

WE HAVE LONG KNOWN that our view of fourteenth-century music is incomplete. Extraordinary examples from the central traditions of learned polyphony such as the **Squarcialupi** codex and the self-prepared *Gesamtausgaben* of Machaut transmit repertoires to us in (nearly) complete states, systematically organized, and often decorated with stunning beauty. For Italian music, **Squarcialupi** and a handful of other codices—**Rossi**, **Panciaticchi**, **London**, **Reina**, **Pit.**, and **Mancini** in particular—have formed the backbone of manuscript sources for scholarship on polyphonic music.¹ However, it is widely recognized that the music of these collections existed side-by-side with other musical traditions. These traditions are hinted at by the instrumental diminutions of the **Faenza** codex,² and by traces

¹ See sigla list for details of all bold names. The manuscripts are listed in approximate chronological order, except for Squarcialupi which would be last.

² For more on **Faenza**, see Dragan Plamenac, “Keyboard Music of the Fourteenth Century in Codex Faenza 117,” *Journal of the American Musicological Society* 4 (1951), pp. 179–201; Armen Carapetyan, ed., *An Early Fifteenth-Century Italian Source of Keyboard Music: The Codex Faenza, Biblioteca Comunale 117*, Musicological Studies and Documents 10, (Rome: American Institute of Musicology, 1961); and Pedro Memelsdorff, “Motti a motti: reflections on a motet intabulation of the early Quattrocento,” *Recercare* 10 (1998), pp. 39–68. Giulio Cattin also discusses keyboard music of **Padua 553** in his “Ricerche sulla musica a S. Giustina di Padova all’Inizio del Quattrocento: Il copista Rolando da Casale. Nuovi frammenti musicali nell’Archivio di Stato,” *Annales Musicologiques* 7 (1977), pp. 17–41. The last manuscript written in score of assuredly instrumental music notation, **Assisi 187**, was discovered and described by Agostino Ziino, “Un antico ‘Kyrie’ a due voci per strumento a tastiera,” *Nuova rivista musicale italiana* 15.4 (1981), pp. 628–33. Along with the single pieces of **Padua 553** and **Assisi 187**, much of the contents of **Faenza** is sacred music; thus the single voice instrumental dances of **London 29987** and **Florence 17879** take on even greater importance.

of improvised polyphony and normally unwritten practices within the art song repertoire.³ Connections among these traditions and the existence of a diversity of styles can only be seen obliquely within the main line of codices, which for the most part were well-edited in attempts to present particular musical repertoires.⁴ Evidence for more varied traditions of Italian polyphony, with wider reaches, would be strengthened if we possessed a much larger body of musical sources for study; sources created at different times, in different regions, and for different purposes.

The many manuscript fragments found throughout Italy provide such a body of sources. The fragments are usually regarded as auxiliary, but by their number alone they pre-

³ On improvisation, see Brooks Toliver, "Improvisation in the Madrigals of the Rossi Codex," *Acta musicologica* 64 (1992), pp. 165–76. The unwritten tradition has been discussed in Nino Pirrotta, "New Glimpses of an Unwritten Tradition," in *Words and Music: The Scholar's View. A Medley of Problems and Solutions Compiled in Honor of A. Tillman Merritt*, ed. Laurence Berman (Cambridge, Mass.: Distributed by Harvard University Press, 1972), pp. 271–91; Anne Stone, "Glimpses of the unwritten tradition in some ars subtilior works," in *Essays in Memory of Nino Pirrotta*, ed. Frank D'Accone (Neuhausen-Stuttgart: American Institute of Musicology, 1995–1996). Connections to the more humble sacred polyphonic traditions are extensively discussed in several papers in *Le Polifonie primitive in Friuli e in Europa, Atti del congresso internazionale Civile del Friuli, 22–24 agosto 1980*, edited by Cesare Corsi and Pierluigi Petrobelli (Rome: Torre d'Orfeo, 1989), in particular F. Alberto Gallo, "The Practice of *cantus planus binatim* in Italy From the Beginning of the 14th to the Beginning of the 16th Century." pp. 13–30.

⁴ The seemingly chaotic **London 29987** is an important exception to this characterization. Note also that the manuscript preserves a palimpsest earlier foliation of 98–185, so it too can be called a complete source only with qualification. For information on the concept of the "manuscript repertory" (as opposed to mere manuscript contents), see the papers presented as part of Round Table 2, "Costituzione e conservazione dei repertorii polifonici nei secoli XIV e XV," in *Atti del XIV congresso della società internazionale di musicologia, Bologna, 27 agosto–1 settembre 1987*, vol. 1 (Round Tables), (Turin: E.D.T., 1990). In particular, Wulf Arlt, "Repertoirefragen 'peripherer' Mehrstimmigkeit: das Beispiel des Codex Engelberg 314," pp. 97–123; Margaret Bent, "Manuscripts as Répertoires, Scribal Performance and the Performing Scribe," pp. 138–52; John Nádas, "Song Collections in Late-Medieval Florence," pp. 126–35.

sent a wider and better view of Italian musical life in the fourteenth century than could be gained from even the most careful scrutiny of the intact manuscripts.

In this thesis, I present an investigation of those problems and unanswered questions of trecento music scholarship which are best addressed through a systematic study of the smaller manuscript sources containing Italian music, today scattered throughout Europe and the United States.⁵ The study is concerned with questions whose answers require the study of greater numbers of manuscripts, such as norms for scribal behavior, how the distribution of surviving material sources reflects the importance of musical centers, or how we can de-

⁵ The main title of this study consists of only two words. Many of these pages concern the significance of the second word, fragments. A moment on the first word then might not be out of place. Why have I chosen “trecento” to label a group of manuscripts most of which I cannot date precisely and many of which can certainly be dated to after 1400? In a way, it is an adjective born out of necessity. The problems of the term “Italian *Ars Nova*” to cover this entire period were raised quite some time ago by Charles van den Borren (“L’ *Ars Nova*,” in *Les Colloques de Wéginmont II—1955, L’Ars nova: Recueil d’études sur la musique du XIVe siècle*, (Paris: Les Belles Lettres, 1959), pp. 17–26) and then by Ursula Günther (“Das Ende der *Ars Nova*,” *Die Musikforschung* 16 (1963), pp. 105–20). The problems the term raises for Italian music have yet to be reexamined in light of Sarah Fuller’s evidence for the slipperiness of the term as a reference to a single treatise or, more likely, a circle of related teachings (“A Phantom Treatise of the Fourteenth Century? The *Ars Nova*,” *Journal of Musicology* 4 (1985–6), pp. 23–50, especially p. 44). Simply stating the years covered by the study would have given another way of demarking the chronological range: “Italian Fragments, c. 1330–1420.” I choose not to take this approach because I argue that there is a continuity within the documents studied which goes beyond mere synchronicity. Put another way, I do not want to imply that the boundaries of this investigation could equally well have been drawn ten years earlier or, especially, later depending on the intended length of this study. We are left with a term which, as David Fallows points out, might be considered “historically misleading” or not true to the literal meaning in Italian of trecento (“*Ars Nova*,” s.v., in *2ndNG*). However, the flexibility of such terminology has many precedents in English-language scholarship. Publications such as *Polyphonic Music of the Fourteenth Century* have nearly entire volumes dedicated to music composed after 1400, exemplifying scholarly willingness to bend vocabulary to fit perceived stylistic periods. Recent articles such as Franco Facchin’s “Le fonti di polifonia trecentesca italiana alla luce degli ultimi ritrovamenti” (*Fonti Musicali Italiane nuova serie* 2 (1997), pp. 7–35) show a flexibility on the Italian side to bend the limits of the century as well. The denomination “Italian *Ars Nova* of the Trecento” used by the series published by Certaldo eliminates the ambiguity at the risk of some redundancy.

termine the provenance of manuscripts while not relying on other manuscript sources whose own locations of origin may be in doubt. My work suggests that, because fragments have been discovered one at a time over the past century, assumptions about the larger musical environment of late-medieval Italy have remained unquestioned beyond their usefulness.

I begin by presenting an overview of the source situation, and what we can see of the musical environment, of Italy during the period from around 1330–1420. In this chapter, I address the broad problems in discussing connections among sources and styles. I will also detail some methods for working with fragmentary sources. The chapters which follow are examinations of the particular fragments, divided roughly by geographical region, beginning with the northern sources (with those from Padua taking center stage), continuing with those which can be connected to Florence and Tuscany, and finishing with fragments from other regions, those of unknown origins, and finally touching on non-Italian sources of Italian music. My intention of drawing connections among sources requires that aspects of transmission which cut across sources and regions be discussed within the context of the first fragment that brings the issue to the fore. Thus, some skipping around the text will be necessary to find every discussion of a particular source. This discontinuity is, unfortunately, unavoidable, but I hope it might be mitigated by the index and the availability of an electronic version of this dissertation.⁶

This thesis will also extend our view of the concept of the fragment, making this concept more nuanced and well defined. As a consequence of my goal, the final chapters of the

⁶ The electronic version of this text is available at <<http://myke.trecento.com/dissertation/>>. Copies of the .pdf version from UMI are not, at present, searchable; the version available at this site by contrast is searchable and has color versions of many figures.

dissertation will discuss works which might only be fragmentary from our perspective; that is, the perspective we have as seekers of larger collections of polyphonic music, but they are sources which we have no reason to believe were considered incomplete by their compilers.⁷

**No new fragments recently discovered in Italian archives:
A reflection on what we already have**

The primary aim of this work is not to present new, hitherto unknown sources of Italian mensural polyphony, although it will present one fragment I recently discovered and several works without introductory studies.⁸ Instead, my intention is to paint a new view of the manuscript situation and music culture of trecento Italy based on a reexamination of the fragments already discovered, particularly in relation to one another. Announcements of new manuscript discoveries have been the catalysts for most discussions of fragmentary sources, but often the admirable goal of bringing the essential information about a manuscript to the attention of other scholars as quickly as possible has left much to be done even with the smallest fragments after their announcements. The importance of new fragments too often goes unrealized for scholars tackling various problems; relevant, already announced

⁷ I have been unable to locate studies on the concept of completeness in the Middle Ages when applied to written compilations. It is obvious, given *explicitis* and *scipsits* and other testimonies, that medieval copyists had an idea of a completed text similar to our own. However, the notion of a complete volume, that is, a complete collection of texts, to which nothing could or should be added, is not necessarily a concept shared with us. Thus, how a contemporary reader might have perceived a document made up of disparate parts remains an open question. Our attempts to answer this question will color how we approach polyphonic additions to liturgical manuscripts: as fragments, as additions, as commentary on the main corpus of the manuscript?

⁸ For the new source, see the discussion of the blank fragment **Padua 1027** in Chapter 2. The first long description of **Oxford 56** appears in the same chapter.

sources are omitted in many discussions of trecento music.⁹ Though they are in one sense known, their presence has not yet infiltrated scholarly discourse. In particular, newly-discovered sources have mostly been compared to the largest and most well-known manuscripts. While most discovery publications succeed at isolating the distinct traits of that specific new discovery, these traits are less often put in the context of the full body of contemporary sources. The study of fragments as a group, on the other hand, allows comparisons with the whole surviving repertory of trecento manuscripts which lets us isolate sub-genres and draw out connections among otherwise disparate sources. It is in this important respect that I disagree with Stefano Campagnolo's remark at the beginning of his study of

Panciatichi 26:¹⁰

Nello studio dei manoscritti medioevali è ben noto che ogni codice costituisce un universo autonomo: esso è unico non solo per caratteristiche fisiche e di contenuto, ma anche la storia, l'uso che ne è stato fatto, le fortunate circostanze che ne hanno permesso la conservazione sono uniche.

In the study of medieval manuscripts, it is well-known that each codex constitutes an autonomous universe. It is unique not only because of its physical characteristics and its contents, but also its history, the use which was made of it, and the fortunate circumstances that have allowed its preservation are unique.

⁹ The dizzying similarity among titles of announcement studies is a source of further confusion; witness the difficulty in remembering which sources were referred to in these articles: "A Fourteenth-Century Polyphonic Manuscript Rediscovered," "Frammenti di un codice musicale del secolo XIV," "Frammenti di un codice musicale dell' Ars nova rimasti sconosciuti," "Un frammento di codice musicale del secolo XIV," "Eine neue Quelle zur italienischen Kirchenmusik des Trecento," "Neue Quellen zur Musik des 13., 14. und 15. Jahrhunderts," "Ein neues Trecentofragment," "New Sacred Polyphonic Fragments of the Early Quattrocento," "New sources of Ars nova music," and "Nuove fonti di polifonia italiana dell'ars nova."

¹⁰ Stefano Campagnolo, "Il codice Panciatichi 26 della Biblioteca Nazionale di Firenze nella tradizione delle opere di Francesco Landini," in *Col dolce suon che da te piove: Studi su Francesco Landini e la musica del suo tempo: In memoria di Nino Pirrotta*, edited by Antonio Delfino and Maria Teresa Roasa-Barezzani (Florence, Sismel: 1999), p. 77.

Although much can be gained by the study of a manuscript as an autonomous universe—and this may be a profitable way to begin to describe a new source—the importance of comparisons among sources yields the realization that many sources share a common universe of shared works, compositional and notational influences, and common reception histories.¹¹

The phrase “connections among sources,” is often used as a synonym for works shared among these sources. We might find more meaningful the broader uses of the term which include scribal concordances, notational similarities, and related ideas of the organization of a manuscript. As one expands the concept further, perhaps to include stylistic similarities among works copied, linguistic traits, or physical size, a trove of possible relations and influences is unearthed. Visualizing this web of connections can be as difficult as discovering the connections in the first place. Figure 1.1¹² illustrates the connections which one minor source, **Florence 999**, shares with other trecento and early quattrocento sources. Certain of the connections relate to the manuscript as a whole. Others relate only to one or the other of the two polyphonic works contained within it.¹³ Each of these connections may be studied individually to understand the universe—dependent and interrelated and not autonomous—which makes up the world of a single source.

¹¹ In contrast to this, his introductory statement, Campagnolo’s own work shows a balance of the study of sources as detached objects and as bound within a complex of other sources.

¹² Figures, tables, and examples are numbered consecutively in this dissertation, so that the first Figure, 1.1, is followed by Table 1.2, etc.

¹³ I have made no attempt to chart any of the connections between the monophonic works in this source and those in other sources. That such a task seems nigh impossible now demonstrates how much work is still to be done in the later histories of plainchant. **Florence 999** is the first source we will encounter which is not really a fragment at all. See the following section “Typology of styles, notations, and sources.”

FIGURE 1.1: CONNECTIONS BETWEEN FLORENCE 999 AND OTHER MANUSCRIPTS

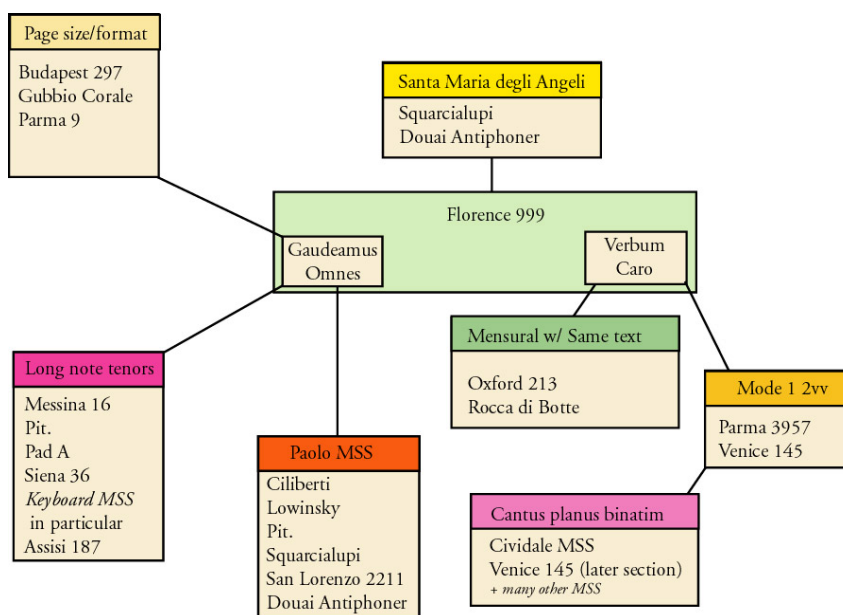


Figure 1.1 emphasizes different reasons (shown in color) why other manuscripts (listed in the different boxes) might be connected to **Florence 999**, or why works in one manuscript may be connected to those in another. Even for a source with few polyphonic pieces, the number of different connections is impressive; for a larger source, the complexity of such a chart would be astounding.

We should resist the urge to consider the unearthing of connections among sources to be a work of secondary importance compared to the discovery of new sources. That the reputation of such a scholar as Nino Pirrotta, who himself complained that he “never had the chance to discover the tiniest fragment of Ars Nova music,” is so enduring reminds us that drawing out these connections and insights from existing sources is a never-ending endeavor of utmost significance.¹⁴

¹⁴ Pirrotta was reporting on a source newly discovered by Hans David, “Church Polyphony Apropos a New Fragment at Foligno,” in *Studies in Music History. Essays for Oliver Strunk*, edited by Harold Powers (Princeton: Princeton Univ. Press, 1968), p. 113.

Building on our Knowledge. What is already known?

For scholars, sorting through the gallimaufry of sources has become so difficult that obvious connections between sources have been overlooked simply because the manuscripts, though published, were not widely known. It may be said that scholarship on Italian sources lags behind its neighbors in this respect.¹⁵ Important work on collecting facsimiles of sources from the Low Countries in one volume has already been completed.¹⁶ The complementary task, collecting descriptions and inventories of manuscripts from the British Isles, was brought comparatively up-to-date in 1993.¹⁷ The collection and reappraisal of recent French sources, though, trails even that of the Italians. However, the changes wrought by recent manuscript discoveries on our view of French music are not only less significant than those encountered by Italy, but are also intertwined with the reappraisal of Italian sources.

The order in which manuscripts have been discovered has had an important influence on the direction of scholarly activity as a whole. The manuscripts known to Johannes Wolf and Friedrich Ludwig do not represent what we should today consider the range of music production found in the Italian fourteenth-century. In particular, they exaggerate the importance of Florence (and to a lesser extent Padua) and the role of secular music for scribes *ca.* 1400.

¹⁵ Franco Facchin's 1997 article, "Le fonti," was an important step in collecting and highlighting recent discoveries.

¹⁶ Eugeen Schreurs, editor, *Anthologie van muziekfragmenten uit de Lage Landen (An Anthology of Music Fragments From the Low Countries)*, (Leuven: Alamire, 1995). The lack of complete work listings (with or without concordances) is one of the few deficiencies of this extraordinary effort.

¹⁷ William J. Summers, "English 14th-Century Polyphonic Music: an Inventory of the Extant Manuscript Editions," *Journal of Musicology* 8.2 (Spring 1990), pp. 173–226. Andrew Wathey, *RISM B-IV 1-2^{sup}*. See also Nicky Losseff, *The Best Concordances: Polyphonic Music in Thirteenth-Century Britain* (New York: Garland, 1994) for inventories of the earlier sources.

Table 1.2 lists the Italian manuscripts in order of their discovery. The dates given are those of the publication of a notice of the manuscript which brought the discovery to the attention of the musicological public. The (otherwise unfortunate) isolation and specialization of music journals as such makes it easier for the later sources to determine which publications to include as designed to bring notice to musicologists. Some of the manuscripts listed as first appearing in Johannes Wolf's 1904 publication were mentioned in earlier catalogs, but there is no indication that scholarship on the musical contents of these sources was conducted prior to Wolf's history.¹⁸

¹⁸ An excellent summary of the historiography of the Paduan fragments appears in Anne Hallmark's "Some Evidence for French Influence in Northern Italy, c. 1400," in *Studies in the Performance of Late Medieval Music*, edited by Stanley Boorman (Cambridge: Cambridge University Press, 1983), p. 197. The compilation of this table was aided substantially by the inventory of literature organized by source which Viola L. Hagopian prepared for the largest and most important sources in her *Italian Ars Nova Music: A Bibliographical Guide to Modern Editions and Related Literature*, Second edition (Berkeley: University of California Press, 1973).

TABLE 1.2: DISCOVERY OF ITALIAN MANUSCRIPTS AND SOURCES CONTAINING ITALIAN MUSIC, IN CHRONOLOGICAL ORDER¹⁹

Manuscript	Year	Discovery
Squarcialupi	by 1774 ²⁰	Angelo Maria Bandini, <i>Catalogus codicum manuscriptorum Bibliothecae Mediceae Laurentianae</i> . ²¹
Pit.	1827	François-Joseph Fétis, <i>Revue musicale</i> 1, pp. 106-115. ²²
Mod A	by 1868	A. Cappelli, <i>Poesie musicali dei secoli 14, 15 e 16</i> (Bologna: Presso Gaetano Romagnoli).
Strasbourg 222	1870	Auguste Lippmann, “Essai sur un manuscrit du quinzième siècle découvert dans la Bibliothèque de la ville de Strasbourg,” <i>Bulletins de la Société pour la Conservation des Monuments Historiques d’Alsace</i> Serie 2, 7, pp. 73–76. Destroyed in the same year as the announcement.
Roquefort	1876	Fétis, <i>Histoire générale de la musique depuis les temps les plus anciens jusqu’à nos jours</i> , vol. 5 of 5 vols, (Paris: Didot), but see, “Lost sources” in the following table.
London 29987	1877	H. Varnhagens, “Die handschriftlichen Erwerbungen des British Museum auf dem Gebiete des Altromanischen in den Jahren von 1865 bis Mitte 1877,” <i>Zeitschrift für romanische Philologie</i> 1. Also in <i>Catalogue of additions to the manuscripts in the British Museum in the years MDCCCLXXVI—MDCCCLXXXI</i> (1882).
Padua 1475	1890	Lodovico Frati, “Frammenti di un codice musicale del secolo XIV,” <i>Giornale storico della letteratura italiana</i> 18, pp. 438-39.
Padua 684	1892	Guido Mazzoni, <i>Tre ballate e due sonetti antichi</i> , Per nozze Salvioni-Taveggia (Padua: Gallina, 1892). ²³

¹⁹ Non-Italian items containing only a single or a handful of Italian works, such as the Old Hall manuscript (which contains a Credo by Zachara) are omitted.

²⁰ “By (date)” will be used instead of just a date if the first traceable discussion of the manuscript seems to assume some prior knowledge of the source’s existence. John Nádas has recently informed me of documents which push this date back by at least a year.

²¹ Wolf, 1904 gives the first substantial musical description of the manuscript.

²² See also Antonio Marsand, *I manoscritti italiani della Regia Biblioteca parigina*, 2 volumes (Paris: Stamperia reale, 1835), vol. 1, p. 570. Fétis seems unaware of the existence of Squarcialupi when describing Pit.

²³ Thanks are owed to the special collections department of the Duke University libraries for helping me obtain a copy of the Mazzoni publication, of which only sixty were printed. A summary of

Manuscript	Year	Discovery
Bologna 2216 and Bologna Q 15	by 1893	Rodolfo Renier, review of Emil Vogel, <i>Bibliothek der gedruckten weltlichen Vocalmusik Italiens aus den Jahren 1500-1700</i> (q.v.) and Horatio Vecchi, <i>L'Anfiparnaso, comedia armonica</i> , <i>Giornale Storico della letteratura italiana</i> 22, pp. 390-393.
Padua 1115 (Pad B)	by 1900	Johannes Wolf, "Der niederländische Einfluss in der mehrstimmigen gemessen Musik bis um Jahre 1480," <i>Tijdschrift der Vereeniging voor Noord-Nederlands Muziekgeschiedenis</i> 6, p. 209.
Stresa	1902	Remiglio Sabbadini, "Frammenti di poesie volgari musicate," <i>Giornale storico della letteratura italiana</i> 40, pp. 270-272 (as Domodossola, Convento di Monte Calvario). Outer folios revealed in G. Contini, "Un manoscritto ferrarese quattrocentesco de scritture popolareggianti," <i>Archivium romanicum</i> (1938), p. 1.
Munich 3223	by 1904	Wolf, <i>Geschichte der Mensural-Notation von 1250-1460</i> , 3 vols (Leipzig: Breitkopf and Härtel), presented with sources of German origin, p. 378
Panciatichi	by 1904	Wolf, <i>op. cit.</i>
Reina	by 1904	Wolf, <i>op. cit.</i>
Bologna 596	1910	Fрати, "Frammento di un antico canzoniere musicale francese," <i>Il Libro e la Stampa</i> 4, pp. 15-17. Later, Ludwig, "Die Quellen der Motetten Ältesten Stils," <i>Archiv für Musikwissenschaft</i> 5 (1923), p. 285, f. A
Parma 9	1911	Associazione dei Musicologi Italiani, <i>Catalogo generale delle opere musicali; I: Città di Parma</i> , pp. 56ff.
Vatican 129	1913	H[enry] M[arriott] Bannister, <i>Monumenti Vaticani di Paleografia Musicale Latina</i> , (Leipzig: Ottone Harrassowitz).
Vatican 171	1913	Bannister, <i>op. cit.</i> First significant discussion, Heinrich Beseler, "Studien zur Musik des Mittelalters. I. Neue Quellen des 14. und beginnenden 15. Jahrhunderts," <i>Archiv für Musikwissenschaft</i> 7.2 (1925), p. 228.
Vatican 657	1913	Bannister, <i>op. cit.</i>

the publication also appears in the review printed in *Giornale storico della letteratura italiana* 21 (1893), p. 200.

Manuscript	Year	Discovery
Vatican 1419	1913	Bannister, <i>op. cit.</i> First significant discussion Bessler, <i>op. cit.</i> p. 226–27.
Vatican 1790	1913	Bannister, <i>op. cit.</i>
Vatican 1969	1913	Bannister, <i>op. cit.</i>
Parma 75	1925	Heinrich Bessler, “Studien zur Musik des Mittelalters. I. Neue Quellen des 14. und beginnenden 15. Jahrhunderts,” <i>Archiv für Musikwissenschaft</i> 7.2, pp. 231–32.
Padua 658 (Pad C)	1925	Bessler, <i>op. cit.</i> , p. 231 fn. 1. Front lifted by 1955 and reported in Plamenac, “Another Paduan Fragment of Trecento Music.” <i>Journal of the American Musicological Society</i> 8 (1955), pp. 165–181, at p. 166.
Egidi	1925	Francesco Egidi, “Un frammento di codice musicale del secolo XIV,” <i>Nozze Bonmartini-Tracagni XIX novembre MCMXXV</i> , (Rome: La Speranza). Lost, see below.
RossiVat	1925	Giovanni Borghezio, “Un codice vaticano trecentesco di rime musicali,” <i>Annales du Congrès Fédération archéologique et historique de Belgique—Congrès jubilaire 2–5 août 1925</i> (26th Congress), pp. 231–32.
Oxford 229 (Pad A)	1926	Bessler, “Studien zur Musik des Mittelalters. II. Die Motette von Franko von Köln bis Philipp von Vitry: Nachtrag zu Studie I,” <i>Archiv für Musikwissenschaft</i> 8.2, pp. 233–35.
Krakow 40582	1927 (1988/1998)	Wolf, “Eine neue Quelle zur Musik des 15. Jahrhunderts,” in <i>Juhlakirja Ilmari Krohn’ille</i> (Helsinki), pp. 151–162. Lost in WWII. Rediscovery announced in <i>CCMS</i> 4 (1988) and then “reintroduced” by Martin Staehelin, “Reste einer oberitalienischen Messenhandschrift des Frühen 15. Jahrhunderts,” <i>Studi Musicali</i> 27.1 (1998), pp. 7–18.
Pistoia 5	1938	Federico Ghisi, “Un frammento musicale dell’ars nova italiana nell’archivio capitolare della cattedrale di Pistoia,” <i>Rivista musicale italiana</i> 42, pp. 162–68.
Faenza	1939	Gino Roncaglia, “Intorno ad un codice di Johannes Bonadies,” <i>Atti e memorie della Reale Accademia di Scienze, Lettere e Arti di Modena</i> , Series 5, vol. 4 (1939), pp. 31–43. ²⁴

²⁴ The manuscript was also known to Padre Martini in 1753 and to Antonio Cicognani (“Intorno ad un antico manoscritto musicale,” *Gazzetta musicale di Milano* 44 (1889), pp. 570–1), but their contributions did not seem to inform the larger musicological public of the manuscript’s exis-

Manuscript	Year	Discovery
ManLucca	1940	Augusto Mancini, "Un nuovo codice di canzoni dell' 'Ars Nova'," in <i>Società italiana per il progresso delle scienze, XXVIII riunione (Pisa 11–15 Ottobre 1939)</i> , relazione, vol. 5 (Rome), pp. 243–44. ²⁵
ManPerugia	1942	Ghisi, "Frammenti di un nuovo codici dell' Ars Nova e due saggi inediti di cacce del secondo Quattrocento," <i>La Rinascenta</i> 5, p. 75.
Siena 327 (= 207b)	1948	Ghisi, "A Second Sienese Fragment of the Italian Ars Nova," <i>Musica Disciplina</i> 2, pp. 173–77
Perugia 3	1952	Ghisi, "L'Ordinarium Missae nel XV secolo ed i primordi della parodia." (Presented 1950. Published 1952). Shown to him by Giovanni Cecchini. Now lost.
Padua 1106 (Pad D)	1955	Plamenac, "Another Paduan Fragment of Trecento Music." <i>Journal of the American Musicological Society</i> 8 (1955), pp. 165–181. Plamenac remarks that the manuscript had been earlier reported by Walter S. Rubsamen, "Music Research in Italian Libraries," <i>Notes</i> 6 (1949), p. 564, but the reference had not been pursued.
Florence Conservatorio	by 1956	Kurt von Fischer, <i>Studien zur italienischen Musik des Trecento und frühen Quattrocento</i> (Bern: Verlag Paul Haupt).
Lowinsky	1956	Nino Pirrotta, "Paolo da Firenze in un nuovo frammento dell' Ars nova," <i>Musica Disciplina</i> 10, pp. 61–66.
Siena 30	1957	Joseph Smits van Waesberghe, <i>Expositiones in Micrologum Guidonis Aretini</i> (Amsterdam: North-Holland).

tence. On the rediscovery, see Dragan Plamenac, "Keyboard Music of the 14th Century in the Codex Faenza 117," *Journal of the American Musicological Society* 4.3 (Autumn 1951), pp. 179–80, and Pedro Memelsdorff, "New music in the Codex Faenza 117," *Plainsong and Medieval Music* 13.2 (October 2004), pp. 142–43.

²⁵ The manuscript was discovered in 1938, two years prior to this publication. First extensive inventory in Nino Pirrotta and Ettore LiGotti, "Il Codice di Lucca," *Musica Disciplina* 3 (1949), pp. 119–38 and in the two following issues. To this, we add new fragments discovered by Nádas and Ziino published in 1990 (*The Lucca Codex*) and 2005 ("Two newly discovered leaves of the Lucca Codex," *Studi Musicali* 34.1, pp. 3–23): bifolio 50/51 containing *L'alma mia piange, Con gli ochi assai ne miro, Donna i'prego Amore, Poy che da ti me convien partir via* (continued on 52r) discovered in 1996 by Giorigo Tori, and bifolio 73/76 (*Prest a la mort* (unicum), *Atandre, atandre, et atendusay* (Antonii), *Noble signore*(?), *Or sus*) discovered in 1997 by Sergio Nelli).

Manuscript	Year	Discovery
Cividale 63	1963/4	Marie Louise Martinez, <i>Die Musik des frühen Trecento</i> , Münchner Veröffentlichungen zur Musikgeschichte 9 (Tutzing: Schneider), p. 130. Appeared approximately simultaneously with Pierluigi Petrobelli, “Nuovo materiale polifonico del Medioevo e del Rinascimento a Cividale.” <i>Memorie storiche forogiuliesi</i> 46 (1965), pp. 213–15, who studied the sources in 1962.
Cividale 98	1963/4	Martinez, <i>op. cit.</i> , Petrobelli, <i>op. cit.</i>
Cividale 79	1963/4	Martinez, <i>op. cit.</i> , Petrobelli, <i>op. cit.</i>
Padua 675, 1225, 1283 (Pad D)	1964	Fischer, “Neue Quellen zur Musik des 13., 14. und 15. Jahrhunderts.” <i>Acta Musicologica</i> 36.2-3, pp. 79–97.
Berlin 523	1964	Fischer, <i>op. cit.</i>
Ivrea 105	1964	Fischer, <i>op. cit.</i>
Casanatense 522	1964	Fischer, <i>op. cit.</i>
Grottaferrata 219	1965	Giuseppe Corsi, “Frammenti di un codice musicale dell’ Ars nova rimasti sconosciuti,” <i>Belfagor</i> 20.2, pp. 210–215.
Ostiglia	1966	Oscar Mischiati, “Uno sconosciuto frammento appartenente al codice Vaticano Rossi 215,” <i>Rivista italiana di musicologia</i> 1.
Bologna Q 1	1966	Mischiati, “Uno sconosciuto frammento di codice polifonico quattrocentesco nella Biblioteca ‘G. B. Martini’ di Bologna,” <i>Collectanea historiae musicae</i> 4, pp. 179–83.
Perugia 15	1966	Reinhard Strohm, “Neue Quellen zur liturgischen Mehrstimmigkeit des mittelalters in Italien,” <i>Rivista italiana di musicologia</i> 1, pp. 77–87
Udine 290	1966	Petrobelli, “Due motetti francesi in una sconosciuta fonte udinese,” <i>Collectanea Historiae Musicae</i> 4 (1966), pp. 201–214.
Seville 25	1968	F. Alberto Gallo, “Alcune fonti poco note di musica teorica e pratica.” <i>L’Ars nova italiana del Trecento</i> 2, pp. 49–76. Dating is of the first extensive treatment including description of polyphonic contents of interest to this topic. First mention in a musical work by Juan F. Riaño, <i>Critical and Bibliographical Notes on Early Spanish Music</i> (London: Quaritch, 1887); description of the contents by Higinio Anglès, “Die mehstimmige Musik in Spanien vor dem 15. Jahrhundert,” <i>Beethoven-Zentenarfeier vom 26. bis 31. März 1927</i> (Vienna: Universal-Edition, 1927), pp. 159–60.
Siena 36	by 1968	F. Alberto Gallo, “Alcune fonti poco note di musica teorica e pratica.” <i>L’Ars nova italiana del Trecento</i> 2, pp. 49–76.

Manuscript	Year	Discovery
Florence 999	1968	Fischer, "Paolo da Firenze und der Squarcialupi Kodex [I-Fl 87]." <i>Quadrivium</i> 9, pp. 5–19
Foligno	1968	Pirrotta, "Church Polyphony apropos of a New Fragment at Foligno," in <i>Studies in Music History. Essays for Oliver Strunk</i> , edited by Harold Powers (Princeton: Princeton Univ. Press, 1968), pp. 113–26; earlier mentioned in Layton 1960. Discovered by Hans David.
Grottaferrata 224	1970	Oliver Strunk, "Church Polyphony à propos of a New Fragment at Grottaferrata," <i>L'Ars nova italiana del Trecento</i> 3, pp. 305–13, and quasi-simultaneously Ursula Günther, "Quelques remarques sur des feuillets récemment découverts à Grottaferrata," <i>L'Ars nova italiana del Trecento</i> 3, pp. 315–97.
Gemona Gradual	1972	Fischer, <i>RISM B IV 4</i> . From an unpublished report by Pierluigi Petrobelli.
Padua 656	1972	Fischer, <i>RISM B IV 4</i> . From an unpublished report by Plamenac.
Siena 10	1972	Fischer, <i>RISM B IV 4</i> .
Guardiagrele 2, 3	1972	Giulio Cattin, Oliver Mischiati and Agostino Ziino, "Composizioni polifoniche del primo Quattrocento nei libri corali di Guardiagrele," <i>Rivista Italiana di Musicologia</i> 7.2, pp. 153–181.
Atri 17	1973	Agostino Ziino, "Nuove fonti di polifonia italiana dell'ars nova." <i>Studi musicali</i> 2, pp. 235–55.
Messina 16	1973	Ziino, <i>op. cit.</i>
Cortona 1	1974	Ghisi, "Inno lauda polifonica all'Assunta ritrovato nell'Archivio comunale di Cortona," <i>Quadrivium</i> 15, pp. 105–11. One side only. Leaf lifted in 1976 and the reverse was published in Ziino, "Precisazioni su un frammento di musica francese trecentesca conservato nell'Archivio Comunale di Cortona," in <i>Università e tutela dei beni culturali: il contributo degli studi medievali e umanistici. Atti del convegno promosso dall'facoltà di Magistero in Arezzo dell'Università di Siena, Arezzo-Siena, 21-23 gennaio 1977</i> , Quaderni del "Centro per il collegamento degli studi medievali e umanistici nell'Università di Perugia," edited by I Deug-Su and Enrico Menestò (Florence: "La Nuova Italia" Editrice, 1981), pp. 351–58 + 3 plates. Lost at the restoration laboratory until it was rediscovered by Di Bacco and Nádas in the early 1990s.

Manuscript	Year	Discovery
Padua 553	1977	Cattin, "Ricerche sulla musica a S. Giustina di Padova all'inizio del Quattrocento: Il copista Rolando da Casale. Nuovi frammenti musicali nell'archivio di stato," <i>Annales Musicologiques</i> 7, pp. 17–41.
Dartmouth 2387	1979	Margaret Bent, review of <i>PMFC 12</i> in <i>Journal of the American Musicological Society</i> 32.2, pp. 562 and 575. First extensive mention in William J. Summers "Medieval Polyphonic Music in the Dartmouth College Library: An Introductory Study of Ms. 002387," in <i>Alte im Neuen, Festschrift Theodor Göllner zum 65. Geburtstag</i> , edited by Bernd Edelman and Manfred Hermann Schmid (Tutzing: Hans Schneider Verlag, 1995), pp. 113–30.
Trent 1563	1980	Bent, "New Sacred Polyphonic Fragments of the Early Quattrocento." <i>Studi musicali</i> 9, pp. 171–89,
Houghton 122	1980	Bent, <i>op. cit.</i>
Assisi 187	1981	Ziino, "Un antico 'Kyrie' a due voci per strumento a tastiera," <i>Nuova Rivista musicale italiana</i> 15.4, pp. 628–33,
Rome 1067	1982	Fabio Carboni, and Agostino Ziino, "Una fonte trecentesca della ballata 'Deh, no me fare languire,'" <i>Studi medievali</i> serie 3, 23, pp. 303–09.
Grottaferrata s.s.	by 1983	Margaret Bent and Anne Hallmark in <i>PMFC 24</i> report on p. 201 that the manuscript was known to Oliver Strunk and rediscovered by Hallmark who mentions it in her "Some Evidence for French Influence" article. No dates are given for these discoveries. Nor does information on the manuscript appear among those notes left by Strunk to the American Academy in Rome.
Florence 5	1983	Mario Fabbri and John Nádas, "A Newly Discovered Trecento Fragment: Scribal Concordances in Late-Medieval Florentine Manuscripts." <i>Early Music History</i> 3, pp. 67–81.
San Lorenzo 2211	1984	Frank D'Accone, "Una nuova fonte dell' <i>ars nova</i> italiana: il codice di San Lorenzo, 2211," <i>Studi musicali</i> 13, pp. 3–31.
Todi 73	1985	Ziino, "Una sequenza mensurale per San Fortunato ed un Amen a tre voci nella Biblioteca Comunale di Todi (con un'appendice sul frammento di Cortona)," <i>L'Arts nova italiana del Trecento</i> 5, pp. 257–70
Ciliberti	1986	Biancamaria Brumana and Galliano Ciliberti, "Le ballate di Paolo da Firenze nel frammento <i>Cil</i> ," <i>Esercizi: Arte musica spettacolo</i> 9, pp. 5–37.

Manuscript	Year	Discovery
Oxford 16	1987	Although discovered by Andrew Wathey the first mention is by Fischer and Gallo in <i>PMFC 13</i> . They report their findings based on a partial description in an earlier unpublished paper by Margaret Bent (1984) which went on to become "The Fourteenth-Century Italian Motet," <i>L'Ars nova italiana del Trecento</i> 6 (1992), pp. 85-125.
Oxford 56	1987	Discovered by Andrew Wathey; first mentioned in <i>PMFC 13</i> (Fischer and Gallo)
Parma 98	1987	Discovered by Petrobelli and reported in <i>PMFC 13</i> (Fischer and Gallo), but also in <i>RISM B IV 2</i> as an English source: the position taken by this dissertation.
Udine 22	1988	Gilberto Pressacco, <i>Rassegna veneta di storia musicali</i> 4, pp 235–41. Pressacco received the notification from Cesare Scalon.
Parma 3597	1989	Strohm, "Polifonie più o meno primitive. Annotazioni alla relazione di base e nuove fonti," in <i>Le Polifonie primitive in Friuli e in Europa: atti del congresso internazionale Cividale del Friuli, 22–24 agosto 1980</i> , edited by Cesare Corsi and Pierluigi Petrobelli (Rome: Torre d'Orfeo). From a collection of MSS microfilms of Bruno Stäblein.
Erevan	1990	Fischer, "Remarks on Some Trecento and Early Quattrocento Fragments," in <i>Atti del XIV congresso della società internazionale di musicologia, Bologna, 27 agosto - 1 settembre 1987</i> , Vol. 1 (Round Tables), (Turin: E.D.T.), p. 162.
Poznań 174a	1991	Agnieszka Leszczynska, "Ślady Trecenta w Poznaniu," <i>Muzyka</i> 36, pp. 63–75.
Trent 60	1992	Marco Gozzi, "Un nuovo frammento trentino di polifonia del primo Quattrocento," <i>Studi musicali</i> 21, pp. 237–51.
Padua 14	1993	Francesco Facchin, "Una nuova fonte musicale trecentesca nell'Archivio di Stato di Padova," in <i>Contributi per la storia della musica sacra a Padova</i> , Fonti e ricerche di storia ecclesiastica padovana 24, edited by Giuliano Cattin and Antonio Lovato, (Padua: Istituto per la storia ecclesiastica padovana), pp. 115–39.
Bern 827	1994	Christian Berger, "'Pour doulz regard...': Ein neu entdecktes Handschriftenblatt mit französischen Chansons aus dem Anfang des 15. Jahrhunderts," <i>Archiv für Musikwissenschaft</i> 51 (1994), pp. 51–77.
Boverio	1994	Ziino, <i>Il Codice T.III.2: Studio introduttivo ed edizione in facsimile</i> , <i>Ars Nova</i> 3, (Lucca: Libreria musicale italiana).

Manuscript	Year	Discovery
Todi Carità	1994	Valeria Sargeni, "Una nuova fonte di polifonia trecentesca in lingua francese conservata nell'Archivio storico comunale di Todi," <i>Esercizi: Musica e spettacolo</i> 13 (nuova serie 4), pp. 5–15.
Frosinone 266 & 267	1995	Giuliana Gialdroni and Agostino Ziino, "Due nuovi frammenti di musica profana del primo Quattrocento nell'Archivio di Stato di Frosinone," <i>Studi musicali</i> 24, pp. 185–208.
Ascoli Piceno 142	1996	Paolo Peretti, "Fonti inedite di polifonia mensurale dei secoli XIV e XV negli archivi di stato di Ascoli Piceno e Macerata," <i>Quaderni musicali marchigiani</i> 3, pp. 85–124.
Macerata 488	1996	Peretti, <i>op. cit.</i>
Cortona 2	1998	Giuliano Di Bacco and John Nádas, "The Papal Chapels and Italian Sources of Polyphony during the Great Schism," in <i>Papal Music and Musicians in Late Medieval and Renaissance Rome</i> , edited by Richard Sherr (Oxford: Clarendon Press), pp. 44–92. Di Bacco and Nádas were signaled about this source by Anthony Cummings and Alice Clark, c. 1994.
Perugia 15755	2004	Biancamaria and Ciliberti, <i>Frammenti Musicali Del Trecento nell'incunabolo Inv. 15755 N. F.</i> (Florence: Olschki).
Padua 1027	2006	Cuthbert (this dissertation)
Reggio Emilia Mischiati	forthcoming	Ziino and Gozzi will report on this fragment which was originally discovered by Oscar Mischiati.
Brescia 5	forthcoming	Stefano Campagnolo.
Siena Ravi 3	forthcoming	Ziino.
Bologna Archivio Covers	forthcoming	Armando Antonelli.

This table does not list manuscripts which fall out of this study because they are too early (**Oxford 112** and **Venice San Giorgio**, known since Gallo's study in 1968) or too late (such as **Gubbio Corale** discovered in 1996 by Reinhart Strohm, or **Casanatense 2151**).

It is an unfortunate reality that the last century of scholarship and discovery has also been a century of disappearance and destruction of manuscripts. Table 1.3 lists those lost sources known to have existed by the time of modern scholarship in music (c. 1800). Unlike

the previous table, all lost manuscripts containing Italian trecento music are included, regardless of provenance or dating.²⁶

TABLE 1.3: LOST, STOLEN, OR DESTROYED MANUSCRIPTS CONTAINING ITALIAN MUSIC

Manuscript	Year lost	Details and reports of loss
Strasbourg 222	1870	Presumed destroyed in fire. An inventory and partial copy, executed by Coussemaker, exists as Brussels, Bibliothèque du Conservatoire Royal de Musique, MS 56.286.
Roquefort	by 1904	Although it was thought to have disappeared soon after its discovery, the manuscript seems to have been an invention of Fétis's. The work of Earp shows that it is to be identified with the Berkeley manuscript and does not possess any Italian music. ²⁷
Egidi	[unknown]	Preserved in a photographic negative given by Egidi to Kurt von Fischer. Computer enhancement of the blurry photograph published in Di Bacco and Nádas, "The Papal Chapels."
Warsaw 378	1944	Preserved as a photographic copy by Maria Szczepańska in Poznań, Biblioteka Uniwersytecka im. Adama Michiewicza, MS 695.
Perugia 3	by 1987	Discovered by Ghisi and reported in 1952, but reported as lost in <i>PMFC 13</i> , with no published transcription ever having been made. Possibly lost by 1960, since Layton reports "Unfortunately, they have not been available for study." ²⁸ Two credos were preserved on two folios in a 1502 incunabulum.

²⁶ One might note that nearly every fragment is a testimony to lost notated music, a topic which will be taken up later in this chapter. Beyond this, there are numerous other documents attesting to further losses. For an overview of the problem and opportunities to learn even from lost sources, see Martin Staehelin, "Mehrstimmige Repertoires im 14. und 15. Jahrhundert: Das Problem der verlorenen Quellen," in *Atti del XIV congresso della società internazionale di musicologia, Bologna, 27 agosto – 1 settembre 1987*, Vol. 1 (Round Tables) (Turin: E.D.T., 1990), pp. 153–59.

²⁷ For this information we are indebted to Lawrence Earp, "Machaut's Music in the Early Nineteenth Century: the Work of Perne, Bottée de Toulmon, and Fétis," in *Guillaume de Machaut: 1300–2000*, edited by Jacqueline Cerquiglini-Toulet and Nigel Wilkins (Paris: Université de Paris IV, 2002), pp. 9–40.

²⁸ Layton, "Polyphonic Music for the Ordinary," p. 370.

Manuscript	Year lost	Details and reports of loss
Guardiagrele 2 & 3	by 1996	Described in print as lost by Ziino, “Dal latino al cumanico, <i>ovvero</i> osservazioni su una versione trecentesca della sequenza <i>Saginsamen babasiz kanini</i> in notazione mensurale,” in <i>Trent’anni di ricerca musicologica: studi in onore di F. Alberto Gallo</i> , edited by Patrizia Dalla Vecchia and Donatella Restani (Rome: Edizioni Torre d’Orfeo, 1996), pp. 31-48, but known to have been stolen much earlier.
Rome Trastevere 4	by 1998	Reported lost in Di Bacco and Nádas, “Papal Chapels,” p. 59.
Venice Giorgio	by 2005	Reported lost in Brumana and Ciliberti, <i>Frammenti Musicali del Trecento nell’incunabolo Inv. 15755 N. F.</i> p. 94
Stresa 14 (?)	unknown	Margaret Bent privately reported that this fragment was missing. Upon my visit to the library, the manuscript was reported as in transit between two different storage centers and not available, but its loss could not be confirmed.

This chart does not include several lost French sources which would be important for understanding music manuscript structure in the fourteenth century, such as the lost Maggs Rotulus.²⁹ Nor does it contain pieces or polyphonic manuscripts which are mentioned in primary source testimonies but for which we have no evidence to believe they survived into the twentieth century, such as Gherardello’s Credo or a quaternion of motets in Cividale during the mid-1360s.³⁰

²⁹ This lost source, containing Machaut’s *Lay mortel: Un mortel lay weil commencier* is discussed in David Fallows, “Guillaume de Machaut and the lai: a new source,” *Early Music* 5.4 (October 1977), pp. 477–83, and in the commentary to Schrade, *PMFC* 2–3.

³⁰ Gherardello’s work is mentioned by Kurt von Fischer in “The sacred polyphony of the Italian Trecento,” *op. cit.*, p. 145. The reference stems from Simone Peruzzi’s sonnet on the death of Gherardello, transcribed in Johannes Wolf, “Florenz in der Musikgeschichte des 14. Jahrhunderts,” *Sammelbände der Internationalen Musikgesellschaft* 3.4 (August 1902), p. 611. In Fischer’s discussion, he speculates that there could have been a complete Mass cycle by the composer. There does not seem to be enough information in the sonnet to justify this supposition. No composer from the trecento is known to have written more than two different types of Mass movements. Only Gratiotus composed one of the Mass movements with a long text (Gloria or Credo) and a movement with a shorter text (in this case, a Sanctus). Margaret Bent called “striking” the lack of Kyrie, Sanctus, and Agnus Dei settings by Ciconia—otherwise the most prolific composer of polyphonic Mass movements of the era—and she noted that his output roughly reflects the proportions in which these movements were composed at the time. (*The Works of Johannes Ciconia*

Table 1.2 made evident the increasing diversity in the types of libraries and archives in which trecento sources have been discovered as the twentieth-century progressed. An in-depth consideration of provenance of sources and the concept of musical center will be presented later. For purposes of introduction, it suffices to consider the current locations of these manuscripts; a spread which argues against a tradition comprising only a few centers (See Figure 1.4):

(*Polyphonic Music of the Fourteenth Century* 24), (Monaco, Éditions de l'Oiseau-Lyre, 1984), p. xi). For the Cividale motets, see Chapter 2 below.

FIGURE 1.4: CURRENT LOCATIONS OF TRECENTO MANUSCRIPTS



The location of a manuscript today is no guarantee of the importance of its region for manuscript production during the Middle Ages. (The evidence for a flourishing center of trecento polyphony in Hanover, New Hampshire is particularly slim.) However, as a rough guide, it is immediately apparent that the Abruzzi, Umbria, and Emilia-Romagna are revealing more polyphonic treasures than would have been considered decades ago.

It is not surprising that the discovery of new sources can change a region from a backwater of polyphonic composition to a center. However, it may be startling to realize that new discoveries can also make a compositional hub seem provincial in some ways. Nino Pirrotta asserted in a 1973 article that the Florentine sources of polyphony distinguished themselves from those of the North through their more cosmopolitan outlook.³¹ By this, Pirrotta meant that northern sources were interested primarily in transmitting only local repertory while Tuscan sources preserved compositions of both central Italy and the Veneto. Though this view has persisted both explicitly and implicitly in later scholarship,³² it is in need of revision and qualification given the new manuscripts, new biographical details, and new musical centers discovered over the past thirty years.³³

One way of measuring whether a center was cosmopolitan would be to count the number or percentage of outsiders (or their compositions) represented in the sources. A purely statistical methodology for examining Pirrotta's view hits a snag from the start: it now seems much more difficult to determine if a composer was northern, Tuscan, or "other" than it did before. The discovery of new centers of musical composition, especially the peripatetic

³¹ Pirrotta, "Novelty and renewal in Italy, 1300-1600," in *Studien zur Tradition in der Musik: Kurt von Fischer zum 60. Geburtstag*, edited by Hans Heinrich Eggebrecht and Max Lütolf (Munich: Musikverlag Katzschler, 1973), pp. 49–50. By this view, he changed his earlier notion that Florence itself was not cosmopolitan in the way other central Italian sources, such as the Codex **Mancini** (which he had considered Lucchese), and Prodenzani's *Saporetto*, were. See Part III of Pirrotta and LiGotti, "Il codice di Lucca," especially p. 121, and the summary of Pirrotta's earlier position in Nádas and Ziino, "The Lucca Codex," p. 15.

³² Nádas, "The Transmission of Trecento Secular Polyphony," pp. 16–18 (with important qualifications on the final two pages).

³³ Pirrotta correctly showed that the direction of new discoveries even in his time were moving toward an equality of numbers between Florentine and Northern sources. "Novelty and Renewal," p. 49.

Papal courts,³⁴ greatly confuses the situation. We must ask ourselves to what extent a composer such as Zachara belongs to any particular region. Born, in all likelihood, in Teramo near L'Aquila (east of Rome), he was affiliated with Papal chapels which at various times made their homes in Pisa, Bologna, and Cividale del Friuli near the present-day border with Slovenia. He also wrote a Mass movement which seems to commemorate a prominent Roman family.³⁵ Other major composers such as Matteo da Perugia and Ciconia present similar difficulties.

The cosmopolitan quality of Tuscan manuscripts must further be called into question by what they do not preserve. The perplexing absence of Johannes Ciconia from the great **Squarcialupi** codex and other major Florentine sources is only the most prominent example. **Squarcialupi**, despite its largely retrospective nature, leaves room for the works of Ciconia's Tuscan contemporaries. In the slightly earlier Florentine manuscript **Pit.** his often-copied *Con lagrime bagnandome* was added later, almost as an afterthought.³⁶ Yet it cannot be argued that Ciconia was unknown in Florence and therefore could not have been included in its large anthologies. Two Florentine *cantasi come* sources, **Chigi 266** and **Riccardiana 1764**, preserve texts which are to be sung to the music of Ciconia's *Lagrime bag-*

³⁴ Di Bacco and Nádas, "The Papal Chapels and Italian Sources of Polyphony during the Great Schism," in *Papal Music and Musicians in Late Medieval and Renaissance Rome*, edited by Richard Sherr (Oxford: Clarendon Press, 1998), pp. 44–92. See the discussion of this important assertion in Chapter 3, below.

³⁵ *Ibid.*, p. 57.

³⁶ The poem has been dated 1406 which, if true, would place it near the end of Ciconia's output but before the probable compilation of the **Squarcialupi** codex. This dating would excuse the song from being present in **Panciatichi**, which may have in part set the standard for which non-Florentine composers to include.

nandome.³⁷ There is further evidence that Ciconia and other northern composers were known in Florence, though not in the manuscript repertory. Sonnet 35 of Prodenzani's poem anthology "Saporetto" cites Ciconia's *O rosa bella*, *Lizadra donna*, and *Con lagrime bagnandome*. (Along with a possible citation of the possibly Ciconian *Le ray au soleyl*—see Example 1.14 later in this chapter for the text of the sonnet.)³⁸

As important as demonstrating that there are composers specifically excluded from the Florentine anthologies is showing that the northern sources were inclusive and diverse. If by inclusiveness we mean the collection of works from other parts of the Italian peninsula, the northern sources are at a disadvantage compared to the Tuscan. But there are other traditions which need to be taken into account. French music played a significant role within Italy, and most especially in the North. Anne Hallmark, Margaret Bent, and Giulio Cattin have all written about Italian interest in French music, with Hallmark's work going the farthest in detailing specific types of influence.³⁹ The scope of the Franco-Italian exchange and its northern center are shown in Table 1.5, below:

³⁷ Blake Wilson, "Song collections in Renaissance Florence: the *cantasi come* tradition and its manuscript sources," *Recercare* 10 (1998), p. 79. Note however that Ciconia is also not in the (probably northern) **Reina** codex. *Cantasi come* works are new words "sung to the tune of" another work. Presumably that work would have been well known (or at least, not obscure), since the music for the pre-existing work is not transmitted.

³⁸ John Nádas, "A cautious reading of Simone Prodenzani's *Il Saporetto*," *Recercare* 10 (1998), p. 35.

³⁹ Bent, "The Fourteenth-Century Italian Motet," *L'Ars nova italiana del Trecento* 6 (1992), pp. 85–125. Cattin, "Ricerche sulla musica a S. Giustina di Padova all'inizio del Quattrocento: Il copista Rolando da Casale. Nuovi frammenti musicali nell'archivio di stato," *Annales Musicologiques* 7 (1977), pp. 17–41 Hallmark, "Some Evidence for French Influence."

TABLE 1.5: INTERSECTIONS OF ITALIAN AND FRENCH POLYPHONY IN ITALIAN FRAGMENTARY MANUSCRIPTS

Boverio (twelve French works along with seven Italian)

Brescia 5 (Machaut's *De petit puo* with two works by Francesco da Firenze⁴⁰)

Cividale 98 [Cividale A] (Credos by Zachara and Philippoctus de Caserta with the French-texted *Puis que aloë* and *Fuyés de moy*; see Chapter 2)

Frosinone 266 and 267 (four virelai, one ballade, three ballate)

Grottaferrata 219 (French works by P. des Molins, Borlet, and an anonymous piece, with Italian secular polyphony by Jacopo da Bologna, Francesco da Firenze, and Giovanni da Cascia)

Grottaferrata/Dartmouth (sacred and secular works by French composers (Perrinet, Johannes Vailant) and Italians (Zachara, Ciconia, and ?Francesco))

Oxford 229 [Pad A] (*Ma fin est mon commencement* by Machaut, *Sones ces nachares*, untexted work, with a French-texted work by Ciconia and Italian-texted works by Jacopo and Francesco)

Padua 658 [Pad C] (a caccia and a madrigal by Jacopo along with the anonymous virelai *Or sus* and a three-part version of the motet *Apollinis eclipsatur*)

Padua 684 [Pad A] (a Credo by Perrinet with sacred works by Gratiopus da Padua and secular works by Gratiopus and Francesco)

Padua 1115 [Pad B] (Senleches's *En ce gracieux tamps joli* and a contratenor from an anonymous French composition, *Ay si*, with works by Antonellus da Caserta, Ciconia, and an anonymous two part ballata, *Se per dureça*)

Padua 1475 [Pad A] (the *Ite Missa Est* from Machaut's Mass, and a Sanctus possibly from Saint Omer in northern France, with Mass movements of probable Italian origin, a Gloria by Egardus (probably from Bruges), and secular music by Francesco, Jacopo, and Johannes Baçus Correçarius)

Parma 75 (works by Antonellus da Caserta, Grenon, Ciconia, and an anonymous virelai)

Pistoia 5 (Italian-texted works by Antonellus da Caserta, Francesco, Ciconia with anonymous rondeaux and ballate)

Rome 1067 (*Deh non mi far languire* and *Esperance*; see Chapter 3)

Approximately half of the manuscripts in Table 1.5 can be securely placed in the Veneto; there are good reasons for suspecting a northern provenance for nearly all the rest (excepting **Brescia 5**). One could also add the Italian or possibly Italian manuscripts **Bologna 596** and **Bern 827** which contain only French works and thus add to the larger tradition of Italian interest in French music shown by the manuscripts **Mod A**, **Chantilly**, and possibly **Ivrea 115**.

⁴⁰ For the use of this name in preference to Landini, see the Appendix at the end of the dissertation.

The breadth of interest of a musical region can also be seen in the genres the region collected in its manuscripts. The following table shows Italian fragments whose compilers (or, in some cases, those who added works to them later) evidently thought sacred and secular works could exist in the same volume:

TABLE 1.6: FRAGMENTS (AND MANUSCRIPTS EXCLUDING THE PRINCIPAL SOURCES) PRESERVING BOTH SACRED AND SECULAR POLYPHONY

Ascoli Piceno 142 (rondeaux, motets, and Salve Regina settings)
Assisi 187 (1 sacred diminution, 1 secular)
Atri 17 (1 sacred, 1 vernacular) ⁴¹
Berlin 523 (3 older sacred works, 1 secular)
Boverio (24 sacred, 19 secular, 1 untexted)
Brescia 5 (Gloria “Qui sonitu melodia,” with two Francesco works)
Cortona 1 (?3 sacred motets, 1 secular work)
Grottaferrata 224 (10 sacred, 3 secular including 1 celebratory motet)
Dartmouth 2387 [<i>part of Grottaferrata/Dartmouth</i>] (1 sacred, 1 secular)
Oxford 229 [Pad A] (6 sacred, 5 secular)
Padua 684 [Pad A] (5 sacred, 4 secular)
Padua 553 (1 sacred keyboard work + other works)
Padua 1475 [Pad A] (12 sacred, 6 secular including 2 celebratory motets)
Perugia 15755 (a Mass cycle and a collection of works by Jacopo; it is unclear whether these two fragments were originally from the same manuscript.)
Poznań 174a (?1 sacred, ?2 secular, 1 unidentified)
Siena 36 (1 sacred motet, 1 equal-note Kyrie, 2 secular)
Siena Ravi 3 (6 sacred works with 1 French-texted work)
Vatican 1419 (8 sacred, 3 secular)
Venice Giorgio (2 sacred motets, 1 secular)

When to this list is added **London 29987** and **Pit.**, both of which contain a few sacred works, the keyboard manuscript **Faenza**, or the late manuscript **Bologna Q 15**, which transmits the secular models for some “parody” sacred works, a sizeable collection of materials awaits reexamination. Note also that these two tables provide us with the minimum

⁴¹ The vernacular piece is a polyphonic lauda, a work whose content is sacred but whose form and poetic language is closely related to the secular genres.

number of fragments which contain both French and Italian or sacred and secular music—the discovery of additional folios to already known sources could add to these lists.

Typology of styles, notations, and sources

The study of fragmentary trecento sources reveals strong connections among sources, but also deep differences in the types of sources and the styles of music which they contain. The important connections between musical style and manuscript type, while practically universally accepted, have not been deeply explored. This section presents the received divisions of trecento polyphonic music, which have formed the most important bases for classifying manuscripts of the era. I continue by showing how notation, audience, and musical style have been intertwined in these divisions in ways which have impeded their usefulness. I propose instead disentangling these features and classifying notational system, musical style, and manuscript type separately before considering anew relationships among these different features.

Variety in Sacred Works; Variety in Sacred Sources

In his groundbreaking article on sacred music of the trecento, Kurt von Fischer remarked on the “astonishing variety of styles” found in the 120 complete and 25 fragmentary pieces he had collected.⁴² Fischer used a loose definition of the term “style.” Those styles he listed first could also be termed genres or even, in some cases, text-sources. His examples included movements of the Mass Ordinary, “Benedicamus” settings, and motets. He con-

⁴² “The sacred polyphony of the Italian Trecento,” *Proceedings of the Royal Musical Association* 100 (1973–74), pp. 143–144.

tinued by grouping these pieces into what he termed six stylistic groups, which are summarized in Figure 1.7.

FIGURE 1.7: FISCHER'S SIX STYLISTIC GROUPS OF SACRED POLYPHONY

- (a) Pieces in square notation. (approximately 70)
- (b) Pieces in mensural or partially mensural notation, derived from *cantus planus binatim* style. (5)
- (c) Liturgical motets in *ars antiqua* style. (9)
- (d) Pieces in Italian trecento notation. Divided as:
 - 1. Franconian, pre-Marchettian notation. (6)
 - 2. Related to madrigal style, in pure trecento notation. (10)
- (e) Motets from pre-1350 written in notation of Marchettus. (3)
- (f) French influenced Mass movements and motets from northern Italy. (15)

Excluded were the compositions of Ciconia, Matteo da Perugia, and Zachara as well as laude and contrafacts.

Here, style is largely defined as the notational system of a piece and not the music as a sounding object. The French influence of (f) and similarities to the madrigal of (d2) might give some image of the sound of those works, but even here the connection to style of sound is weak. The connection between (d1) and (d2) is obscure; it is unexplained how pre-Marchettian and “pure trecento” notations can both be considered under the same notational rubric. The compositions in group (d1) are closer temporally to those of (e) than to (d2). The *ars antiqua* category (c) combines both musical and notational aspects.

Margaret Bent took up Fischer's divisions in her review of Fischer and Gallo, *PMFC* 12. Bent's review was as much an examination of Fischer's 1974 article as of the *PMFC* volume, since the authors implicitly employed the same distinctions of genre in dividing the

pieces in their *exclusa*.⁴³ Bent altered Fischer's groupings somewhat, creating four groups by combining works in square notation (a) with those derived from *cantus binatim* (b) and the early motets of (e) with the pieces in trecento notation (d).⁴⁴

For both Bent and Fischer, the next important step was showing how these separate divisions were transmitted in different types of manuscripts. For Fischer, these divisions indicated a separation in audience and performers for the different stylistic groupings. A passage of Fischer's, which Margaret Bent also found vital enough to quote, asserts that pieces in groups (a), (b), (c), and (d1) are found in plainchant manuscripts and *laudarii* while the later pieces, found in (d2), (e), and (f):

with few exceptions...are preserved in collections of polyphonic music intended for chapels with highly trained singers. The difference in style is therefore a social and educational matter, dividing the repertory into, on the one hand, music for traditional monastic and clerical use and, on the other hand, music for centers of culture with a sophisticated musical training.⁴⁵

In Bent's view, the separation among these two types of piece was so great that she questioned why Fischer and Gallo chose to edit the repertories together "as if they told a sin-

⁴³ Bent, Review of Kurt von Fischer and F. Alberto Gallo, editors, *Italian Sacred Music (Polyphonic Music of the Fourteenth Century, vol. 12)*, *Journal of the American Musicological Society* 32.3 (Fall 1979), p. 562.

⁴⁴ For another way of dividing sources into categories, see Charles Hamm's review of Fischer's *RISM B IV 3-4* (*Journal of the American Musicological Society* 27.3 (Autumn 1974), pp. 518-522) which reclassifies the three repertories which Fischer identifies on the basis of musical style into two categories largely on the basis of manuscript contents.

⁴⁵ Fischer, *op. cit.* p. 145

gle story,”⁴⁶ rather than reflecting (as she put it elsewhere) the “technical and stylistic [dividing line] which is in general borne out by manuscript segregation.”⁴⁷

Yet the connections implied in Fischer’s statement are not self-evident. It would be hard to prove that the manuscripts containing much of Fischer’s category (d2), (e), and (f) polyphony were intended for chapels at all, let alone those with highly-trained singers. Not only do examples of sacred music in largely complete manuscripts such as **Pit.** and **London 29987** call this audience into question, but also secular works in prominent positions (i.e., at the top of pages which are not at the ends of gatherings) in mostly sacred fragments such as **Pad A** should give us pause. It is also not a given that three-voice compositions with complex notation necessarily imply performance by more highly trained singers than simpler notation.⁴⁸ Nor can it be assumed that manuscripts with sophisticated notational systems originated at centers of higher cultural sophistication than manuscripts with less complex notation. Florence, Padua, and Cividale are only the most clearly documented of the many locations which produced both sacred music of high notational complexity and simple two-voice works.⁴⁹

⁴⁶ Bent, *op. cit.*, p. 563.

⁴⁷ Bent, “The Definition of Simple Polyphony: Some Questions,” in *Le Polifonie primitive in Friuli e in Europa: atti del congresso internazionale Cividale del Friuli, 22-24 agosto 1980*, edited by Cesare Corsi and Pierluigi Petrobelli (Rome: Torre d’Orfeo, 1989), p. 33.

⁴⁸ In particular, the assumption is flawed that works transmitted in the most complex notation, that of the *ars subtilior*, would have been executed by the most highly trained musicians. This is tantamount to supposing that our best performers are all engaged in the performance of Brian Ferneyhough or Claus-Steffan Mahnkopf.

⁴⁹ The difficulty in pinning manuscripts down to specific locations is the primary obstacle to adding further cities to the list. In Florence, the two-voice composition *Verbum caro factum est* of **Florence 999** can be contrasted with Paolo’s *Gaudeamus omnes* earlier in the same manuscript, or the more complex sacred music found in **Pit.** In Padua, the Ascension songs of **Padua 55** and **56** from earlier in the trecento (but with signs of use well into the quattrocento) can be contrasted

Independence of Notation and Style

Fischer's categories might seem to suggest that notation is intimately tied to the style of the work. But not only is it *theoretically* possible for a notational system to transmit a musical work normally written in another, there are several pieces whose divergent notations in different sources resist an easy equation of written form with musical style.⁵⁰ For instance, the simple, two voice *Benedicamus Domino* trope for the feast of St. Nicolas, *Nicolay Solem-*

with the repertoires of **Pad A** and **Pad D**. See Chapter 2 for a fuller discussion of the fertile mix of styles in Padua. Although the rich and varied collections of *cantus planus binatim* in the Cividale manuscripts, such as **Cividale 56**, are well known, it is often overlooked that the same region is in possession of important and more sophisticated sacred works such as the Gloria by Rentius de Ponte Curvo of **Cividale 63** and **Udine 22**. That Di Bacco and Nádas were able to connect the composer, as Laurentius de Pontecurvo, to Gregory XII in March 1410 does not remove the Cividale connection for the piece nor, in particular, for the manuscript as a whole: a fact acknowledged by the structure of the authors' Table 2.1 which lists "sources *whose contents* may be associated with the repertory of the papal chapels" (emphasis mine). Di Bacco and Nádas, "The Papal Chapels and Italian Sources of Polyphony during the Great Schism," in *Papal Music and Musicians in Late Medieval and Renaissance Rome*, edited by Richard Sherr (Oxford: Clarendon Press, 1998), pp. 49 and 59.

⁵⁰ Although my principal argument here is that *in practice* multiple systems of notation were used to transmit the same piece, we might note that recent researches have expanded also the theoretical ability of notational systems as well. That extended sequences of syncopations are possible in Italian notation via co-joined notes has been known since at least Michael Long's dissertation. Long, carefully correcting Nino Pirrotta, argued that Marchetto's prohibition regarding these "one-pitch ligatures" was a warning against scribes' obscuring the forms of the notes and not a proscription of the ligature itself. (Long, "Musical Tastes in Fourteenth-Century Italy: Notational Styles, Scholarly Traditions, and Historical Circumstances," (Ph.D. dissertation, Princeton University, 1981), pp. 15–20. Pirrotta, "Marchettus de Padua and the Italian Ars Nova," *Musica Disciplina* 9 (1955), p. 59. Marchettus of Padua, *Marchetti de Padua: Pomerium*, Corpus Scriptorum de Musica 6, edited by Giuseppe Vecchi (Rome: American Institute of Musicology, 1961), 3.2.50.) Long showed (as Nádas did later with different repertoires) that two semibreves or minims connected under a *punctus divisionis*, e.g. ♠♠, can prolong a syncopation from a previous tempus (Long, *op. cit.*, pp. 98–103; Nádas, "Transmission of Trecento Secular Polyphony," pp. 99–100). Conversely, my discussion of ligated major semibreves later in **Pad C** will show that the Italian notational system was able to create a note of the value of the (illegal) imperfect breve even in the compound division of *duodenaria*.

nia, appears in northern Italian and Swiss sources notated differently. *Nicolay Solemnia* in the gradual **Civiale 56** is an example of *cantus planus binatim* and has been cited previously by Gallo.⁵¹ The work appears in a manuscript containing twelve polyphonic pieces, none of which is notated in a system preserving rhythmic information (see Figure 1.8).

FIGURE 1.8: CIVIDALE 56, F. 254v (DETAIL)



Nicolay Solemnia in the manuscript St. Gall 392 is notated to imply consistent breve-long pairs, equivalent in rhythm to the second rhythmic mode. Fischer chose to transcribe the work with the accent on the long via an initial upbeat breve (see Figure 1.9):⁵²

⁵¹ F. Alberto Gallo, “The Practice of *cantus planus binatim* in Italy From the Beginning of the 14th to the Beginning of the 16th Century,” in *Le Polifonie primitive in Friuli e in Europa: Atti del congresso internazionale Cividale del Friuli, 22-24 agosto 1980*, edited by Cesare Corsi and Pierluigi Petrobelli, (Rome: Torre d’Orfeo, 1989), p. 17.

⁵² Kurt von Fischer, “Neue Quellen Mehrstimmiger Musik des 15. Jahrhunderts aus Schweizerischen Klostern,” in *Renaissance-Muziek 1400-1600: Donum Natalicium René Bernard Lenaerts*, edited by Jozef Robijns, (Leuven: Katholieke Universiteit, Seminarie voor Muziekwetenschap, 1969), p. 300. Fischer’s transcription violates in spirit, though not in practice, Marchettus’s teaching in the *Pomerium* which argues that privation cannot precede sound at the beginning of a work (unless some other voice is already singing). Marchettus, *Pomerium*, ed. Vecchi, p. 61; also translated in Ralph Clifford Renner, “The Pomerian of Marchettus of Padua: a translation and critical commentary,” (Thesis (M.A.), Washington University (St. Louis), 1980), p. 38.

FIGURE 1.9: *NICOLAY SOLEMPNIA* FROM ST. GALL 392, TRANSCRIPTION BY KURT VON FISCHER

The image shows a transcription of a musical piece from the St. Gall manuscript. It consists of two staves of music in a square neumatic notation system. The top staff has a clef-like symbol on the left. The lyrics are written below the notes: "Ni-co-la-y so-lem-pni-a / su a". The bottom staff also has a clef-like symbol and the same lyrics: "Ni-co-la-y so-lem-pni-a / su a". The notes are square-shaped and connected by lines, with some notes having a small 'v' or 'u' shape above them, possibly indicating a specific pitch or rhythm.

The St. Gall version of *Nicolay* cannot be taken as an isolated anomaly. The work is also transmitted as second mode in the **Berlin 190**, with an added third voice. (There is, however, a separation of time between the versions: both the St. Gall and the Berlin manuscripts date from the middle of the fifteenth century, while **Cividale 56** originated near 1400).

The secular music of the trecento also contributes ways in which pieces reveal scribal knowledge of different notational systems. Eugene Fellin's study of variants in the top voice of madrigals and cacce listed nine different ways in which scribes could, consciously or inadvertently, alter the notation of the work which they copied. His ninth method is of interest here, a substitution of a French notational system for Italian or vice-versa.⁵³ (It is worth mentioning that Francesco's blindness should make us consider him separately in discussions of composer's intention with regards to notation.⁵⁴) We might also take note of a canonic motet

⁵³ Eugene Fellin, "A Study of Superius Variants in the Sources of Italian Trecento Music: Madrigals and Cacce," (Ph.D. dissertation, University of Wisconsin, 1970), pp. 29–30. Fellin's ninth category seems incongruous among the other eight categories of change which, for the most part, involve small changes to notation such as substitution of separated notes for ligatures (category 4). However, there is a way in which the ninth category fits within Fellin's system. Like nearly all of the other notational variants, changes from one notational system to another involve little change in the sound of the work despite the greater scribal initiative. Fellin's table documenting changes of notational systems between manuscripts, pp. 34–39, has remained a largely neglected source of knowledge.

⁵⁴ Although I have mentioned (in talks and my unpublished 1998 thesis) this need to consider Francesco's notation separately from other composers', Oliver Huck independently came to the same

by Johannes Ciconia copied in **Bologna Q 15** on ff. 270v–71r, where, although the piece is copied in French mensural notation, the scribe is conscious that the original system was Italian. Thus he gave instructions to the performer to interpret the tenor and contratenor as if they were in Italian notation: in this case by considering two semibreves (in ligature) as equivalent to a perfect (3 semibreve) breve even when the ligature is not followed by a breve.

Among other works showing scribal fluency in different systems and independence in notation is a Mass movement by Zachara possessing a rhythmically straightforward cantus in one version and a cantus with more complex syncopations and cross-rhythms in another.⁵⁵

conclusion in his recent article, “Die ‘Entstehung des Komponisten’ und der ‘Schritt in die Schrift’: Überlieferung und Edition der Musik des frühen Trecento,” in *Text und Autor*, Christiane Henkes and Harald Saller, with Thomas Richter, editors (Tübingen: M. Niemeyer, 2000). Maria Caraci Vela also discusses the impact of Francesco’s blindness on the transmission of his works (“La Tradizione Landiniana” in Delfino and Rosa-Barezzani 1999 (“Con dolce suon”), pp. 17–18). What I wrote in 1998 remains my belief:

Interestingly, though Landini’s eleven madrigals and cacce studied by Fellin display variations in notation type between pieces, there is no variation in notation type between concordances of a single piece. Could it be that because of his blindness, Landini relied on various scribes to record his work (explaining his lack of a single notational system across his output of madrigals) and that his compositions were only written down once, while other composers might have written several versions of their pieces in different notational styles? An examination of the notation of Landini’s ballate should be undertaken. In any event, studying the works of Landini in order to determine authorial intention in notation types seems somewhat futile.

However, the criticism that Anonymous V levels against Francesco’s (supposed improper use of red) notation suggests that he was in fact directly responsible for the written form of some of his works. (Coussemaker *CS III*, p. 396; cited by Leonard Ellinwood, “Francesco Landini and His Music,” *Musical Quarterly* 22.2 (April 1936), pp. 192–93). Anonymous V refers to Francesco as “Checus de Florentia,” so he was certainly aware of the affliction.

⁵⁵ Partial transcription from **Bologna Q 15** and, along with its original note values, from **Mod A**, by Anne Stone, “Glimpses of the unwritten tradition in some ars subtilior works,” *Musica Disciplina* 50 (1996), part of the two volume, *Essays in Memory of Nino Pirrotta*, edited by Frank D’Accone and Gilbert Reaney, 1995–1996 (i.e., 1998), pp. 78–81, with a fuller discussion of this passage in her dissertation, “Writing Rhythm in Late Medieval Italy: Notation and Musical Style in the Manuscript Modena, Biblioteca Estense, Alpha.M.5.24,” (Ph.D. dissertation, Harvard University, 1994), pp. 153–157. Reaney’s own transcription of the same work in *E15cM* vol. 6, no. 17, gives

Anne Stone has argued persuasively that we should not necessarily assume that the performance of the two versions was different. Rather, what is subtler about the *ars subtilior* may be close relationship between the way the rhythms were naturally performed and the precise values which are used to record the sound on paper.⁵⁶ If one believed that all versions of the two voice trope *Nicolay Solemnia* discussed above were sung in the second rhythmic mode, then we could also call those versions which notated a distinction between semibreves and breves “more subtle.”⁵⁷

Beginning Anew: Classification of Manuscript and Fragment Types

If musical style, independent of notation, or location of origin have not been exhaustively studied, the classification of manuscript types, despite some pioneering works, rewards new research even more quickly. Among polyphonic manuscript sources, eight have received the most substantial examinations, the four retrospective Florentine codices and four north-

an entirely different yet also satisfying treatment. His edition presents the cantus almost like a baroque melody, with **Bologna Q 15**'s top voice as a base upon which ornaments from **Mod A** appear, like footnotes, as explanations off the staff. See the further discussion of this work in “Popularity and Transmission” later in this chapter.

⁵⁶ Stone, “Glimpses,” esp. pp. 61–64, and her opening argument in “Che cosa c'è di più sottile riguardo l'*ars subtilior*?” *Rivista Italiana di Musicologia* 31 (1996), pp. 3–31.

⁵⁷ Surprisingly, we have little evidence to suggest that the notation of the Credo Cardinalis and other simple two-part mensural settings was *not* integral to the style of performance of the work. That is to say, the notational system is consistent among the many settings which appear during the late trecento and early quattrocento. It is not until later in the fifteenth-century that non-mensurally notated (but not necessarily, non-mensurally performed) settings of Credo IV appear. See for instance the Icelandic fragment, **Reykjavik AM 80** from the library of Munkaþverá, written in 1473, or the French manuscript, **Amiens 162**, from *ca.* 1500, both of which contain non-mensural versions of the Credo Cardinalis. See Árni Heimir Ingólfsson, “‘These are the Things You Never Forget’: The Written and Oral Traditions of Icelandic *Tvisöngur*,” (Ph.D. dissertation, Harvard University, 2003), pp. 50–55.

ern manuscripts, **Reina**, **Mod A**, **Mancini**, and **Rossi**.⁵⁸ Two of these manuscripts have been reassembled from multiple sources—in the case of the **Rossi** codex, a source in Rome and one in Ostiglia, and in the case of the **Mancini** codex, three separate discoveries in Lucca and one in Perugia.⁵⁹ The remaining eighty or so sources are typically grouped together simply as fragmentary manuscripts. But they can be considered in several distinct groups based on how their forms were initially conceived. The majority of fragments were originally codices, most likely similar to the eight larger examples which currently survive. They were originally manuscripts of multiple gatherings created to contain polyphony. I will return to this point with stronger arguments shortly.

Fifteen mensural, polyphonic sources are manuscripts of liturgical chant in which a few polyphonic compositions are found. The main corpuses of six of these sources were copied in the late twelfth to early fourteenth centuries, and originally were entirely monophonic. Polyphony was added during the period covered by this study. The remaining liturgical sources are not really fragments in the sense of missing, misplaced, or partially surviving mu-

⁵⁸ Early studies of trecento music tended not to consider **Mod A** strongly when writing the history of the period, considering its repertory more significant for French music and for the period following. It should be mentioned that these sources are not entirely polyphonic. **Squarcialupi** and the **Rossi** codex preserve a number of single voice ballate. French manuscripts of the fourteenth-century, like the Machaut sources, also occasionally mix monophonic and polyphonic works.

⁵⁹ Literature written early in the last century tended to refer to them as the **Rossi** and **Mancini fragments**, but as more of the MSS have been found and, more importantly, as the significance of the manuscripts became more apparent, their designation within the literature changed to coincide with the respect given to the more complete sources, that is, they are now *codices*. The transformation of the manuscripts can be seen in Fischer's *Studien* of 1956 where the eight manuscripts mentioned each receive a column heading. The same phenomenon might now be taking place with the Boverio manuscript (Turin T.III.2) perhaps as a result of its publication in facsimile with introduction. It is listed as one of the principal sources of Trecento polyphony in the second New Grove. The palimpsest manuscript San Lorenzo 2211 serves as a bridge between the fragmentary and nearly-complete sources because of its large size contrasted with the difficulty of reading it.

sic. In these sources, such as **Florence 999**, the polyphonic sections were planned at the time of the creation of the manuscripts. (A few sources, including **Parma 9**, contain both of these two types of addition; they possess polyphony which was integral to the conception of the manuscript and polyphonic works added later; other sources, such as **Vatican 657** contain polyphony added when other monophonic sections were also added).

The timeline of Italian polyphony found in liturgical manuscripts is unbroken from the late duecento to the mid-quattrocento. Although dating these sources is generally much more difficult than dating their more complex counterparts, we can say with reasonable certainty that several of these sources come from before 1360, thus filling in a part of the fourteenth century which we know was rich in polyphonic activity, but from which we have no major sources.⁶⁰ Polyphonic mensural pieces in liturgical manuscripts have often been treated in the literature either as having little relation to the high art polyphony or conversely as a part of that repertory not requiring much comment about its path of transmission. However, the continued discovery of manuscripts, liturgical and otherwise, containing sacred polyphonic music attacks the idea of the trecento as a nearly completely secular period in polyphonic music.⁶¹ In Table 1.10, asterisks indicate sources of sacred polyphonic music not known to Kurt von Fischer when he published his landmark *Studien zur Italienischen Musik des Trecento und frühen Quattrocento* in 1956.

⁶⁰ For the dating of the Rossi codex, the earliest major secular source, see Nino Pirrotta, *The Rossi Codex* as well as Tiziana Sucato, *Il codice Rossiano 215. Madrigali, ballate, una caccia, un rondellus*.

⁶¹ The erosion of this view was first strongly argued by Kurt von Fischer in his "Sacred Polyphony" article, *op. cit.*

TABLE 1.10: ITALIAN SOURCES OF SACRED MENSURAL POLYPHONY

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- * Ascoli Piceno 142
 - * Assisi 187 (instrumental version of a *Kyrie*)
 - * Atri 17
 - * Barcelona 883
 - * Bologna 1
 - * Boverio
 - * Brescia 5
 - * Cividale 63 (probably the same MS as Cividale 98)
 - * Cividale 98
 - * Cortona 2
 - Faenza diminutions
 - * Foligno
 - * Florence 999 in monophony
 - * Florence San Lorenzo 2211
 - * Grottaferrata/Dartmouth + monophony
 - *? Grottaferrata s.s.
 - * Guardiafrede 2 and 3 in monophony
 - * Gubbio Corale in monophony
 - Krakow 40582
 - * Macerata 488
 - Mod A
 - * Messina 16
 - Pad A
 - * Pad D⁶²
 - * Padua 14
 - Padua 55 + Padua 56 in monophony
 - * Padua 553 instrumental version of a *Gloria* + mensural monophony
 - * Parma 9 in monophony (and additions to monophony)
 - * Parma 3597 in monophony
 - * Perugia 15755
 - Pit.
 - * Poznań 174a
 - * Reggio Emilia 408 in monophony
 - * Rome Trastevere 4
 - * Seville 25
 - * Siena 10 added to monophony
 - * Siena 36
 - * Siena 207⁶³

⁶² One of the four fragments of **Pad D**, **Padua 1106**, was known by the time Kurt von Fischer published the *Studien*. It contains motets but no sacred works.

⁶³ One of two parts (formerly 326) was discovered in 1924, the other (327) in 1964.

- * **Siena Ravi 3**
- * **Todi 73** in monophony
- * **Trent 1563**
- * **Udine 22**

These Vatican sources were known to Fischer but not discussed in his catalog:

Vatican 129

Vatican 171

Vatican 657

Vatican 1419

Vatican 1969

The designation “in monophony” means that the polyphony is an integral part of an otherwise monophonic manuscript. “Added to monophony” by contrast shows those sources where the polyphony has been added later to a monophonic collection. For **Grottaferrata/Dartmouth**, I have written “+monophony” since a single monophonic piece is coeval with the surviving remnants of the manuscript. A *? indicates that the manuscript was probably not known to Fischer.

If any suspicions remained that the sacred music in the trecento has been slighted in the literature, Nino Pirrotta and Pierluigi Petrobelli’s headings for the second New Grove entry on Italy remove all doubt. They divided art music before the seventeenth century into three categories: plainchant, early secular music, and the Renaissance, neglecting these important sources.⁶⁴ The polyphony of liturgical manuscripts will be covered in Chapter 4.

Other sources of polyphonic music contain pieces copied into manuscripts that are not primarily repositories of music. The polyphony found in four of these sources, **Barcelona 883**, **Siena 30**, **Siena 36**, and **Seville 25**, is seen in the company of music treatises. The music in **Assisi 187**, **Padua 656**, **Vatican 129**, and **Vatican 1419** are later additions to unrelated manuscripts.⁶⁵ The trecento polyphony of **Berlin 523** is a special case: it is an addition to a

⁶⁴ Pirrotta and Petrobelli, “Italy §I.1–3,” in *2ndNG*. The entry on plainchant does mention *cantus planus binatim*. The discussion of early secular music includes reference to “a scattering of motets” whose Latin texts may reference religious occasions. No mention of music for the Mass appears in this section.

⁶⁵ **Padua 656** is the only truly non-fragmentary manuscript listed in Kurt von Fischer and Gianluca D’Agostino’s article “Sources, MS, §VIII (Italy),” in *2ndNG*. However, the division of sources into “Principal individual sources” and “Other fragments” carries with it the assumption that all

French sacred polyphonic source of the thirteenth century, which then became the cover for a later, unrelated manuscript. In a sense, it is a fragment of a fragment.⁶⁶ Together, these nine sources form the study group for Chapter 5.

Flyleaves and Dismembered Manuscripts

Since they are both the most numerous and the most misunderstood, I wish to consider in greater detail those fragments which, I assert, were at one time part of manuscripts which were similar to the larger polyphonic sources. One finds fragments of larger polyphonic manuscripts primarily in three settings: as flyleaves, as internal strengthening for the covers of books, and as covers of notarial documents. In the first group, they appear as flyleaves and pastedowns for other books, whether manuscript or printed. These books could be either copied or printed later, in which case our manuscripts might have been added as part of the original binding, or they could be earlier manuscripts which were restored or rebound later.

The second setting, fragments which were used internally (within the covers) to strengthen the bindings and covers of other books, is one which some might group with the first. I consider them separately for three reasons. First, these dismembered sources are use-

other sources were fragmentary manuscripts. It is an irony that musical contents of the non-fragmentary *source Padua 656* is a fragmentary *piece*: a section of the tenor of Ciconia's *Con la grime bagnandome*, copied twice.

⁶⁶ A more-detailed typology would also consider additions within other trecento manuscripts whether fragmentary or nearly complete. For the cases of the **Mancini** codex and **San Lorenzo 2211**, for instance, consideration of principal versus secondary copying layers of works (distinguished for example by the position of a work on a page or changes in scribal hand between works) has proved fruitful in understanding to what extent an attribution at the top of a page applies to a work below. See Nádas and Ziino, *The Lucca Codex*, p. 42, and David Fallows, "Ciconia's Last Songs and their Milieu," in *Johannes Ciconia: musicien de la transition*, edited by Philippe Vendrix (Turnhout: Brepols, 2003), pp. 114–15.

ful for their bulk. While only parchment folios are generally strong enough for the flyleaves and notarial covers, a quantity of paper folios would have been equally sufficient to parchment as stuffing for bindings. I consider them separately also because they often suffer more damage, from folding and severe trimming, than fragments from the first group (which, when they are lucky enough to be used in manuscripts of similar size to their original state often lose “only” their margins, foliations, and composer attributions). Finally, I consider them separately because of the difficulty in locating these fragments. A diligent librarian who notes the contents of every manuscript flyleaf will enable us to identify fragments of the first group; but the same diligence which does not allow books to fall into a state of disrepair *might* hinder the discovery of this second group.⁶⁷

The last large group of dismembered fragments is found as covers of collections of notarial documents, often used to protect internal indices (i.e., *vacchette*). In every known case parchment sources were employed. Typically, these folios suffer greater damage on one side (the outside of the folder) than the other. Folds which run contrary to the original design of the manuscript can have disastrous consequences for text or music on the fold.⁶⁸

⁶⁷ I place the word “might” in italics in acknowledgment of the difficult position which curators are in when juggling the research needs of current scholars with the need to preserve materials for posterity. Scholars encounter the same conflicts. Surely there are many of us who have returned a manuscript and pointed out a loose page in need of being reattached to the book while praying that the custodians would not make a complete restoration and rebinding of the manuscript, making our codicological work more difficult.

⁶⁸ For instance, the obliterated middle staff of f. 56v of **Mancini** renders illegible a crucial line of Zachara’s *D’amor languire*. Attempted transcriptions are necessarily unsatisfactory in this location. See my article, “Zacara’s *D’amor Languire* and Strategies for Borrowing in the Early Fifteenth-Century Italian Mass,” in *Antonio Zàcara da Teramo e il suo tempo*, edited by Francesco Zimei, dedicated to Kurt von Fischer (Lucca: Libreria Musicale Italiana), pp. 352–54, and Lucia Marchi’s dissertation, “La musica in Italia durante il Grande Scisma (1378–1417): il codice

Their use as notarial covers often brings with them clues to the location of other folios from the same manuscript.⁶⁹

Since understanding the trecento involves the recovery and study in context not only of the lost manuscripts and fragmentary sources of the time but also considering the lost pieces contained within these sources, the remainder of this introductory chapter develops different ways to glimpse works we know existed in the past but have vanished from the surviving material traces of the trecento.

Counting our Losses: The Missing Polyphonic Works of the Trecento⁷⁰

Fully understanding a repertory of music involves, above all, having a grasp of its extent. We need to view the repertory as a whole in our minds in order to distill its salient features, its internal subdivisions, and, perhaps above all, the distinctive and wonderful exceptions which give life and development to music. Getting a handle on a repertory is especially difficult when what survives for us to study is distant, or worse, incomplete. We know that our perspective is obscured, our understanding partial. Our conclusions are subject to revision; they are in short, inconclusive.

Torino, Biblioteca Nazionale Universitaria, T. III. 2" (Tesi di dottorato, Università degli Studi di Pavia, 2000), pp. 231–34.

⁶⁹ See Nádas and Ziino's use of such clues to discover new leaves of the **Mancini** codex in *The Lucca Codex*, pp. 15–17.

⁷⁰ I wish to acknowledge Lisa Friedland (Department of Computer Science, University of Massachusetts, Amherst) for conversations and advice which resulted in many of the mathematical models used in this section, and David Tabak (National Economic Research Associates) for first noting the similarities to animal capture/recapture sampling methods. I owe a special thanks Prof. William Bossert of the Department of Biophysics, Harvard University for spending time in discussion with me about this project.

We would be more assured about our work if we were convinced that we lacked only a little from the repertory, and that what we lacked was similar to what we already had. But understanding the extent of our losses has been considered difficult or impossible by musicologists.

In this section, I consider the size, measured in number of pieces, of various sub-genres of the *trecento*. I suspected that the information we already had for certain repertories could substantially lessen our uncertainty about the extent of our losses. This section discusses some ways we conceive of missing pieces in a repertory, and ways we might develop methods for estimating the number of missing pieces. It then applies these methodologies to the subject at hand: the various polyphonic genres of the fourteenth century. The section concludes by remarking on other uses of these methods and their applicability to other branches of music scholarship and humanistic studies.

There are several reasons why we should consider the total size of an incomplete repertory. The number of missing pieces gives us an estimate of how fruitful we expect searches for new manuscripts to be. As is noted elsewhere in this thesis, the rate of discovery of fragments has increased rather than declined over the last forty years,⁷¹ and we have no reason to expect that the rate will drop off in the near future. As important as the discovery of new manuscripts is for the study of scribal concordances and notational features, given that these discoveries are time-consuming and often require expensive excursions to study distant “leads,” it is fair for scholars, and those who fund scholars, to ask if we expect new manuscript finds to result in new pieces of music. More importantly (and less materialistically), if

⁷¹ See Table 1.2.

we suspected a single source or small group of sources to be representative of a much larger collection of music we would be inclined to grant that source or group more weight in our analyses. A source that represented many missing sources would carry more force in preparing descriptions of typical music of a time, than sources that represented in themselves the full extent of the genre. The monophonic instrumental compositions in the **London** codex (29987) are examples of pieces to which we have given further weight and study because they are presumed to stand in for a much larger repertory.⁷²

We should also consider the missing repertory because its size and composition affect how we view sources that do exist. As has already been mentioned, the majority of fragmentary manuscripts seem to have originally been similar in size to those few sources which do survive in complete or mostly complete state. Our losses are represented by the disembodied folio numbers which stand in for so many lost pages:

⁷² I should add that serious questions can be raised at least in this case about whether these pieces are similar to the unwritten instrumental pieces; this is taken up in more detail within my discussion of keyboard music in the fragments in the following chapters and also the discussion of the possible instrumental work “Sones ces Nachares” from **Pad A** in Chapter 2.

TABLE 1.11: HIGHEST EXTANT FOLIO NUMBER FOR SOME TRECENTO FRAGMENTARY MANUSCRIPTS⁷³

Parma 75	243 (233?)
Perugia 15755	171 ⁷⁴
Stresa 14	141
Florence 5	138 ? (see Chapter 3)
Frosinone 266/267	133 ⁷⁵
Ciliberti	97
Todi Carità	93 ?
Brescia 5	71
Siena Ravi 3	70
Vatican 1969	60
Padua 1475	50
Munich 3223	22
Florence Conservatorio	19 ⁷⁶

We should not forget that these numbers do not represent the original length of these manuscripts, but merely the highest numbered folio which currently survives. For instance, the gathering structure of **Pad A**, discussed in Chapter 2, shows that although our last folio number is 50 (on **Padua 1475**), we can be fairly certain that the original manuscript contained at least 70 folios. The order of works in **Florence 5** gives another hint at the original length of a manuscript. Its seemingly-alphabetical presentation of Francesco's ballate

⁷³ These sorts of loss are not confined to the main period of this study: among slightly later manuscripts, one should recall the **Boorman** fragment's preserved foliation of 125, or the earlier **Venice Giorgio**'s folio 86.

⁷⁴ Oliver Huck, review of *Frammenti Musicali Del Trecento nell'incunabolo Inv. 15755 N. F.*, edited by Biancamaria Brumana and Galliano Ciliberti (Florence: Olschki, 2004), forthcoming in *Plain-song and Medieval Music*. Brumana and Ciliberti did not notice this folio number on binding strip VIa, thus their highest identified folio number is 36.

⁷⁵ A second, arabic foliation of 217 appears on the bifolio with signature 267, but it is unclear whether this foliation is original.

⁷⁶ Although f. 19 is easily read on one of the two folios, a cut-off numeration on (new numbering) f. 2r escapes easy identification. Eugene Fellin suggests that this folio might have originally been f. 21 ("A Study of Superius Variants," p. 26) but since the two folios are a single, joined bifolio this identification is nearly impossible. An interpretation of "xxvi" is more likely, necessitating three missing bifolios (20/25, 21/24, 22/23). Less likely, the foliation could be "xvi" indicating that the bifolio has been folded against its original orientation.

ends with ballate beginning with the letter “C” (*Che pen’è quest’al cor*, *Chogli ochi assai ne miro*, and *Cosa nulla*). Even supposing that Francesco were the last composer in the manuscript (unlikely) and that it preserved only half of his 113 known ballate which begin with the letters *D* through *V*,⁷⁷ we would still need forty folios to complete the manuscript.⁷⁸

As tempting as it might be to suppose that manuscripts were often dismembered from their extremes, we have little evidence for this mode of destruction. It would therefore be more prudent to suppose that that these folios represent random samples of the original manuscripts. The expected length of the manuscripts, as an average, would then be twice the highest surviving folio number.⁷⁹

⁷⁷ The transmission rate of fifty percent seems appropriate since, of Francesco’s thirteen known ballate between *Benché ora* and *Cosa nulla*, **Florence 5** provides readings for seven.

⁷⁸ In the case of **Florence 5**, however, we would have less reason than for other manuscripts to suppose that the lost pages represent otherwise unknown works, because of its high concordance rate.

⁷⁹ For a manuscript with j folios, the expected folio value, that is, the likely average folio over repeated

random discoveries, given by:

$$EV = \sum_{i=1}^j p_i i$$

where p_i is the probability of drawing folio i . If each page is equally likely to be preserved then the

expected value reduces to:

$$EV = \frac{1}{j} \sum_{i=1}^j i = \frac{1}{j} \cdot \frac{j(1+j)}{2} = \frac{1+j}{2} \approx \frac{j}{2}$$

(It is not always the case that one can reverse a formula like this one to get the estimated book length. In fact, the field of parameter estimation is controversial enough that it accounts for perhaps half of all theoretical statistical research. However as a general rule for the average length of a manuscript, the inversion of this formula would raise few eyebrows. It should not be considered an accurate way of estimating the length of any one particular manuscript given a surviving folio number).

The average of the entries on Table 1.11 is 100, so we might predict an average book length of 200. For another way of considering the expected length of a manuscript, we can compare with the lengths of the surviving Florentine codices, **Panciatichi** 115, **London 29987** 185 (palimpsest numbering), **Pit.** 150, **Squarcialupi** 216, and **San Lorenzo 2211** 188 (highest surviving folio), which average 171 folios. These two estimates accord well, and strongly suggest that the fragments were originally similar in length to the larger, surviving Florentine codices.

But what was on these lost pages? We return to the problem of the missing pieces within these missing sources. There are several other lost pieces (or at least, lost concordances) which are tantalizingly close to being available to us. Four trecento flyleaves are still attached to their host manuscripts, leaving a face undiscovered, or visible only as show through. Librarians have good reason to be cautious about lifting flyleaves: in several cases, much of the ink is lifted from the page, and the cover (with a mirror) becomes the more important source for that face of the manuscript.

TABLE 1.12 : POLYPHONIC SOURCES STILL PASTED DOWN WITH AT LEAST ONE FACE HIDDEN.

Houghton 122	1v, Marian motet. 2r, Credo
Oxford 56	Back pastedown: unknown work, probably in <i>tempus imperfectum cum prolatione maiori</i> . ⁸⁰
Padua 1027	Half of the front and back folios are attached to the cover. As the rest of the fragment is blank, and there is no show-through, the hidden sections are probably blank also.
Ivrea 105	No description

Works which are unidentifiable despite being revealed are another glimpse into the problems of lost sources. The following table, Table 1.13 lists only those works not included in the previous and does not begin to consider the problem of identification of certain works from **San Lorenzo 2211**:

⁸⁰ For the identification of the front pastedown of **Oxford 56** as Ciconia's *Gloria: Suscipe, Trinitas*, see Chapter 2, below.

TABLE 1.13 : POLYPHONIC SOURCES WITH ILLEGIBLE FACES OR FRAGMENTS TOO SMALL TO IDENTIFY

Civiale 98	Ballade tenor (?) f. 1r bottom.
Cortona 2	Gloria, f. 1r., Sanctus, f. 1v B.
Grottaferrata/Dartmouth	Two offsets from missing folios.
Krakow 40582	One side of each of the two folios is an illegible Gloria.
London 29987	Erased Credo, f. 1r. ⁸¹
Oxford 16	Erased work.
Oxford 56	Several unidentified and mostly illegible works.
Perugia 15755	Several motets and music with no surviving texts.
Rome 1067	<i>Speravit</i> , f. 44v and small work on f. 42v.
Seville 25	Unidentified compositions, ff. 23v and 39r.
Vatican 171	Four unidentified Glorias.
Vatican 1790	Mensural voice at the bottom of f. 1r.
Vatican 1969	Three voice virelai, f. 49r.

This table should not be read as implying that all other sources have satisfactory readings.

Some hints as to the extent of our musical losses can be found in references to musical compositions in other works, such as poems in text sources where composers' names have been added, or texts which make obvious that they are discussing specific musical compositions. These pieces are in a sense then only semi-lost. Their music and their poetry are not available to us, but their one-time existence is documented. An example of a poem documenting lost musical works is Simone de' Prodenzani's thirty-fifth sonnet of *Il Saporetto*:⁸²

⁸¹ Michael Long, "Musical Tastes in Fourteenth-Century Italy: Notational Styles, Scholarly Traditions, and Historical Circumstances," (Ph.D. dissertation, Princeton University, 1981), pp. 172–73. The visible parts of the Credo, transcribed by Long on p. 176, are compatible with Zachara's Credo in **Civiale 98**. Further investigation is warranted. Another unidentified, erased early-fifteenth century Credo can be found on f. 1v of the probably Viennese manuscript **Nuremberg 9a**, f. 1v. The voice has been erased in favor of Zachara's Credo, "Cursor." (Mentioned in Fischer and Gallo, *PMFC 13*, p. 264.)

⁸² Edition from Fabio Carboni, *Simone De' Prodenzani: Rime* (Manziana: Vecchiarelli, 2003), computer file 3, p. 15. In Carboni's new numbering of the sonnets, this sonnet is no. 24. I have added italics to the full title of Rosetta in line two and inverted the order of "partir da te mi" from "da te partir me" in line four. This reading accords with the versions of Boccaccio's text found in **Bologna Archivio Covers**, year 1337 and 1338. Although not present in the Bologna versions of this text, in *Filostrato*, the text continues asking, "Perché mi toglì il sollazzo e la pace?" Perhaps

Titles definitely to be associated with works which survive today are shown in bold type.

Colla vivola fe' cançon di maio,
Rosetta che non cambi mai colore,
Le sui nafres tam fort, dolce sapore,
Comme partir da te mi degio oma'io?
D'amor languire e puoi el dolce Raio,
O rosa bella, che m'alegrie 'l core,
Legiadra donna e poi *Donna d'amore,*
Un fior gientile del qual mi 'namoraio,
Questa mirabil donna, Margarita,
Con lagrime bagnando el suo bel viso,
Ditutto se' e fè Sella mia vita,
Costei sarebbe bella in Paradiso,
Non credo, donna, O giemme incolorita
 del Cicognia una parte fu l'aviso.

Of the works or possible works cited, we have copies of the nine in bold in Example 1.14. All of these works are by Antonio Zachara da Teramo except *O rosa bella*, and the three works with “donna” in their incipits. John Nádas has equated “El dolce Raio” with Ciconia’s *Le Ray au Soleyl* and has tentatively connected *Questa mirabil donna, Margarita* with the refrain of the ballade *N’a pas longtemps* which discusses the pleasing and beautiful Margarite.⁸³ We are still left with at least two lost works (*Come partir da te me debbo mai* and *Se la mia vita*) and possibly five if we consider “Costei sarebbe bella in Paradiso,” “O gemma incolorata,” and “Cançon di maggio” the titles of lost works. Depending on what mix of

Prodenzani selected this poem because of the potential for a pun on the name of the central character of *Il Saporetto* or the title of his other major work. The version of the poem given above can be compared with Santorre Debenedetti, editor, *Il “Sollazzo” e il “Saporetto,” con altre rime di Simone Prudeniani d’Orvieto*, supplement to *Giornale Storico della Letteratura Italiana* 15 (Torino: Loescher, 1913), which includes as songs, “Cançon di maggio” (1), “dolçe sapore” (3), and considers as a title, “El dolce raggio” rather than the shorter “Raio.”

⁸³ John Nádas, “A cautious reading,” p. 35. The quotation in *N’a pas longtemps* is “La très plaisant et belle Margarite.” See David Fallows, “Ciconia’s last songs and their milieu,” in *Johannes Ciconia: musicien de la transition*, edited by Philippe Vendrix (Turnhout: Brepols, 2003), p. 114, for a summary of the arguments which allow *Le Ray au Soleyl* to shed the designation “opus dubium.”

these interpretations we use, we have between 56 percent (9 of 16) and 85 percent (11 of 13) of the works mentioned in this poem. Are these typical numbers? Can we generalize from this evidence?

We have other evidence of lost sources which we can use. The poet Franco Sacchetti provided several editions of his works. In later editions, he was careful to note which of his poems had been set to music and by whom. Figure 1.15 lists the works which Sacchetti reports were set by the composer Nicolò:⁸⁴

FIGURE 1.15: NICOLÒ'S WORKS MENTIONED IN THE CATALOG OF SACCHETTI

M = madrigal, B = Ballata, C = Caccia; works which survive today are shown in bold type

Come selvaggia fera fra le fronde (M)
Come la gru quando per l'aere vola (M)
Correndo giù del monte a le chiar'onde (M)
Di diavol vecchia femmina ha natura (B)
Nel mezzo già del mar la navicella (M)
Passando con pensiero per un boschetto (C)
Una augelletta, Amor, di penna nera (M)
Chi 'l ben soffrir non pò (B)
Povero pelegrin salito al monte (M)
Lasso, s'io fu' già preso (B)
State su, donne!—Che debian noi fare (C)
Chi vide più bel nero (B)

Seven of Nicolò's twelve works on texts by Sacchetti currently survive (58%); of the thirty-four of Sacchetti's texts that were set to music by any composer, only twelve remain (35%).⁸⁵ Do these percentages apply to Italian music as a whole, or are the pieces set to Sac-

⁸⁴ Adapted from F. Alberto Gallo, *Music of the Middle Ages II*, (Cambridge: Cambridge University Press, 1985), pp. 65-66.

⁸⁵ One lost Sacchetti ballata, Francesco's *Né te né altra voglio amore*, possessed at least four different lauda contrafacts, though all are transmitted in the same source, **Chigi 266**. The ascription to "Franciscus de Organis" is from Sacchetti's autograph, **Florence 574**.

chetti's texts, mostly by the oldest generation of composers of the Italian *Ars Nova*, different and unrepresentative?⁸⁶

For the remainder of this section, I wish to introduce another possible method for examining repertories which do not survive. This method uses probabilistic models and simulations in part borrowed from animal biology. These models are most commonly employed to count animal populations whose members are difficult to capture *in toto*. Although there is a fair amount of probability and other mathematics used to get the final numbers presented in this project, the fundamental points can be followed with little background in probability and statistics.

The first principle to borrow is that the number of unique works in each manuscript source gives us some indication of the size of a repertory. If with every new fragment or book we discover, the majority of works are unknown from other sources, then, all else being equal, we would expect that a large part of the repertory remains undiscovered. Conversely, if new manuscript discoveries were, in general, not bringing with them new works, then we would suspect we have most of the original repertory (if not most of the copies of the origi-

⁸⁶ There are further documents which might allow us to estimate our losses in a similar fashion for nearby repertories. Perhaps the most famous to scholars working on French music of the period is the index page formerly in the possession of the Duchess of Trémoille of a lost manuscript of motets. Work on this source was carried out by Martin Staehelin in a short but important article on lost manuscripts of the fourteenth and fifteenth centuries, "Mehrstimmige Repertoires im 14. und 15. Jahrhundert: Das Problem der verlorenen Quellen," in *Atti del XIV congresso della società internazionale di musicologia, Bologna, 27 agosto—1 settembre 1987*, Vol. 1 (Round Tables) (Turin: E.D.T., 1990), pp. 153–59. Through concordances with other French and Italian manuscripts, Staehelin ascertained that 63% of the 114 pieces in the index survive. (Staehelin did not seem to include the concordance in the recent manuscript **Cortona 1**, though this changes the percentage only slightly). His work was concentrated on source losses rather than work losses and, as such, focused on library catalogs, payment records, and assumed omissions in stemmata as his most important evidence.

nal repertory, which is an important distinction). While it might be obvious that more unique works would hint at a larger repertory, this presumption does not tell us *how much* larger one repertory might have originally been than another.

It is even more intuitive, but extremely important to keep at the forefront of our minds, that this principle tells us nothing about whether we have most or all of the contents of *other* repertories. If we have few new pieces of fourteenth-century Italian music accompanying new manuscript discoveries, it does not tell us anything about how much French music there is left to discover. This obvious statement makes the decision of what constitutes a repertory and what does not an important decision. Slicing repertories too thinly can create a problem of overfitting—seeing correlations where there is not enough data to support them, a problem I will return to later.⁸⁷

We may begin with a simple example including some assumptions that might sound incorrect. We can modify these assumptions later and see how altering them affects the result. Consider how scientists might count the number of fish in a lake—they could catch 100 fish, tag them with some sort of marker, release them; then they could catch another 100 fish. If 20% of those fish were previously tagged, then we could guess that we had

⁸⁷ It follows that even a small amount of data collected on a certain repertory is more important for estimating the size of that repertory than an abundance of data gathered about a different repertory. The weight of this axiom to my work cannot be overstated: there are many large Florentine codices of mostly-Florentine works, nearly exclusively secular, which have a great many pieces in common. As I will show later, the fragments on which I work preserve parts of that repertory but primarily comprise different repertories, mainly sacred and ceremonial, with a much lower rate of retransmission. The fragments therefore preserve the types of music which we should expect future manuscript discoveries to have a higher chance of containing.

originally tagged 20% of the total fish in the lake. We would then estimate that there were 500 fish in the lake. This is known as a “capture/recapture” method of counting.⁸⁸

We can use the same method of counting with musical works in manuscripts—we take a certain number of manuscripts as the first catch and we mentally “tag” the pieces in that batch by taking note of which pieces appear. We might then consult other manuscripts and see the amount of overlap among manuscripts. What might seem like a flaw in this method is that we assume each song was equally likely to be transmitted—as if each fish were equally easily caught. Surprisingly, there are several cases where this assumption does not strongly conflict with our data, as will be presented. More importantly, when we adjust for different pieces having different popularities, we find that our unadjusted prediction *underestimates* the number of pieces. So a model assuming equal probability gives us a minimum estimate of the number of missing pieces, which is still extremely useful. It happens that most other refinements to the model—non- or only partially intersecting repertoires is one— affect the model in the same way, increasing the range of possible values but leaving the estimated minimum number alone.⁸⁹ It bears repeating, that though the estimates given in

⁸⁸ The generalized formula for a capture-recapture model with two captures is:

$$\text{Size of population} = \frac{\text{Total number of items tagged in first capture} * 100}{\text{percentage of tagged items in the second capture}}$$

One might note that the size of the second capture does not come into the equation. However, larger captures will usually result in more accurate estimates.

⁸⁹ A list of potential refinements to a capture-recapture model and their effects on the estimated size of the population can be found on p. 57 of Michael Begon’s short introduction, *Investigating Animal Abundance: Capture-Recapture for Biologists* (Baltimore: University Park Press, 1979). Begon gives three situations where this number might be overestimated, none of which is likely to occur in this study. First that the mark on the animal might not be permanent; for our purposes this impermanence means that we might not recognize a piece when it appears in a second manuscript. Second, that marking decreases survival rates, or here that the presence of a piece in one

this paper can be refined, and will be later, the refined estimates will not be lower than what I present here.

In order to make accurate estimates we must first have a good grasp of the number of pieces which survive in each genre. This study will limit itself to the period in which nearly all our manuscripts stem, 1380–1415, (the only major exclusion is the **Rossi** codex), and will thus consider only those earlier pieces which are retransmitted in a retrospective manuscript.

Table 1.16 gives the number of works in each of five different genres contained in different Italian and foreign manuscripts of the trecento and early quattrocento. The number of pieces in the genre contained in each manuscript is given, as are the number of pieces appearing in one, two, three, etc., manuscripts, and the percentage of *unica*. About half of the madrigals and cacce exist in only a single source. This number increases to about two-

manuscript lessens its likelihood of appearing in a second manuscript. The first case, lack of recognition of a piece, is only possible in the case of poorly researched concordances and tiny fragments which may be different parts of the same piece—these form a near negligible percentage of the total corpus. The second case, that a source would avoid containing the same piece as another source, may be true for fragments which were originally part of the same manuscript but are not today identified as such. In this case, the two fragments would be less likely to have works in common. However, some of the most similar manuscript fragments, for example **Pad A** and **Pad D**, *do* have repertory in common and this sharing has been an important reason for not uniting the fragments. In other cases where scholars might disagree about whether two or more fragments are from one source, in this study I have considered them the same source in order to avoid the possibility of overestimating. **Trent 1563** and **Krakow 40582** are exceptions to this rule, since the different numbers of lines per staff makes it unlikely that they stem from the same source (see Chapter 2). The final possible source of overestimating comes from open populations, where individuals can enter and leave the sample space. One might suppose that the changing repertory over time would be equivalent to this situation, but it is instead equivalent to death and birth within a population which is already accounted for. Since our sample space, that is, our repertory, is the whole of Italian mensural polyphony from the late fourteenth century to the early fifteenth century, it is impossible for such a piece to enter or leave this realm from some other.

thirds for the ballate and three-quarters for the Latin-texted works. As I have mentioned above, this alone hints at a relatively larger lost repertory of sacred music than secular.⁹⁰

TABLE 1.16: SURVIVING NUMBERS OF TRECENTO PIECES LISTED BY MANUSCRIPT AND ORGANIZED BY GENRE

Only pieces which survive in at least one manuscript from *c.* 1380–1415 are included.

*Cacce*⁹¹

Panciatichi 26	15	
Squarcialupi	12	<i>Number of pieces contained in x manuscripts</i>
London 29987	8	Six 1
San Lorenzo 2211	6	Five 1
Pit.	5	Four 2
Rossi	1	Three 2
Mod A	1	Two 7
Egidi	1	One 12
Pad C	1	= 25 pieces (48% unica)
Strasbourg 222	1	
	= 51 copies	

⁹⁰ Instrumental diminutions have been omitted from the present study.

⁹¹ To stress again: works which appear only in **Rossi** or **Reggio Emilia Misciati** do not appear in this table since it is premature to speculate about lost works from the period about which we know so little.

Madrigals

Squarcialupi	116		
Panciatichi 26	59		
San Lorenzo 2211	58	Seven	4
Pit.	46	Six	2
Reina	39	Five	16
London 29987	35	Four	16
Mancini (Lucca)	12	Three	21
Rossi	5	Two	33
Vatican 1790	4	One	75
Florence Conservatorio	3	= 167 pieces (45% unica)	
Grottaferrata 219	3		
Mod A	2		
Trent 60	2		
Boverio	1		
Pad A	1		
Pad C	1		
Vatican 1419	1		
= 379 copies			

Ballate

Squarcialupi	217	Pad B	3	
Pit.	111	Siena 207	3	<i>Pieces in x MSS</i>
Panciatichi 26	84	Brescia 5	2	Eight 1
Mancini (Lucca)	59	Casanatense 2151	2	Seven 2
Reina	58	Frosinone	2	Six 7
San Lorenzo 2211	52	Parma 75	2	Five 10
London 29987	48	Prague 9	2	Four 17
Ciliberti	12	Poznań 174a	2	Three 47
Mod A	10	Seville 25	2	Two 82
Pad A	7	Strasbourg 222	2	One 243
Boverio	6	Vatican 1419	2	= 409 pieces
Florence 5	6	Assisi 187	1	(59% unica)
Paris 4917	6	Berlin 523	1	
Pistoia 5	6	Florence Conservatorio	1	
Lowinsky	5	Grottaferrata 219	1	
Paris 4379	5	Ivrea 105	1	
Stresa 14	5	Oxford 213	1	
Bologna 2216	3	Padua 656	1	
		Vatican 1411	1	
= 730 copies				

Liturgical Compositions – manuscripts of the central timeframe and location

Boverio	16			
Mod A	10			
Pad A	10			
Grottaf./Dartmouth	8			<i>Foreign and later manuscripts (first column includes only those works appearing in at least one ms. of the central timeframe. The second column includes all works, including pieces in trecento style only appearing in these foreign or later manuscripts)</i>
Pad D	7			
Civiale 63 & 98	6			
Macerata 488	6			
Vatican 171	6			
Pit.	5	Bologna Q 15	8	(18)
Vatican 1419	5	Warsaw 378	4	(9)
Cortona (1 & 2)	4	Kras.	2	(5)
Grottaferrata s.s.	4	Utrecht 1846 ¹	2	(2)
Krakow 40582	4	Bologna 2216	1	(4)
London 29987	4	Nuremberg 9/9a	1	(2)
Siena 207	4	Munich Emmeram	1	(1)
Guardiagrele 3	3	Budapest 297	1	(1)
Bologna Q 1	2	Copenhagen 80	1	(1)
Oxford 56	2	Old Hall	1	(1)
Reggio Emilia 408	2	Trent 87		(3)
Udine 22	2	Oxford 213		(2)
Atri 17	1	Copenhagen 17a		(1)
Civiale 79	1			
Florence 999	1	Total copies in trecento MSS		: 122
Foligno	1	Additional copies of same pieces in other MSS		: 21
Houghton 122	1	Total copies		: 143
Messina 16	1	(Total copies including 16 trecento-style pieces		
Oxford 16	1	in 28 copies, only in non trecento-MSS)		: 171
Poznań 174a	1			
Rome Trastevere 4	1	<i>Number of pieces contained in x manuscripts</i>		
Siena 36	1	Six	3	
Trent 1563	1	Five	3	
Vatican 129	1	Four	1	(Only in later MSS)
		Three	5	(Two only in later MSS)
		Two	16	(Five only in later MSS)
		One	88	(Eight only in a later MS)
				= 116 pieces (76% unica) including pieces only in later MSS
				= 98 pieces (82% unica) excluding pieces only in later MSS

Non-liturgical Latin Works (motets) – manuscripts of the central timeframe and location

Pad D	6		
Ascoli Piceno 142	5		
Mod A	5		
Cortona (1 & 2)	4		
Egidi	3		
Munich 3223	3		<i>Foreign and later manuscripts (see explanation above)</i>
San Lorenzo 2211	3	Bologna Q 15	1 (10)
Civiale 57	2	Trémoille	2 (2)
Houghton 122	2	Ivrea 115	1 (1)
Macerata 488	2	Munich Emmeram	1 (1)
Pad A	2	Oxford 213	(2)
Boverio	1	Bologna 2216	(1)
Fava	1	Siena 36 ⁹²	(1)
Grottaferrata/Dartmouth1			
Padua 553	1	Total copies in trecento MSS	: 43
Oxford 16	1	Additional copies of same pieces in other MSS	: 5
Poznań 174a	1	Total copies	: 48
		(Total copies including 9 trecento-style pieces in 13 copies, only in non trecento-MSS)	: 61

Number of pieces contained in x manuscripts

Three	3 (One only in later MSS)
Two	8 (Two only in later MSS)
One	36 (Six only in Bologna Q 15)
	= 47 pieces (77% unica) including pieces only in later MSS
	= 38 pieces (79% unica) excluding pieces only in later MSS

Excluded from the lists of liturgical and non-liturgical Latin pieces are works of simpler polyphony (non-mensural or mensural pieces with fewer than four different rhythmic levels; for instance, harmonized Credo Cardinalis settings), works definitely pre-1340, and contrafacts (where the secular version survives; possible but undiscovered contrafacts are included such as the Kyrie “Rondello”). Also omitted are pieces in Italian manuscripts which can be described as being in the “international repertory.” These I define as works in six or more manuscripts of which over half are not Italian (e.g., Gloria “Qui sonitu melodie”).

Though tangential to this part of the study, a surprising revelation of Figure 1.16 is that there are nearly as many sacred and ceremonial works of the trecento as there are madrigals.⁹³

⁹² The Kyrie in **Siena 36** seems of older style than the motet.

I will return to this observation later when we consider the number of missing madrigals and missing Latin works.

Taking the pieces that exist today as our given, I began with an equal popularity model. I looked at the amount of overlap between manuscripts to estimate the number of works which do not appear in any manuscript. In order to give the details of my method while avoiding obscuring the results for readers uninterested in the more technical aspects, the probability basics necessary to obtain these estimates are given as an appendix to this chapter. Interested readers are invited to follow that argument before continuing.

⁹³ This discovery is a side result of the revision I am preparing of Kurt von Fischer's landmark 1956 catalog but will force a major revision of our view of the century as a whole, of which this dissertation is a start. In Table 1.16, pieces which appear twice within the same source are counted once.

TABLE 1.17: ESTIMATES FOR THE NUMBER OF ITALIAN WORKS IN MSS CA.1380–1415

	(a)	(b)	(c)
Cacce	25	28	
Madrigals	167	177	165
Ballate	409	507	384
Liturgical Pieces	116	196	115
(only in trecento MSS	98	168)
Non-Liturgical Latin Works	47	105	
(only in trecento MSS	38	93)

(a) total surviving today

(b) estimated lower bound for the number of pieces given a random distribution model

(c) estimated total for today from cross validating the model by removing the fragments and San Lorenzo (for madrigals and ballate) or the five MS with the most liturgical works (Boverio, Mod A, Pad A, Pad D, Grottaferrata/Dartmouth). See below on cross validation. No holdout cross validations were performed for cacce or motets since there are fewer of them.⁹⁴

I want to point out some results which can be seen simply from Table 1.16 and column (b) in Table 1.17. Comparing the estimates for madrigals to that for sacred and ceremonial works, the much lower concordance rate for the Latin works gives us reason to believe that more Latin pieces were composed in the trecento than madrigals, that most quintessentially Italian of all genres. (And this estimate still excludes the international repertory which, for the most part, mixed freely with the native Italian sacred music).

An important quality in a model is its ability to be tested and stand up to such testing. One way to test the model is called cross validation. This means running the model with incomplete information and then using the model to predict our current situation, to which we can compare. For instance, I removed the fragmentary sources and San Lorenzo

⁹⁴ It is important that the works chosen to be removed for holdout cross validation are chosen arbitrarily and that if repeated cross validations are performed with different works the researcher does not choose the one which gives the desired result. Here, I chose to remove the manuscripts which were easiest to delete and recalculate from my spreadsheet version of the Kurt von Fischer catalog—the small manuscripts for the secular tables and the large manuscripts for the liturgical works.

entirely from the data used to make the model and then used the model to predict how many additional pieces would be found if added the number of folios in those fragmentary sources we now have. Without the fragments of San Lorenzo, for instance, we would have 159 madrigals in 314 copies. On the basis of this information, the model then predicted that there were originally 175 madrigals, and further that if we had 65 more copies of madrigals, six of them would be new. So the cross validated model predicted that with the sources we have today we should have 165 madrigals given our source situation. As you can see, we have 167—a close estimate. Running the same model for ballate, we have an estimate of 385 ballate instead of the 409 we do have—not as close but still a good estimate, while the model for liturgical music is off only by one from our observed number, 115 instead of 116, which is amazingly close. Taken as a whole, these tests suggest that the role of popularity in the transmission of music to us today is a supporting one to that played by random chance. (More information about cross validation appears as an appendix to this chapter).

The other standard way to test a model is, unfortunately, more difficult for us to perform: find new sources and see how they accord with the model. We can not just find new trecento sources whenever we want.⁹⁵ However, since I began this project, four new sources have been discovered. One fragment, **Brescia 5**, I was able to incorporate into this study; two others, **Siena Ravi 3**, **Bologna Archivio Covers**, and **Perugia 15755** came to my attention too late. However, we can see how they conform to the model's predictions. The fragment in Brescia contains two ballate; as was to be expected, both of them were already

⁹⁵ The inability to create more data samples as needed has been explored in the works of the statistician John Tukey who coined the term “uncomfortable science” for such situations.

known. The **Bologna Archivio Covers** source contains a single ballata—already known. The fragment in Siena contains five Latin-texted works; two are known and three unknown. The Perugia fragments contain Mass movements, motets, and madrigals. All of the madrigals are previously known while all the Mass movements and most of the motets are new discoveries. Of course, not every newly discovered source will conform so well to this model, but we should not be surprised when they do: new sources bringing old secular and new sacred music.

Popularity and Transmission

The study and analysis of medieval music has always been, and will always be, a selective art. Some works and some composers are more studied than others, and this selection informs (at best) or skews (at worst) our view of the period being studied. Given the limited time and resources with which we work, we may wish to focus our efforts on those pieces which were most well-known or most popular in the period in which we study. Unfortunately, as we know too well, determining which pieces were popular at the time they were written is a difficult task, sometimes seen as impossible.

We often think that a work in many sources must by definition have been popular. (Or at least, when we take into account the vast unwritten tradition, we can at least say it was popular among those who copied and read music). We use similar metrics to determine the popularity of pieces today, such as number of performances or record sales. But we should become concerned about the usefulness of such measures when there are extremely few sources. For instance, David Fallows reminds us in a recent paper that although 10 songs by Du Fay are preserved in the 11 sources copied after his death (that is, one song in each

manuscript with one piece duplicated), we are most likely seeing random survival of sources and it would be “dangerous for statistical purposes” to consider these pieces popular.⁹⁶

In the previous section, the models were used with the important supposition that each piece was equally likely to be selected (random). We saw before that if pieces are not equally likely to be chosen then our models provide a minimum estimate for the number of lost pieces. We also saw via the cross-validation method that the random model only differs slightly (less than 7%) from the non-random, actual world. But the deviation from the random model, however small, should be investigated.

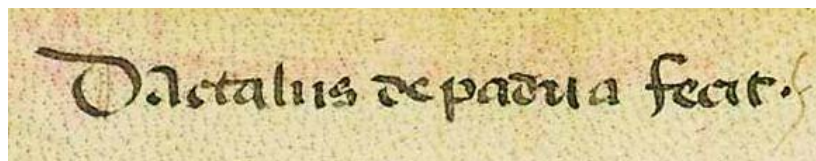
We can create further models which allow us for the first time to pin down a few pieces of trecento music as being definitely popular for scribes to copy. We often think that a work in many sources must by definition have been popular, or when we take into account the vast unwritten tradition at least popular to copy. But just as a random series of coin flips will occasionally have a long string of heads without having any meaning behind it, so too can a piece of music appear in many different manuscripts purely by the vagaries of preservation.

What we might like to know is how likely it is that a piece which is copied in, say six sources, appears so often out of chance rather than because it was specifically popular. For example, *Tosto che l'alba* and *Usellet(t)o selvag(g)io* are cacce found in five and six sources respectively. No other cacce are found in more than four sources. We might therefore conclude that these were popular cacce. Yet if all cacce were once copied equally, given the

⁹⁶ Fallows, “Ciconia’s Influence,” paper presented at the Jena Conference, *Kontinuität und Transformation der italienischen Vokalmusik zwischen Due- und Quattrocento*, July 1–3, 2005.

surviving manuscript situation, we might still expect to see a *cacce* appearing in five sources. Thus we cannot say without other testimonies that *Tosto che l'alba* was a popular song for its time, only that it is *fairly likely* that it was popular. However, there is only a 2% chance that any *caccia* at all would appear randomly in six sources, so it is more likely that *Usellet(t)o selvag(g)io* was popular. Further, we cannot say anything definitive about the popularity of the two *cacce* which appear in four sources, *Così pensoso* and *Nell'acqua chiara*, since a random distribution of surviving sources would predict a couple of pieces appearing in four manuscripts. We simply have too few *caccia* sources. To put it another way, the number of sources in which a work appears is significant only in relation to the total number of sources available in which it could have appeared.⁹⁷

⁹⁷ That it is difficult to say for sure which pieces were definitely popular does not excuse the injustices done by the lack of performances of many works which survive in four, five, or more sources. David Fallows in 1975 drew attention to a neglect of Bartolino da Padova on disc (since somewhat ameliorated). He admonished that if we use the number of surviving sources as “any yardstick of respect in the 14th century, Bartolino is especially important, for three of the ten most widely distributed trecento pieces are by him.” (“Performing Early Music on Record—1: A Retrospective and Prospective Survey of the Music of the Italian Trecento,” *Early Music* 3.3 (July 1975), pp. 252–53 with evidence in a note on p. 260.) One may have to amend Fallows’s statement based on an argument he reports twenty-eight years later that one of these three works, “Imperial sedendo” is not by Bartolino. The argument by his student, Leah Stuttard, is that there is a conflicting attribution between **Squarcialupi** and **Mod A**—where it is attributed to the otherwise unknown Dactalus de Padua—and its style does not accord with Bartolino’s (Fallows, “Ciconia’s last songs,” p. 120). As Fallows points out, it is nearly impossible that Dactalus is a miscopying of Bartolinus. Indeed, the added suffix, “fecit” (to my knowledge never again used in this manuscript), could be read as a reaffirmation of authorship, “Yes, Dactalus, and not someone else, composed this,” (**Mod A**, f. 30r):



It also seems more likely that a work by an unknown composer would be misattributed to a well-known, than vice-versa.

Let us take the liturgical Latin works as a second example. Table 1.18 gives for the sacred Latin works the actual number of pieces copied in six, five four, etc. manuscripts, and gives a comparison to the number predicted if all pieces were equally popular.

TABLE 1.18: COUNT OF LITURGICAL PIECES COMPARED TO THE PREDICTED NUMBER

<i># of MSS in</i>	<i>Actual # of pieces</i>	<i>Predicted # of pieces</i>	(Titles of actual pieces; Z = Zachara)
Seven	2	.00	(Z. Credos <i>PMFC 13: 21 & 23</i>)
Six	1	.03	(Z. <i>Gloria: Laus, Honor;</i>)
Five	3	.24	(Z. <i>Gloria "Micinella"; Ciconia, Gloria: Suscipe Trinitas; Egardus, Gloria PMFC 12: 7</i>)
Four	1	1.6	
Three	5	8	
Two	15	30	
One	85	71	

The predicted number of pieces differs from the number of pieces we actually possess in two significant respects. First, there are slightly more *unica* relative to the number of pieces with concordances than we would suppose if all pieces were equally popular. This higher percentage is to be expected in cases where some pieces are more popular than others, since (if we hold the total number of copies of pieces constant) each concordance of a popular piece is one fewer concordance of a less popular work. Reducing the number of concordances of less popular works also pushes more works into the “zero-copy” range, that is, the lost works. Thus we can see that our estimate of the total number of lost works should be slightly higher than the model worked out on a supposition of equal popularity.

The second significant difference is that we have more pieces with many copies (five or six for the liturgical works) than would be predicted. Only two out of every hundred simulations predicted that there should be even a single piece with six sources, instead we have three such pieces. These pieces that greatly exceed an equal probability model can be identified as the most likely popular pieces (at least for scribes to copy) among works of the trecento and early quattrocento.

We can run the same analysis for the other genres of trecento music. Table 1.19 lists the five works which we can say were possibly or probably popular at their time and the ten pieces which were popular almost without doubt.

TABLE 1.19: [POSSIBLY-]POPULAR WORKS

Liturgical: Undeniably Popular, *Seven sources: 1 in 400 probability (0.28%)*
(i.e., that the number of copies of any of these is due to chance)

Credo, *PMFC 13.21* (Zachara) Bologna Q 15, Boverio, Grottaferrata/Dartmouth, Pad D, Mod A,
Valladolid 7, Warsaw 378,

Credo, *PMFC 13.23* (Zachara) Boverio, Cividale 98, Grottaferrata/Dartmouth, Kras., Siena 207,
Trent 1563, Warsaw 378

Liturgical: Popular, *Six sources: 3% probability that the perceived popularity is only due to chance*

Gloria: Laus, Honor (Zachara) Bologna Q 15, Munich Emmeram, Old Hall, Pad D, Siena 207, Warsaw 378

Liturgical: Possibly popular, *Five sources: 22% probability*

Gloria “Micinella” (Zachara) Atri 17, Bologna Q 1, Bologna Q 15, Bologna 2216,
Grottaferrata/Dartmouth

Gloria: Suscipe, Trinitas (Ciconia) Grottaferrata s.s., Grottaferrata/Dartmouth, Oxford 56, Pad D, Warsaw 378

Gloria, PMFC 12.7 (Egardus) Grottaferrata/Dartmouth, Mod A, Pad D, Udine 22,⁹⁸ Kras.

Caccia: Popular, *Six sources: 2% probability*

Usellet(t)o selvaggio (Jacopo da Bologna)

Caccia: Possibly popular, *Five sources: 23% probability*

Tosto che alba (Gherardello)

Madrigal: Popular, *Eight sources: 0.4% probability*

La douce çere (Bartolino da Padova)

Madrigals: Probably popular, *Seven sources: 6% probability*

La bella stella (Giovanni da Cascia)

O dolce appres’un bel pelaro (Jacopo)

O cieco mondo (Jacopo)

Ballata: Undeniably popular, *Eight sources: 1 in 500 probability (0.2%)*

Donna s’i’t’ò fallito (Francesco da Firenze)

Ballate: Popular, *Seven sources: 3% probability*

Con langreme bagnandome (Johannes Ciconia)

Gentil aspetto (Francesco)

Non avrà mai pietà (Francesco)

S’i’ti so(n) stato (Francesco)

Francesco’s *Donna s’i’t’ò fallito* stands out on Table 1.19 for appearing in so many sources (eight, not counting a lauda contrafact and a citation by Prodenzani) that it is nearly

⁹⁸ See Chapter 2 for more information on the **Udine 22** version of this Gloria.

impossible to believe that it was not a popular work for scribes to copy *ca.* 1400.⁹⁹ That all three of the popular ballate are by Francesco should not be too surprising—his popularity has never been seriously challenged in the literature.¹⁰⁰ Between the madrigals and the cacce a wider variety of composers are represented, but still without any surprises. Intriguingly, the only sacred works which we can definitely say were popular are all compositions by Antonio Zachara da Teramo, a composer whose popularity in our own time continues to increase as we become more and more fascinated with his bizarrely compelling output.¹⁰¹

⁹⁹ There are two released recordings of the work, Thomas Binkley and the Studio der frühen Musik's 1972 edition and Mary Springfels's Newberry Consort recording of 1990. Tiziana Morsanuto, "Discografia di Francesco Landini," in Defino and Rosa-Barezzani, *Col dolce suon* (q.v.), pp. 564 and 581.

¹⁰⁰ However, the reasons which have justified Francesco's popularity can be scrutinized. Leo Schrade begins his edition of Francesco's works by describing him as "long recognized as Italy's greatest composer of the fourteenth century." Schrade continues by saying, "Perhaps as a result of such a recognition, the music of Landini has been more comprehensively preserved than the music of any other Italian musician." (Schrade, *PMFC* 4, p. i). It is dangerous to suppose that those music manuscripts which were preserved survive because of the greatness of music collected and not because of the vagaries of time. Our notions of presumed quality and importance in the fourteenth century are already shaped so strongly by what happens to survive. To crown the surviving manuscripts by hinting that they are the products of quasi-Darwinian natural selection over the centuries elevates this bias even further.

¹⁰¹ Unfortunately, only one of these popular Zachara works (*Credo* 23) has been recorded, and that on a nigh impossible-to-find mono-CD released by Quadrivium in 1992 (SCA 027). Fortunately, the Ensemble Micrologus has made Zachara's sacred works part of their repertory, so one might hope for more recordings in the future.

FIGURE 1.20: FRANCESCO AND ZACHARA FROM SQUARCIALUPI



It is natural to want to ask why these works, particularly Zachara's, were popular; in doing so we move into a more speculative realm. It may be Zachara had a connection, particularly at the beginning of his works, with more simple polyphony, which had a wide distribution throughout Italy. Evidence of the influence of homophonic mensural polyphony is found in Zachara's *Gloria*, "*Micinella*" (mentioned as possibly popular, above), as well as in an unattributed *Gloria* found in **Warsaw 378** in a similar style to Zachara's. The openings are similar to the mostly-homophonic mensural Mass movements (or rhythmicized *cantus planus binatim*) which flourished during the late trecento and early quattrocento. An example of which is seen in a Credo ("Regis") setting from **Vatican 657**:

FIGURE 1.22: DETAIL OF CREDO FROM VATICAN 657, FF. 419V–20R.¹⁰²

This movement is perfectly homophonic for the first two lines of music and nearly perfect following. The phrases have a tendency to use longer note values at the beginning and ends, and semibreves and minims in the middle and before cadences.¹⁰³ Some pieces of homophonic polyphony, such as the first Credo of *Parma 9* (ff. A–D. *Cardinalis*) even accelerate from their opening longs, through breves, to semibreves, and finally minims before allowing the notes to occur in other orders.¹⁰⁴

The *Gloria “Micinella”* of Zachara also begins homophonically and may recall the same tradition. The opening is in two voices, almost a trademark of Zachara’s *Glorias*. Two places which are not homophonic set $\blacklozenge\blacklozenge$ (♪♪) in the top voice against \blacklozenge (♪) in the lower voice. This substitution is common in homophonic mensural polyphony (see the *Nachtrag* to *Wolkenstein A*, on f. 18r for one example):

¹⁰² I have touched-up part of this facsimile to remove some show through. (Throughout this dissertation, all altered images are noted.)

¹⁰³ This connects slightly to the trecento style of having long melismas on the penultimate syllable of a phrase, but unlike the secular styles, such as ballate or especially madrigals, the shorter note values in the sacred works begin several syllables before the cadence.

¹⁰⁴ Transcription in Fischer and Gallo, *PMFC 13*, pp. 163–65.

EXAMPLE 1.23: ZACHARA, GLORIA “MICINELLA” FROM PMFC 13. OPENING

Antonius 'Zacharias' de Teramo
I-Bc 15 (I-Bu 2216)

Glo - ri - a in ex - cel - sis De - o.

Et in Et in ter - ra

(Not in I-Bu)

Et in Et in ter - ra

5 10 #

pax ho - mi - ni - bus bo - nae vo - lun - ta - tis.

pax ho - mi - ni - bus bo - nae vo - lun - ta - tis.

15

C1 Lau - da - mus te.

C2 Lau - da - mus te.

C3 Contratenor
Laudamus te.

T Tenor
Laudamus te.

It might be noted that the only pieces where rhythmicized binatim is recalled before moving to more complex polyphony are Glorias. No known Credo begins like this. This might be an indication that the two repertories existed alongside each other and (moving further into speculative territory) that Zachara, known for his musical trickery, might have wished to deceive his listeners as long as possible about what type of piece they are about to hear. Since the Gloria was the first Mass movement which seems to have been set polyphonically with frequency in fourteenth and early fifteenth-century Italy—polyphonic Kyries were still rare at this time—it would be the most likely candidate for such deceptively-homophonic treatment. In one of the definitely popular Credos (*PMFC 13.21*), Zachara

does prolong the plainchant beyond its traditional ending at “Credo in unum deum” by setting also “Patrem omnipotentem” to the monophonic (but rhythmic) formula of Credo I. This formula was gaining in popularity at the end of the century—it is also used for Zachara’s Credo “du village,” the first of many settings by later composers—and Zachara could have been counting on the listeners to recognize this (and perhaps recognize an old warhorse) before jolting them with something original and at a much increased rhythmic pace. Significantly, the otherwise rhythmically active version in **Mod A** includes no decorations in the opening, as if they are being held in reserve for after the suspense has been lifted:¹⁰⁵

EXAMPLE 1.24: ZACHARA Credo (PMFC 13.21), INCIPIT

Cre - do in u - num De - um, Antonius 'Zacharias' de Teramo

I-Bc 15, I-MOe 5.24

C MOe Patrem Pa - trem o - mni - po - ten - tem,

C Bc Patrem Pa - trem o - mni - po - ten - tem,

C MOe fa - cto - rem cae - li et ter - rae, vi - si -

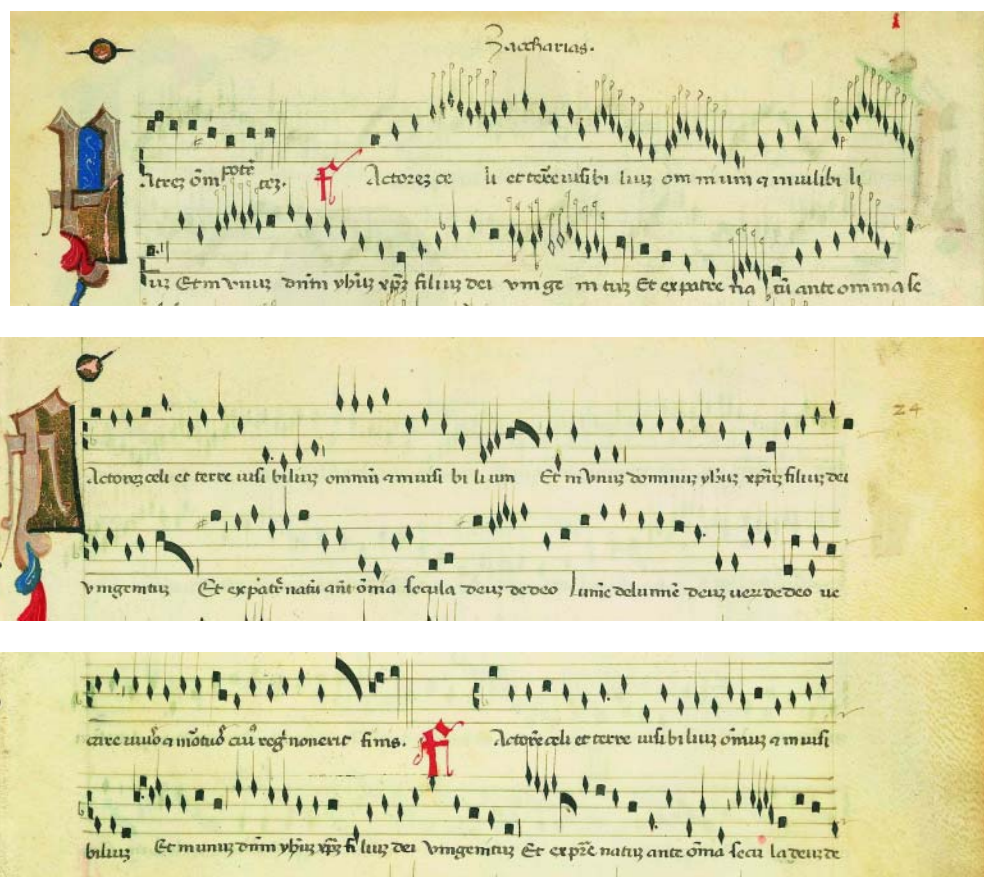
C Bc fa - cto - rem cae - li et ter - rae, vi - si -

Ct Bc (MOe) Factorem fa - cto - rem cae - li et ter - rae, vi - si -

T Bc (MOe) Factorem fa - cto - rem cae - li et ter - rae, vi - si -

¹⁰⁵ See my discussion of the significance of these two versions in “No new fragments.”

FIGURE 1.25: ZACHARA Credo from MOD A, ff. 23v–24r (DETAILS)



I want to end by stressing both the need for and the promise of greater refinements to this system. Our models currently do not exploit the many different sizes of manuscripts at our disposal, nor do they take a particularly nuanced approach to deviations from the predicted random distributions. Such refinements afford us an opportunity to give back to the world of statistical analysis since there are few statistical models dealing with multiple captures where the captures happen with no particular order. The models presented here could also be employed in any number of other areas of research in the humanities. In musicology, estimates of the total number of chants sung in a region or the number of folk songs recalled by a group of people could be useful in many studies. We could figure out the probability that a Renaissance motet which is unattributed in many sources was unattributed as a result of chance in order to investigate theories of scribal confusion about the composer. Beyond

musicology, the methods could be refined and reapplied to answer questions about the number of sonnets of a given poet or the total vocabulary of a particular author.¹⁰⁶ Numismatists might be interested in how many different types of coin were in circulation in a given region at a certain time, or what certainties we might have about estimating the proportions of coins minted; codicologists could have a better understanding of the economics of papermaking if they possessed more accurate estimates of the total number of watermark types originally produced in a particular region and time. The use of population estimates in musicology and in the humanities is in its earliest infancy; as such, the number of uses for these models can only be guessed.

¹⁰⁶ This last problem was approached by two scholars of statistics, Bradley Efron and Ronald Thisted, in their article, "Estimating the number of unseen species: How many words did Shakespeare know?" *Biometrika* 63 (1976), pp. 435–447. Some of the more difficult math in their article which might hamper their methodology's usefulness for humanists can now be alleviated by using the speed of personal computers to solve exactly equations which previously needed to be estimated.

Appendix to Chapter 1: Some probability basics and derived models

Probability review

A probability is defined as a number between 0 and 1 (inclusive), and represents the likelihood of an event happening. For example, if we roll a fair six-sided die, the chance that we get a five is $1/6$. That is, there are six possible outcomes, of which one gives us the desired outcome. We can write that a is the event “roll 5” and $\Pr(a) = 1/6$.

The probability of something *not* happening is defined as one minus the probability of the event happening. So $\Pr(\text{roll something other than 5}) = \Pr(a \text{ does not occur}) = 1 - 1/6 = 5/6$.

If x and y are independent events, like dice rolls or people working on unrelated manuscripts, then the probability of x and y happening is $\Pr(x \text{ and } y) = \Pr(x) * \Pr(y)$.

In addition to knowing how likely it is that something will occur (probability) we also often want to know how many times an event will occur if we keep performing or observing a certain action. For instance, if we go back to the example of dice, you may want to know how many times you would *expect* to roll a five if you rolled a die ten times. We call this rational expectation the *expected value* (EV).

Fortunately, for independent events, such as dice rolls, where what you rolled previously does not affect what you are likely to roll next, all you need to do to calculate expected value is multiply the probability of your outcome by how many times you do it.

So on average the expected number of fives if you roll a die ten times is:

$$\text{EV} = \text{number of rolls} * \Pr(\text{roll a five}) = 10 * 1/6 = 10/6 \text{ or } 1.67$$

Of course, it is impossible to roll 1.67 fives. What it means is that, on average, one or two of the ten rolls would be a five.

Applications: Estimating the number of lost pieces in trecento manuscripts

Most of the expressions we derive will depend on n , which is the value we are ultimately trying to estimate. What we will do below is try to find a way to relate the abstract variable n to the number of pieces we would expect to see given that n . Then we will take the number of pieces we *do* see and solve the equations in reverse to find n .

Let $X = \{x_1, x_2, \dots, x_n\}$ be the set of pieces which we assume may have once existed. We want to estimate n , the original number of pieces. Any given piece x in X might be a work which exists today or one which is no longer extant. All pieces of both types are included in the set X .

Let $M = \{m_1, m_2, \dots, m_y\}$ be the set of manuscripts now available, where we define k_i to be the number of pieces in manuscript m_i . Unlike the set of pieces, this set M only comprises manuscripts or fragments we have now. The total number of surviving manuscripts is y .

The compiler of manuscript m_1 chooses k_1 different pieces to place in it. There are any number of reasons why the person writing the manuscript might choose a given piece to be in the manuscript—the audience of the manuscript, the pieces known to the scribe, forms to be represented, etc.—but among the pieces in a single sub-genre, it can be difficult for us to tell why certain pieces are chosen or not.

We will begin with a model that supposes that within each sub-genre the pieces chosen are as good as random to us; certainly we will check to see how good an assumption this is later. Given this supposition, the probability that any piece (call it x) appears in this manuscript m_1 depends just on the number of pieces in the manuscript and the total number of pieces in the sub-genre. In fact, it is equal to the proportion of all the pieces available which are in the manuscript. Thus, if we use the designation k_1 to represent the number of

pieces in manuscript m_1 , then the proportion of all pieces in manuscript m_1 is the ratio of the number of pieces in m_1 , that is, k_1 , to n , written mathematically as:¹⁰⁷

$$\Pr(\text{item } x, \text{ appears in } m_1) = \frac{k_1}{n}.$$

The probability that x does not appear in m_1 is:

$$\Pr(x_1 \text{ does not appear in } m_1) = 1 - \Pr(\text{item } x, \text{ appears in } m_1) = 1 - \frac{k_1}{n}$$

Or for a different manuscript, m_2 : $\Pr(x \text{ does not appear in } m_2) = 1 - \frac{k_2}{n}$. And so on

for any manuscript.

For two manuscripts which are compiled independently of each other (excluding for example the Machaut manuscripts, but not the principal trecento manuscripts), we can multiply probabilities to get the probability that a piece does not appear in either manuscript. For instance the probability that x_1 does not appear in m_1 and also x_1 does not appear in m_2 is the product of the two terms:

$$\Pr(x_1 \text{ does not appear in } m_1) * \Pr(x_1 \text{ does not appear in } m_2) = \left(1 - \frac{k_1}{n}\right) \left(1 - \frac{k_2}{n}\right)$$

which elementary algebra reduces to $\left(\frac{n-k_1}{n}\right) \left(\frac{n-k_2}{n}\right)$ or more simply $\frac{(n-k_1)(n-k_2)}{n^2}$.

We can then generalize this statement to find the probability of x not appearing in any extant manuscript:

$$\begin{aligned} \Pr(x_1 \text{ does not appear in any MS}) &= \left(1 - \frac{k_1}{n}\right) \left(1 - \frac{k_2}{n}\right) \dots \left(1 - \frac{k_y}{n}\right) = \left(\frac{n-k_1}{n}\right) \left(\frac{n-k_2}{n}\right) \dots \left(\frac{n-k_y}{n}\right) \\ &= \frac{(n-k_1)(n-k_2) \dots (n-k_y)}{n^y}. \end{aligned}$$

¹⁰⁷ A first attempt at a model which allows for unequal probability of including pieces would weigh each piece, as follows: $\Pr(\text{item } x \text{ with weight } w_1, \text{ appears in } m_1) = k_1 w_1 / n \sum_i w_i$

If we have a formula for the probability that any given (original) piece is not known to us, then we can use the principle of expected value (discussed above) to estimate how many pieces we would expect to be missing today, given the manuscripts we have and the number of pieces there once were in the trecento. (Note though that the probability of x not appearing in any MS, and the expected number of such pieces, each depends on n , the original number of pieces in the trecento—which is exactly what we are trying to find in the first place! This obstacle will be worked out soon).

The expected value of the number of pieces not appearing in any MS that survives today is simply the probability that any given piece does not appear in any manuscript multiplied by the total number of pieces, our unknown n :

$$\text{EV(missing pieces)} = n * \Pr(x \text{ does not appear in any ms}) = n * \frac{(n - k_1)(n - k_2) \cdots (n - k_y)}{n^y} \text{ or}$$

$$\frac{(n - k_1)(n - k_2) \cdots (n - k_y)}{n^{y-1}}$$

It looks like we have two unknowns here: the expected number of missing pieces (EV) and the total number of pieces (missing or known), n . But what is the expected number of missing pieces? It is simply the number of pieces that were written originally (n) minus the number we currently have (let us call that number r).¹⁰⁸

$$\text{EV(missing pieces)} = n - r$$

So we can substitute back into the previous equation:

$$n - r = \frac{(n - k_1)(n - k_2) \cdots (n - k_y)}{n^{y-1}}$$

¹⁰⁸ As can be seen in other chapters regarding the identification of concordances, discovering this number was not as easy as it might appear.

In this equation, r and k_1, k_2, \dots, k_y are all numbers we know, so n is our only variable. However, solving for n in this equation is still not easy when y is a number above three or four—since y is the number of manuscripts containing pieces in a particular genre, y will be on the order of ten to thirty.

Since the last equation is too complicated to solve directly, reducing it would have required tricky math decades ago. However, the solution can be closely estimated in seconds through computer-assisted “trial and error”. We rewrite the previous equation as:

$$n - r - \frac{(n - k_1)(n - k_2) \cdots (n - k_y)}{n^{y-1}} = 0$$

and then write a program to try various numbers of n (theoretically, from $r + 1$ to infinity, but from $r + 1$ to 2,000 is good enough) until it finds the n which comes closest to solving this equation. By closest, one means which comes closest to making the left side of the equation zero. (We are unlikely to find the exact solution since n can be a fraction rather than a whole number).

Writing such a program would not be difficult for most programmers. One such program, written in Perl, follows:

```
#!/usr/local/bin/perl

##### find_n.pl -- Michael Scott Cuthbert
### Find hypothetical total number of pieces given X1 pieces randomly
### distributed in manuscripts of size N1 N2 N3 N4...

###    ./find_n.pl X1 N1 N2 N3 N4 ...

use strict;
use Math::BigFloat;

my $pieces_surviving_today = shift @ARGV;
my @ms_sizes    = @ARGV;
my $total_number_of_mss = scalar @ms_sizes;

# n * (1/n^(num_of_mss)) * (n - a1) * (n - a2) * ... * (n-ay) = n -
pieces_surviving_today (r)

    ### n = our current guess for the number of original pieces; start by
    ###    supposing we have them all (plus 1 to avoid division by zero).
my $n = $pieces_surviving_today + 1;
```

```

    ### best_distance is a measure of how close we are to solving the
    ### equation.lower is closer to solving, so we initialize to a high
    ### number. 1 is a high number for these things.
my $best_distance = 1;

    ### best_n = our best guess for the original number of pieces
    ### we initialize to zero, meaning "no clue"
my $best_n = 0;

    ### left_side = we use a high precision number for the left side of
    ### the equation since we multiply a bunch of numbers
    ### together then divide them
my $left_side = Math::BigFloat->new('0');
my $binomial = Math::BigFloat->new('0');

my $highest_number_of_pieces_to_consider = 2000;

## start counting up to highest number of pieces to consider
## seeing how well the two sides of the equation match

while ($n <= $highest_number_of_pieces_to_consider) {
    my $right_side = $n - $pieces_surviving_today;

    $binomial = 1;
    foreach my $this_ms_size (@ms_sizes) {
        $binomial *= ($n - $this_ms_size);
    }
    $left_side = 1/($n**($total_number_of_mss - 1)) * $binomial;

    ##### Find our error distance
    my $this_distance = abs($right_side - $left_side);

    ##### Uncomment these lines to get debugging information
    ## print int($n) . " (best: " . sprintf("%3.3f", $best_distance * 100) .
    ## "% -> this:" . sprintf("%3.3f", $this_distance * 100) . "%)\n";

    ##### If this error distance is our best so far, remember what n was.

    if ($this_distance < $best_distance) {
        $best_distance = $this_distance;
        $best_n = $n;
    }

    ##### for small numbers of n, we try to find the best fractional value,
    ##### but we only print out whole numbers, since the number of
    ##### pieces must be a whole number
    if ($n < 200) { $n += .1 }
    else { $n++ }
}

if ($best_n == 0 or $best_n >= ($highest_number_of_pieces_to_consider-1)) {
    ### failure
    printf ("%3.5f: no best found between %d and
            $highest_number_of_pieces_to_consider\n",
            $best_distance, $pieces_surviving_today + 1);
} else {
    ### success -- round $best_n to the nearest whole number and print it.
    printf ("%4d\n", $best_n + 0.49);
}

```

Cross Validation (Holdout Method)

We can test the theoretical method given above in a number of different ways, the most commonly used being bootstrap, jackknife, and cross-validation methods. This appen-

dix describes the simplest form, a type of cross validation called the holdout method. To test this theory by holdout cross validating, one first finds a value for n on the basis of some arbitrary subset of the data. Then to cross validate, we use a similar model to find an expected number r_l for the number of pieces we would expect to have if we had new manuscripts m_{y+1} , m_{y+2} , etc. Our calculations are much easier than before, since we have an estimate for n . For a first approximation, the portion of the repertory that is missing $(n - r)/n$, when multiplied by the number of new pages in all the new manuscripts m_{y+1} , m_{y+2} , gives us the number of new pieces we should expect to find (which when added to r gives r_l).

This method gives only an approximate result, since the portion of the repertory that is missing changes with each new find. A more accurate test comes from computing a new expected value for the missing pieces using the new manuscripts. If j is the number of new manuscripts we've added then:

$$\text{EV}(\text{new \# missing pieces}) = n * \frac{(n - k_1)(n - k_2) \cdots (n - k_y)(n - k_{y+1})(n - k_{y+2}) \cdots (n - k_{y+j})}{n^{y+j}}$$

Since n is a constant, this equation can be evaluated simply. We then can subtract the new number of missing pieces from n to get our expected number of pieces we should have now, and can compare that number to the number of pieces actually observed.

Although this second, more complicated method has been used in the cross-validation examples in this dissertation, the first method's results are only slightly different.

Calculating the expected number of copies in a random distribution

One way of testing to see how well our first supposition, that of equal probability, holds up is to run a "Monte Carlo" simulation of work distribution. Simply put, we will put

on slips of paper in a hat the names of all known pieces in a given genre. We also will put a numbered slip of paper for every lost piece predicted by the previous model so there are as many slips of paper as there are predicted total pieces. Then for each surviving manuscript we will draw a number of slips of paper equal to the number of pieces in that genre in that manuscript. For instance, for **Boverio** which contains sixteen liturgical works, we will draw sixteen slips. It should be obvious that each piece is equally likely to be drawn, and that no piece can appear in the same manuscript twice. We record what pieces appeared and then replace the slips into the hat, shuffle, and repeat for each manuscript. (The “Monte Carlo” aspect of the simulation stems from the role that probability or luck plays in determining the outcome, as in a casino in Monte Carlo).

In the end we have a record of what pieces we drawn multiple times, which were drawn once, and which were never drawn, and can figure out the total number of pieces drawn six times, five, four, and so on down to zero times. If we wanted, we could then compare this equal-popularity simulation to our real-world situation to see how well what we have compares to the equal-popularity hypothesis.¹⁰⁹

A more accurate comparison would be obtained by performing this whole simulation multiple times and taking the average of the simulated draws. By taking the average we assure ourselves that we are seeing a typical distribution and not something exceptional (like hitting a jackpot).

¹⁰⁹ If we were to do so, we would certainly find that the total number of surviving pieces predicted by the equal-popularity hypothesis accords with the total number we actually have. But we must avoid being falsely impressed by the accuracy of this figure: recall that our estimate of the total number of pieces (surviving and lost) was first generated by an equal-popularity model. So we are in a sense just getting back from the model what we put into it.

A reasonable objection to performing this simulation even once is how time consuming it would be (draw, record, replace, reshuffle, repeat *ad nauseam*). Performing a few thousand simulations and taking the average is impossible by hand; so, as before, we simulate the draws with a computer program. An example of such a program appears below:

```
#!/usr/local/bin/perl

use strict;

#### multiple_distribute.pl
#### take a number of pieces and fill these manuscripts with them, then
#### calculate the number of pieces which appear zero times, once, twice,
#### etc. do this many times and report the average.

## usage:
## ./multiple_distribute.pl 10000 150 70 50 40 8 2 2 2 1 1

## where 10000 is the number of times to perform the random draw,
## 150 is the total number of pieces one originally started with
## and 70, 50, 40, 8, etc.. are the number of pieces of this genre in
## each manuscript.

my $number_of_runs = shift @ARGV;

## total unique pieces
my $total_unique = shift @ARGV;
my @ms_numbers = @ARGV;

my $total_unique_multiplied = $number_of_runs * $total_unique;
my @used_times;

my @some_piece_had_x_copies_this_run;

for (my $run = 0; $run < $number_of_runs; $run++) {
    my @used_all_ms = ();

    foreach my $this_ms_size (@ms_numbers) {
        my @used_this_ms = ();
        for (my $i = 0; $i < $this_ms_size; $i++) {
            my $selected_piece;

            do {
                $selected_piece = int(rand($total_unique));
            } while ($used_this_ms[$selected_piece]);
            ## dont allow piece to appear more than once per ms.

            $used_this_ms[$selected_piece]++;
            $used_all_ms[$selected_piece]++;
        }
    }

    my @need_high;
    for (my $i = 0; $i < $total_unique; $i++) {
        $used_times[$used_all_ms[$i]]++;
    }

    ### did any piece appear in X copies this run?
    COPIES: for (my $j = (scalar @used_times)-1; $j >=0; $j--) {
        for (my $i = 0; $i < $total_unique; $i++) {
            if ($used_all_ms[$i] == $j) {
                $some_piece_had_x_copies_this_run[$j]++;
                next COPIES;
            }
        }
    }
}
```

```

    }
  }
}

my $tot_so_far = 0;
for (my $i = (scalar @used_times)-1; $i >=0; $i--) {
  $tot_so_far += $used_times[$i];
  printf("%i => %8.02f  (%6.02f%%) ( %8.02f => %6.2f%%) [%6d]\n",
        $used_times[$i]/$number_of_runs,
        ($used_times[$i]*100/$total_unique_multiplied),
        $tot_so_far/$number_of_runs, ($tot_so_far*100/$total_unique_multiplied),
        $some_piece_had_x_copies_this_run[$i]);
}

```

Here is the example of the output from the program which ran the simulation 10,000 times on the liturgical pieces.

```

./multiple_distribute.pl 10000 196 16 10 10 8 7 6 6 6 5 5 4 4 4 4 4 3 2 2 2 2 1 1
1 1 1 1 1 1 1 1 1 1 18 9 5 2 4 2 1 1 1 1 3 2 1

8 => 0.00 ( 0.00%) ( 0.00 => 0.00%) [ 1]
7 => 0.00 ( 0.00%) ( 0.00 => 0.00%) [ 27]
6 => 0.03 ( 0.02%) ( 0.03 => 0.02%) [ 298]
5 => 0.26 ( 0.13%) ( 0.29 => 0.15%) [ 2296]
4 => 1.75 ( 0.89%) ( 2.05 => 1.05%) [ 8436]
3 => 8.88 ( 4.53%) ( 10.93 => 5.58%) [ 10000]
2 => 31.84 ( 16.24%) ( 42.77 => 21.82%) [ 10000]
1 => 73.16 ( 37.33%) ( 115.92 => 59.15%) [ 10000]
0 => 80.08 ( 40.85%) ( 196.00 => 100.00%) [ 10000]

```

The number on the far left (7, 6, 5, etc.) is the number of copies of a piece. The next column is, on average, how many pieces with that many copies appeared. So on an average run, there were 32(*ish*) pieces with two copies, 73 with 1 etc. The next column shows the percentage of works this row represents. The next two columns (e.g., 42.77 => 21.82%) gives a running total of the previous columns for all the rows so far. In this case, on average, the simulation predicts 21% of all works (lost and known) will exist in two or more copies. The final column shows how many times the simulation produced a work in that number of copies. So, looking at the second row, 298 times out of 10,000, a piece appeared in six sources. We can interpret this number to mean that if we have a piece in six sources, there is a 3.0% chance that random survival explains the number of sources. Since 3.0% is a low probability, we are thus inclined to take popularity as a better explanation for the results.