	1.14	4.00	1.08
10/8	2.00	1.14	3.00	0.81
13/8	2.00	1.14	4.00	1.08
	99.00	56.25	187.00	50.68

APPENDIX THREE

MELODIC INTERVALS DATA

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Kyrie 1						
unis	4.7		2.5		4.9	
2nd	30.3	24.2	30.9	29.6	30.3	27.7
3rd	18.2	20.2	10.8	10.8	15.6	9.5
4th	0.7	1.4	2.0	6.1	2.6	6.1
5th	.	.	1.4	3.4	.	2.6
8ve	.	.	2.7	.	0.9	.
Gloria 2						
unis	9.3		6.3		1.9	
2nd	25.4	37.4	16.7	28.6	18.0	42.9
3rd	10.2	12.1	13.8	16.1	12.8	8.7
4th	4.0	0.5	4.3	5.9	5.3	4.9
5th	0.2	0.2	5.1	1.6	3.0	1.5
7th	.	.	.	.	0.4	.
8ve	0.7	.	0.4	.	0.8	.
Gloria 4						
unis	13.8		11.0		1.8	
2nd	29.0	35.4	22.9	24.9	15.2	49.1
3rd	10.2	9.1	11.0	15.9	11.1	7.7
4th	1.1	0.8	6.1	3.3	6.4	4.7
5th	0.6	.	2.9	2.0	2.9	.
7th	.	.	.	.	0.6	.
8ve	.	.	.	.	0.6	.
Credo 5						
unis	25.5		7.7		1.4	
2nd	19.6	29.3	20.4	24.2	19.0	45.3
3rd	8.0	11.8	6.7	14.7	8.1	10.0
4th	3.6	0.2	9.1	7.0	4.1	4.5
5th	1.1	0.2	4.9	3.9	2.3	1.4
6th	0.5	.	0.4	.	.	.
7th	.	.	0.4	.	0.5	.
8ve	0.2	.	0.7	.	3.6	.
Sanctus 6						
unis	11.8		7.8		2.5	
2nd	24.5	38.2	26.8	31.9	16.0	51.9
3rd	10.8	9.8	7.8	11.7	10.5	6.3
4th	3.9	0.7	5.6	3.9	2.1	4.2
5th	0.3	.	2.2	1.1	3.4	0.4
7th	.	.	.	.	0.4	.
8ve	.	.	0.6	0.6	2.5	.
Gloria 7						
unis	7.6		7.5		13.7	
2nd	21.0	40.9	23.1	29.1	5.9	53.0
3rd	14.6	9.4	9.7	9.7	7.8	.
4th	4.1	1.8	7.5	3.7	7.8	4.9
5th	0.6	.	4.5	4.5	4.9	1.0
8ve	.	.	.	0.8	1.0	.

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Credo 8						
unis	11.2		7.8		3.4	
2nd	21.4	35.3	20.2	22.6	21.6	38.1
3rd	13.2	12.2	9.5	15.2	10.2	9.7
4th	4.8	1.4	5.8	7.8	8.0	5.7
5th	0.7	.	5.4	3.7	3.4	2.8
6th	.	.	0.4	.	.	.
8ve	.	.	1.7	.	0.6	.
Gloria 9						
unis	10.3		6.7		1.5	
2nd	24.9	35.3	27.2	32.0	22.8	42.2
3rd	11.1	10.5	10.4	13.3	9.4	9.4
4th	4.5	2.0	4.3	3.2	4.2	3.7
5th	0.7	0.7	1.3	0.8	3.5	1.7
6th	0.2	.	.	.	0.3	.
7th	.	.	0.3	.	.	.
8ve	.	.	0.5	.	1.2	.
Sanctus 13						
unis	9.7		6.2		14.2	
2nd	27.8	31.4	19.2	22.0	26.5	34.6
3rd	10.2	15.4	14.7	16.9	9.9	10.5
4th	3.6	0.9	4.5	3.4	3.7	0.6
5th	0.7	.	4.5	6.2	.	.
6th	.	.	0.6	.	.	.
8ve	0.5	.	1.7	.	.	.
Agnus 14						
unis	6.8		9.0		11.6	
2nd	30.1	27.4	22.6	21.1	31.5	30.1
3rd	10.1	18.2	12.8	21.1	11.6	13.7
4th	4.4	2.0	3.8	3.8	0.7	0.7
5th	0.7	.	1.5	2.3	.	.
7th	.	.	2.3	.	.	.
8ve	0.3	.	.	.	.	.
Gloria 15						
unis	9.1		12.0		28.0	
2nd	32.1	30.5	20.1	24.9	21.3	37.3
3rd	9.6	14.4	10.9	16.5	8.0	.
4th	2.4	1.1	4.1	3.9	2.7	2.7
5th	0.2	0.2	2.3	2.7	.	.
6th	.	.	0.2	.	.	.
7th	.	.	0.5	.	.	.
8ve	0.6	.	2.0	.	.	.
Credo 16						
unis	13.7		16.0		28.0	
2nd	24.0	33.6	19.4	25.3	21.3	37.0
3rd	11.8	12.4	10.4	13.8	8.0	.
4th	2.2	0.3	3.8	3.8	2.7	2.7
5th	1.0	0.5	2.7	2.5	.	.
6th	.	.	0.2	.	.	.
7th	.	.	0.5	.	.	.
8ve	0.5	.	1.4	0.2	.	.

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Credo 17						
unis	11.7		14.4		30.6	
2nd	24.0	30.8	17.0	21.2	16.1	33.9
3rd	11.0	15.9	11.8	20.3	8.1	.
4th	4.7	0.5	4.6	2.6	6.5	1.6
5th	0.5	0.5	2.6	2.9	.	3.2
6th	0.5	.	.	.	.	.
7th	.	.	1.6	.	.	.
8ve	0.2	.	1.0	.	.	.
Albanus 23						
unis	9.6		14.6		21.5	
2nd	27.1	29.2	17.8	26.0	23.1	32.3
3rd	12.1	15.4	10.0	15.5	9.2	4.6
4th	3.5	2.1	2.9	5.9	4.6	4.6
5th	0.6	.	2.6	0.6	.	.
6th	0.2	.	0.3	0.3	.	.
7th	.	.	2.0	0.3	.	.
8ve	0.2	.	1.2	.	.	.
Ave Regina 24						
unis	9.0		11.9		18.8	
2nd	22.3	32.9	18.2	32.5	37.5	37.5
3rd	12.3	15.9	12.3	10.9	.	.
4th	4.3	1.4	4.6	4.0	6.2	.
5th	1.0	.	2.0	1.7	.	.
6th	0.2	.	0.3	.	.	.
7th	.	.	0.3	.	.	.
8ve	0.7	.	1.0	0.3	.	.
Christe 25						
unis	14.1		10.0		20.0	
2nd	21.0	31.3	17.9	28.3	30.0	35.0
3rd	14.1	13.2	14.0	16.5	.	5.0
4th	3.5	1.7	5.0	3.6	10.0	.
5th	1.2	.	1.4	1.4	.	.
6th	.	.	0.4	.	.	.
7th	.	.	0.4	.	.	.
8ve	.	.	1.1	.	.	.
Dies 26						
unis	13.2		7.1		18.8	
2nd	22.3	34.2	22.6	32.1	31.3	37.5
3rd	12.9	12.3	10.4	15.7	6.3	6.3
4th	3.1	1.0	3.0	10.4	.	.
5th	0.6	.	3.3	1.5	.	.
6th	0.2	.	0.3	.	.	.
7th	.	.	0.9	.	.	.
8ve	0.2	.	0.6	.	.	.

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Gaude 27						
unis	10.0		9.0		14.7	
2nd	24.4	33.3	18.5	27.3	26.5	35.3
3rd	12.3	13.3	11.7	14.3	14.7	5.9
4th	3.3	1.8	5.5	6.0	.	2.9
5th	0.9	0.2	2.9	2.4	.	.
6th	0.3	.	0.7	.	.	.
7th	.	.	0.9	.	.	.
8ve	0.3	.	0.9	.	.	.
Specialis 31						
unis	6.8		10.4		8.3	
2nd	28.5	30.5	26.1	20.4	25.0	25.0
3rd	11.7	14.5	10.4	16.6	.	16.7
4th	4.8	2.8	2.4	4.3	8.3	8.3
5th	0.4	.	3.8	3.8	8.3	.
6th	.	.	0.5	.	.	.
7th	.	.	0.5	.	.	.
8ve	.	.	0.5	.	.	.
9th	.	.	0.5	.	.	.
Veni 33						
unis	8.1		5.5		17.7	
2nd	26.8	28.7	21.3	32.9	32.4	29.4
3rd	12.1	17.3	8.5	9.8	5.9	2.9
4th	5.2	1.1	7.3	7.3	2.9	5.9
5th	0.4	0.4	1.8	3.1	.	2.9
8ve	.	.	2.4	.	.	.
(textless) 34						
unis	16.3		5.5		.	
2nd	19.4	33.7	12.7	21.8	15.8	63.2
3rd	10.2	14.3	10.9	20.0	.	.
4th	4.1	.	7.3	10.9	21.1	.
5th	1.0	.	5.5	3.6	.	.
6th	1.0	.	.	.	.	.
Ave 35						
unis	9.4		1.9		.	
2nd	30.2	30.2	21.2	34.6	34.1	34.1
3rd	9.4	11.3	9.6	9.6	11.4	9.1
4th	3.8	.	3.9	7.7	.	4.6
5th	1.9	3.8	3.9	3.9	4.6	2.3
7th	.	.	1.9	.	.	.
8ve	.	.	1.9	.	.	.
Magnificat 36						
unis	22.6		15.8		20.4	
2nd	26.6	25.6	23.9	31.2	26.4	24.7
3rd	6.1	14.1	7.0	15.0	10.8	13.9
4th	5.0	.	3.0	.	1.7	.
5th	.	.	1.8	1.0	0.9	1.3
8ve	.	.	1.4	.	.	.

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Ave 37						
unis	8.8		6.4		3.2	
2nd	23.0	36.4	26.7	32.7	18.7	37.4
3rd	12.3	14.0	11.4	15.8	15.5	14.4
4th	5.5	.	3.0	0.5	7.5	2.7
5th	.	.	2.0	1.0	0.5	.
6th	.	.	0.5	.	.	.
Regina 38						
unis	6.8		2.0		0.7	
2nd	30.7	35.6	31.8	30.4	31.0	35.8
3rd	9.1	11.7	7.2	16.5	9.4	12.4
4th	4.4	1.6	5.0	3.0	2.9	3.3
5th	0.2	.	2.0	1.0	1.6	1.3
6th	.	.	.	.	1.0	.
7th	.	.	0.3	.	.	.
8ve	.	.	0.6	.	0.7	.
Crux 39						
unis	6.5		8.4		2.4	
2nd	31.8	34.4	30.5	35.8	30.0	32.1
3rd	10.5	13.8	10.5	11.6	8.9	13.3
4th	1.2	0.6	1.6	0.5	2.4	4.4
5th	0.6	.	1.0	.	3.4	1.4
7th	0.2	.	.	.	.	0.3
8ve	0.4	.	.	.	1.4	.
Gloria 43						
unis	9.1		4.4		5.4	
2nd	28.5	30.0	25.4	29.8	17.1	45.0
3rd	10.7	13.8	12.7	14.5	12.4	7.0
4th	4.4	2.7	4.4	2.6	4.7	4.7
5th	0.7	.	2.6	3.1	3.1	.
7th	.	.	.	.	0.8	.
8ve	.	.	0.4	.	.	.
Quam 44						
unis	18.0		15.6		17.4	
2nd	29.7	23.8	32.3	9.0	14.3	30.4
3rd	10.5	14.0	6.6	16.2	7.5	12.4
4th	1.7	0.6	3.0	5.4	5.6	3.1
5th	0.6	1.2	3.0	6.6	5.6	3.1
6th	.	.	0.6	.	.	.
8ve	.	.	1.8	.	0.6	.
Salve 45						
unis	10.1		9.7		0.8	
2nd	31.4	31.1	27.2	27.6	18.4	44.0
3rd	8.6	14.5	7.6	13.8	10.4	10.4
4th	2.1	0.6	5.2	2.8	5.6	4.8
5th	1.8	.	2.8	1.0	2.4	0.8
8ve	.	.	1.0	1.4	2.4	.

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Salve 46						
unis	9.9		6.8		1.9	
2nd	27.0	34.5	20.9	30.6	18.6	44.7
3rd	10.6	12.5	10.6	13.5	7.5	13.0
4th	3.1	1.1	4.0	4.0	3.7	2.5
5th	0.5	0.3	1.4	2.9	1.2	1.9
6th	0.1	.	1.0	0.4	0.6	.
7th	.	.	1.6	0.2	.	.
8ve	0.3	.	1.6	0.4	4.4	.
9th	0.1	.	.	.	.	.
Sancta 47						
unis	14.1		9.1		6.5	
2nd	24.9	34.4	22.6	17.6	17.8	31.2
3rd	12.2	11.4	10.2	16.8	14.0	12.3
4th	2.5	0.2	5.0	5.0	3.1	3.8
5th	0.2	.	3.9	6.1	3.1	5.5
6th	.	.	0.3	.	.	.
7th	.	.	0.6	.	.	.
8ve	.	.	2.5	0.6	2.7	.
Sancta 48						
unis	12.8		3.1		1.2	
2nd	42.8	32.6	29.5	33.3	22.2	44.5
3rd	11.2	13.4	8.5	11.6	4.9	11.1
4th	2.1	.	8.5	3.9	8.6	3.7
5th	1.1	.	0.8	0.8	.	1.2
8ve	.	.	.	.	2.5	.
Sancta 49						
unis	7.3		6.3		2.1	
2nd	24.7	32.7	29.6	27.3	24.1	35.6
3rd	11.6	16.4	8.0	15.9	11.0	13.6
4th	5.1	1.1	2.8	3.4	4.2	4.2
5th	0.7	.	5.1	0.6	2.1	1.6
7th	.	.	0.6	.	.	.
8ve	0.4	.	.	0.6	1.6	.
Speciosa 50						
unis	13.7		4.7		3.1	
2nd	30.3	28.6	24.4	32.3	24.7	38.2
3rd	9.2	14.9	15.0	11.0	8.3	11.3
4th	1.7	0.6	3.2	4.7	2.1	3.1
5th	0.6	.	1.6	2.4	5.2	3.1
8ve	0.6	.	0.8	.	1.0	.

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Sub Tuam 51						
unis	6.4		3.2		0.5	
2nd	23.3	36.2	25.8	31.7	28.1	38.6
3rd	13.5	13.2	8.1	15.1	10.0	9.1
4th	4.1	1.4	4.3	4.3	3.8	5.7
5th	0.7	0.7	2.7	1.6	1.0	1.4
6th	0.3	.	.	.	.	.
7th	.	.	0.5	.	0.5	.
8ve	0.3	.	2.2	.	1.4	.
9th	.	.	.	0.5	.	.
Gaude 52						
unis	8.3		9.2		5.8	
2nd	28.2	29.8	29.3	20.1	21.9	32.2
3rd	10.6	14.8	11.6	19.5	12.7	17.5
4th	3.9	2.9	4.9	1.8	5.1	2.1
5th	1.3	.	1.8	1.2	1.4	0.3
7th	.	.	.	.	0.3	.
8ve	0.3	.	.	0.6	0.7	.
O Crux 53						
unis	8.8		7.5		1.7	
2nd	32.0	32.5	23.3	29.3	30.6	35.8
3rd	9.3	14.3	10.5	15.8	9.8	7.5
4th	2.5	0.3	4.1	4.5	3.5	4.1
5th	0.3	.	1.1	1.1	3.5	3.5
6th	.	.	0.4	.	.	.
8ve	0.3	.	2.3	.	.	.

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Beata 1						
unis	2.8		14.8		.	
2nd	40.9	32.4	27.8	40.7	14.1	50.0
3rd	5.6	8.5	9.3	5.6	14.1	4.7
4th	4.2	5.6	1.9	.	3.1	3.1
5th	.	.	.	.	4.7	4.7
8ve	.	.	.	.	1.6	.
Ave 2						
unis	7.8		23.8		7.1	
2nd	36.7	32.0	27.9	36.1	8.0	47.3
3rd	9.4	7.8	8.2	4.1	11.6	3.6
4th	2.3	3.1	.	.	3.6	7.1
5th	.	0.8	.	.	7.1	2.7
8ve	.	.	.	.	1.8	.
Beata 5						
unis	5.9		2.8		4.0	
2nd	50.6	41.2	43.1	23.6	20.0	37.3
3rd	7.1	10.6	6.9	16.7	10.7	14.7
4th	3.5	.	1.4	4.2	6.7	2.7
5th	1.2	.	1.4	.	1.3	1.3
7th	.	.	.	.	1.3	.
Salve 10						
unis	7.7		3.6		0.6	
2nd	31.6	34.7	32.5	33.9	25.1	38.8
3rd	8.7	10.6	9.2	10.1	12.0	12.0
4th	3.3	1.4	2.9	2.5	4.9	2.7
5th	0.8	0.6	2.2	2.2	2.2	1.1
6th	0.4	.	0.2	.	0.6	.
7th	0.2	.	.	.	.	.
8ve	.	0.2	0.5	0.2	.	.
Salve 14						
unis	5.3		4.3		.	
2nd	23.7	38.7	23.6	35.7	22.5	42.3
3rd	9.2	14.5	7.9	13.6	11.7	12.6
4th	5.3	0.5	5.7	3.6	2.7	3.6
5th	1.9	0.5	5.0	0.7	3.6	.
8ve	0.5	.	.	.	0.9	.
Anima 18						
unis	.		7.1		3.2	
2nd	.	.	25.3	23.1	21.5	32.9
3rd	.	.	5.0	19.2	10.8	13.3
4th	.	.	6.6	5.0	4.4	4.4
5th	.	.	1.7	3.3	5.1	3.2
6th	.	.	.	.	.	.
7th	.	.	0.6	.	.	.
8ve	.	.	3.3	.	1.3	.

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Regina 19						
unis	8.6		9.2		2.8	
2nd	26.2	32.6	30.3	29.4	22.0	33.0
3rd	12.2	15.1	10.1	9.2	8.8	14.8
4th	3.9	0.7	2.8	4.6	8.2	4.4
5th	0.7	.	1.8	0.9	3.3	2.2
8ve	.	.	0.9	0.9	0.6	.
Mater 23						
unis	4.9		3.0		1.0	
2nd	26.3	32.2	27.8	32.0	32.0	34.0
3rd	12.5	17.0	6.5	15.4	10.0	16.0
4th	4.9	0.9	5.3	2.4	1.0	3.0
5th	0.5	0.5	3.0	2.4	2.0	.
6th	.	.	1.2	.	.	.
7th	.	.	0.6	.	1.0	.
8ve	0.5	.	0.6	.	.	.
Ibo 24						
unis	7.9		5.9		6.7	
2nd	21.9	34.4	26.7	26.2	21.1	33.0
3rd	11.6	17.2	8.0	15.0	7.7	15.5
4th	5.1	.	5.4	2.1	4.6	3.1
5th	1.4	.	5.4	3.7	4.1	2.1
7th	0.5	.	.	.	.	.
8ve	.	.	0.5	.	2.1	.
Anima 25						
unis	6.8		3.4		6.9	
2nd	26.5	35.7	22.2	33.8	23.5	40.2
3rd	10.5	14.8	7.7	13.5	7.8	10.3
4th	2.8	0.9	4.8	5.3	4.4	2.9
5th	0.9	.	3.9	1.9	3.4	.
7th	.	.	1.5	.	.	.
8ve	1.2	.	1.5	.	0.5	.
Quam 26						
unis	11.3		7.5		5.5	
2nd	36.1	32.7	35.7	24.3	29.2	40.2
3rd	3.4	11.7	1.8	13.2	4.0	9.6
4th	1.9	0.8	2.6	4.9	4.0	3.0
5th	1.9	.	4.0	2.6	2.0	0.5
6th	.	.	.	0.4	0.5	.
7th	0.4	.	1.3	.	.	.
8ve	.	.	0.9	0.4	1.5	.
Sanctus 1						
unis	3.9		23.9		2.3	
2nd	38.1	36.1	15.7	36.4	16.8	39.7
3rd	3.9	10.3	8.3	4.2	13.8	12.2
4th	3.9	1.9	5.8	.	5.3	3.8
5th	1.3	0.7	2.5	1.7	4.6	1.5
6th	.	.	.	1.7	.	.

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Sanctus 2						
unis	3.8		15.4		1.9	
2nd	37.0	35.3	28.5	30.8	11.3	45.9
3rd	8.2	9.2	7.7	12.3	15.7	9.4
4th	3.3	3.3	4.6	0.8	1.9	5.0
5th	.	.	.	.	6.3	1.3
8ve	.	.	.	.	1.3	.
Sanctus 3						
unis	9.2		25.7		1.1	
2nd	30.8	40.8	33.8	28.4	11.2	47.2
3rd	11.7	5.0	4.1	4.1	15.7	7.9
4th	0.8	1.7	1.4	2.7	4.5	4.5
5th	.	.	.	.	2.3	2.3
6th	.	.	.	.	1.1	.
8ve	.	.	.	.	2.3	.
Agnus 4						
unis	8.4		21.1		1.0	
2nd	37.4	39.7	25.6	25.6	13.6	40.8
3rd	6.1	3.8	10.0	14.5	18.5	8.7
4th	2.3	2.3	.	.	7.8	7.8
5th	.	.	3.3	.	1.9	.
Agnus 5						
unis	2.0		31.9		3.5	
2nd	33.1	41.6	11.5	26.5	12.9	43.1
3rd	11.7	7.8	16.8	4.4	7.8	8.6
4th	2.0	2.0	2.7	6.2	4.3	8.6
5th	.	.	.	.	6.9	0.9
6th	.	.	.	.	0.9	.
7th	.	.	.	.	2.6	.
Agnus 6						
unis	2.4		40.0		.	
2nd	48.8	29.3	35.0	15.0	5.9	44.1
3rd	4.9	7.3	.	10.0	14.7	11.8
4th	2.4	4.9	.	.	11.8	8.8
5th	.	.	.	.	2.9	.
Gloria 10						
unis	8.3		6.5		3.6	
2nd	27.0	33.0	34.8	25.4	17.7	47.2
3rd	11.8	14.3	7.2	12.0	6.1	8.1
4th	4.5	1.0	2.5	5.1	7.7	3.6
5th	0.3	.	2.2	2.2	3.2	0.8
6th	.	.	0.7	.	0.4	.
7th	.	.	0.4	.	0.8	.
8ve	.	.	0.7	0.4	0.8	.

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Credo 11						
unis	11.0		7.4		13.3	
2nd	19.9	44.8	21.5	39.7	25.9	37.1
3rd	11.4	5.2	9.7	5.8	9.8	5.6
4th	3.7	1.9	3.2	3.2	4.2	1.4
5th	0.8	0.4	34.4	3.7	0.7	2.1
6th	0.2	.	0.9	.	.	.
7th	0.2	.	0.2	.	.	.
8ve	0.4	.	0.2	.	.	.
Credo 13						
unis	10.3		6.2		5.3	
2nd	32.4	34.9	27.0	32.9	12.5	52.3
3rd	6.6	8.5	7.1	11.6	9.9	8.0
4th	3.6	2.8	4.5	3.3	5.1	1.6
5th	1.0	.	2.8	2.8	3.5	.
6th	.	.	0.7	.	0.5	.
7th	.	.	0.5	.	0.3	.
8ve	.	.	0.7	.	1.1	.
Credo 14						
unis	16.7		4.2		1.7	
2nd	29.2	30.0	27.2	32.0	17.2	49.4
3rd	7.30	11.5	9.3	13.1	8.6	8.6
4th	3.5	1.3	3.5	3.8	8.6	2.6
5th	0.6	.	3.5	1.9	2.2	0.4
6th	.	.	0.3	.	.	.
8ve	.	.	1.0	.	0.9	.
Sanctus 15						
unis	6.7		5.4		1.9	
2nd	29.6	38.0	27.5	34.6	19.8	42.8
3rd	9.5	9.0	0.4	12.1	14.7	11.2
4th	3.9	1.9	6.0	0.7	5.1	1.9
5th	0.9	0.5	2.0	1.3	1.9	0.6
6th	.	.	0.3	0.3	.	.
7th	.	.	.	0.3	.	.
8ve	.	.	0.3	0.7	.	.
Gloria 16						
unis	12.1		3.8		2.8	
2nd	31.1	33.6	32.2	27.4	16.7	46.0
3rd	9.1	10.9	10.4	17.0	11.9	12.3
4th	1.8	0.7	1.0	1.9	3.6	2.0
5th	0.7	.	2.5	2.2	2.8	.
6th	.	.	0.3	.	0.4	.
8ve	.	.	1.3	.	1.6	.
Gloria 18						
unis	9.7		14.7		8.7	
2nd	32.9	29.7	24.8	21.4	33.3	31.9
3rd	9.0	13.7	7.5	14.7	8.7	7.3
4th	3.0	1.8	5.3	3.8	.	1.5
5th	.	.	3.8	3.0	2.9	4.4
6th	.	.	.	.	1.5	.
8ve	0.3	.	0.8	0.4	.	.

	voice I		voice II		voice III	
	asc.	desc.	asc.	desc.	asc.	desc.
Credo 18						
unis	9.2		17.8		8.7	
2nd	31.9	30.5	22.7	27.4	33.3	31.9
3rd	8.8	14.5	6.8	12.5	8.7	7.3
4th	2.8	1.2	3.9	3.4	.	1.5
5th	0.7	.	2.4	1.6	2.9	4.4
6th	0.2	.	.	.	1.5	.
7th	.	.	0.5	.	.	.
8ve	0.2	.	1.0	.	.	.
Credo 19						
unis	19.8		26.1		14.9	
2nd	23.3	28.2	17.2	19.7	16.4	40.5
3rd	8.6	12.1	7.6	14.0	9.8	5.1
4th	3.5	2.4	5.7	3.2	4.6	3.6
5th	1.9	.	4.5	1.9	2.1	0.5
8ve	0.3	.	.	.	1.5	1.0
Sanctus 20						
unis	11.5		2.8		2.7	
2nd	25.5	36.7	36.5	32.7	18.1	51.1
3rd	11.2	9.7	5.6	12.2	8.5	6.4
4th	3.2	1.4	0.9	1.9	4.8	2.7
5th	0.7	.	2.8	1.9	4.3	0.5
6th	.	.	.	0.9	.	.
8ve	.	.	1.9	.	1.1	.