Directory of Computer Assisted Research in Musicology

1988

Edited by

Walter B. Hewlett

Eleanor Selfridge-Field

Center for Computer Assisted Research in the Humanities

Menlo Park, CA

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Preface

The *Directory of Computer Assisted Research in Musicology* makes information about current computer activities available to an academic audience. Through the publication of the *Directory* the Center hopes to provide preliminary information about work that will eventually be reported more completely in longer publications, to offer a non-partisan forum for the inspection of technical achievements of potential value to humanities scholarship, and to provide an overview of an interdisciplinary field that is experiencing rapid growth.

In the *1988 Directory* we have turned our attention to computerized bibliographical resources. The article on the *Répertoire International des Sources Musicales* by Joachim Schlichte and John Howard is the first easily available comprehensive description of the music manuscript project known as RISM Series A/II. Ensuing descriptions of the music-related work of the Research Libraries Group and the Online Computer Library Center based in the United States and the BLAISELINE service in the United Kingdom, compiled from reports by Kären Nagy, David Fenske, and May Katzen, provide the balance of material in this section.

The News section and the Log of Current Activities and Applications are cast in the same format as in previous directories. The section on music printing by computer, which includes 54 illustrations of current work from four continents, continues a practice started in 1986, when the lead article was an overview of approaches to this task. The Center's annual call for contributions by active professionals of selected passages of music is, as best we are aware, a unique one in the volume and breadth of the systems represented and in the opportunity it offers to prospective users for comparing results from a large number of systems. In the hope that contributors will be encouraged to contact one another, we offer an address list of all those whose names appear in the *Directory* at the rear of the book. Anyone engaged in an activity that seems to be compatible with the work reported here is invited to submit information for future inclusion. A formal solicitation for news is sent to everyone on the Center's mailing list a few months prior to the publication of a new directory.

We would like to express our sincere thanks to all of the contributors named above, to the software developers who have contributed their work, and to the many scholars from around the world who have provided reports of their work. As in past years, we are indebted to Lelio Camilleri for his tireless efforts to keeping channels of communication with the European community open, exemplified in this directory by his report on the Lancaster conference held in April. We would like to thank Mario Baroni and our many other Italian colleagues for their assistance and collaboration during the past year. Alan Marsden and John J. Hughes have provided special help on several occasions. We wish to acknowledge with special gratitude the efforts of Frances Bennion, Edmund Correia, and Steven Rasmussen in connection with the tasks of distribution, layout, and translation for this year's *Directory*. All three, plus Esther Hewlett, have provided invaluable proof-reading assistance.

Menlo Park, CA
July 15, 1988

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Major Bibliographical Databases

Cooperative bibliographical projects organized on national and international lines have produced enormously large compilations of material. Much of this data is now stored in machine readable form. As computers become more widely available and computer software becomes more sophisticated, these large bibliographic databanks can be expected to play an increasingly important role in musicological research.

This year's *Directory* presents reports on four of the major bibliographic projects currently in progress. Of this group, one is concerned entirely with the cataloguing of primary sources (music prints and manuscripts) and three are concerned principally with cataloguing secondary source material (books, scores, recordings). Besides their differences in focus, there are also important differences in design: the RISM A/II project is intended to serve as a stellar databank from which satellite bibliographies on specific topics can be culled, while RLIN, OCLC and BLAISELINE are chiefly intended for online consultation.

The Répertoire International des Sources Musicales (**RISM**) is an international music cataloguing effort, the origins of which date back to the 1950's. While RISM's many published catalogues of printed music (Series A/I) and categorically arranged source material (Series B) are familiar to most music scholars, its long-standing effort to catalogue all seventeenth- and eighteenth-century music manuscripts is one that has until recently been of low visibility. RISM director Joachim Schlichte and US RISM Coordinator John Howard explain what RISM A/II is all about and where its work currently stands in the lead article of this *Directory*.

While RISM is concerned exclusively with musical material, national bibliographical networks support general reference activities. The Research Libraries Information Network (**RLIN**) and the Online Computer Library Center, Inc. (**OCLC**) serve complementary groups of libraries in the United States and overseas. Both are cooperative schemes originally designed to support cataloguing, interactive searching, and interlibrary lending of materials. Reports compiled by Kären Nagy, Music Librarian at Stanford University, and David Fenske, Music Librarian at Indiana University, on RLIN and OCLC respectively have been supplemented with information provided by John J. Hughes, Jeanette Drone, and Mark Crook. The material on the British Library's BLAISELINE service for music bibliography was compiled by May Katzen for the *Humanities Communication Newsletter* No. 10 (1988).

Bibliographical Retrieval Services

Certain kinds of bibliographical material can be searched by users subscribing to commercial retrieval services. Such services offer access to many unrelated bibliographical databases. Most services currently operating are designed for business and institutional use. We have made no effort to list all of these, since many provide little of relevance.

Individual access is becoming increasingly available, although in some cases the range of information available is limited to high-demand items. The associated costs are scaled

differently from service to service, and estimates are difficult to make without some experience in using the system. Some of the same bibliographies that are available online are also being provided on CD-ROMs, which in turn are sold primarily to institutions. One example is the *International Bibliography* (200,000 entries) of the Modern Language Association, which is provided by the H. W. Wilson Co. in either format and in both cases on a subscription basis.

Two of the major commercial services available in the US are BRS (Bibliographical Retrieval Services) and DIALOG. Both are designed for general reference, but both provide access to bibliographies of special interest in the field of music.

BRS

Among the materials available for searching on BRS are these:

* *The Arts and Humanities Citation Index*
  (listing the contents of 1300 periodicals from 1980 onward)

* *Dissertation Abstracts*
  (abstracts of all US dissertations from 1980 onward;
  citations for dissertations accepted from 1861 to 1980)

* *Books in Print*
  (all titles from US publishers; revised at frequent intervals)

* *OCLC Easi Reference*
  (books, records, and scores catalogued within the past three years)

BRS has a special service for individual users called BRS After Dark. Recent rates for connect time to BRS After Dark were $3.30 for 15 minutes and $101.40 for two hours. It also has a monthly minimum of $12.00. For further information about BRS, contact:

BRS Information Technologies
555 East Lancaster Avenue, 4th Floor
St. Davids, PA 19087
(800) 468-0908

DIALOG

DIALOG Information Retrieval Service provides access to such bibliographical resources as:

* *Dissertation Abstracts*

* *MARC* (Library of Congress accessions since 1968)

* *REMARC* (Library of Congress Accessions prior to 1968)

DIALOG also provides access to **RILM** (Répertoire International de Literature Musicale) abstracts in print and in press (1967-1982). Recent costs for connect time to DIALOG were $18.75 for 15 minutes and $150.00 for two hours. For further information about DIALOG, please contact:

DIALOG Information Services, Inc.
3460 Hillview Avenue
Palo Alto, CA 94304
(800) 334-2564

The *Directory of Online Databases* provides comprehensive information about many other services. It is published by Cuadra/Elsevier, 52 Vanderbilt Avenue, New York, NY 10017; (212) 370-5520. Two copies a year are issued.

Bibliographical Database Applications to Scholarship

While bibliographical databases can be differentiated from both structured and fulltext databases in a number of ways, some of the text search strategies developed in one quarter can be readily effective in another. Simple searches for exact matches of single words, while adequate in a word-processing environment, are often inadequate for the needs of academic research.

Some refinements of text searching for single word matches include the following:

1. **truncation** (to allow for multiple prefixes or suffixes)
2. **wild-card searches** (to allow for variable spellings)
3. use of **authority records**

In the first case, a title search for "De" would locate works containing such words as "Deus" and "Dei". The first and second kinds could be combined in a place-of-publication search for "T*rin", which should yield both "Turin" and "Torino". Authority records list all the different spellings with which the same name may appear. The Library of Congress acknowledges 40 different transliterations for "Tchaikowsky". Ockeghem's name is encountered in more than 50 spellings.

The validity of some word-search results can only be established by contextual information. Some search refinements designed to serve this end are these:

4. **Boolean searches** (specification of "AND", "OR", and "NOT" relationships in order to limit or expand the field of potential matches)
5. **specified range searches** (to determine whether one word occurs in close proximity to another and/or with one probable meaning)
6. **embedded letter searches**

In an embedded letter search, word boundaries and irrelevant letters will be ignored in seeking a sequential match. Thus "valor" would be matched not only with "valour" but also with "ha*l*v*e* *a*ll *o*u*r*". Such searching is useful in dealing with obsolescent and dialectal

spellings and in certain aspects of the analysis of poetry, since it is capable of retrieving related sounds quite effectively.

The techniques of bibliographical retrieval will not meet all needs. A case in point is encountered in the work of John Hill reported in the "text analysis" category of the **Applications** section of this *Directory*. In a study of the texts of almost 4000 arias used in works by Vivaldi, Hill has determined that neither first-line matches nor scansion-pattern matches are as effective in identifying musical parodies as are the percentages of matching word sequences within full texts. The question of which technique suits what kinds of research best will inevitably vary with the repertory, the provenance, and the period of time involved.

For the present moment, the rapidity with which information can be retrieved and the quantities of information to which access is readily available are of fundamental importance. In reviewing the material in the following pages, readers might wish to keep in mind these general points:

1. Cataloguing information incorporates a great deal of the factual information (names, places, dates) on which scholarship depends.

2. Some techniques for organizing information in ways that facilitate computer searching could be used to advantage by individual users designing their own databases.

3. Online systems serving large numbers of academic institutions potentially offer a vehicle for the dissemination of machine-readable data assembled by individual scholars.

4. Clear knowledge of the purposes, scope, and limitations of existing efforts can enable scholars to make greater use of available resources and to design projects that complement them.

Librarians' journals including *Fontes Artis Musicae* and *Notes: The Journal of the American Music Library Association* have carried any number of reports and articles on the major bibliographical databases. Readers seeking more detailed information about text searching strategies may wish to consult the recently launched journal called *Literary and Linguistic Computing* (published quarterly by Oxford University Press).

Répertoire International des Sources Musicales (RISM)

John Howard and Joachim Schlichte

RISM Project Background

The Répertoire International des Sources Musicales represents an international cooperative effort to compile a census of musical source materials and identify their locations.[1] It was first proposed in 1949 by Hans Albrecht at the Congress of the International Musicological Society (IMS) at Basle and was formally instituted in 1951 as a joint project of the IMS and the International Association of Music Libraries (IAML). The original goal of RISM was to revise the two major bibliographic finding tools for musical works then in existence–Robert Eitner's *Biographisch-Bibliographisches Quellen-Lexikon der Musik und Musikgelehrten* (Leipzig, 1898-1904; rpt., rev., Graz, 1959-60) and his *Bibliographie der Musik-Sammelwerke des XVI. und XVII. Jahrhunderts* (Berlin, 1877; rpt. Hildesheim, 1963)–both of which were incomplete, plagued by inaccuracies, and ultimately rendered nearly useless by the destruction and displacement of library collections during the two world wars.

It was decided at an early stage of the planning, however, to expand the scope of the project, so that by 1958 Friedrich Blume could describe its general plan as follows:

> The RISM is intended to provide a catalogue of all available bibliographical music works, writings about music and textbooks on music from all countries of the world, including monodic music, liturgical sources, song books, treatises and methods, books and periodicals on music, from the earliest times to the year 1800.[2]

RISM is divided into two major series. The first, Series A, is devoted to musical works that appeared under the names of individual composers, and is subdivided into catalogues of works preserved in printed sources (Series A/I) and those preserved in manuscripts (Series A/II). The second, Series B, consists of catalogues of sources that lend themselves better to systematic (categorical) treatment, such as printed anthologies of music, theoretical writings, manuscript sources of tropes and sequences, Hebrew sources of music, etc.

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[1] For a general overview of the history of RISM see Friedrich Blume's "Foreword" to *Recueils imprimés, XVIe-XVIIe siècles: Liste chronologique*, ed. François Lesure, RISM B/I/1 (München-Duisberg, 1960), 23-28; *idem.*, "Zwanzig Jahre RISM," *Acta musicologica*, XLIV (1972), 171-180; and Rita Benton, "Répertoire International des Sources Musicales," *The New Grove Dictionary*, XVIII (London, 1980), 747-49.

[2] Blume, "Foreword," p. 27.

RISM Series A/II: Music Manuscripts 1600-1800

Of the various projects undertaken by RISM the most ambitious by far is Series A/II, an inventory by composer of musical works preserved in manuscripts written between ca. 1600 and 1800.[3] The series is distinguished from other RISM bibliographies by the size of the repertory to be inventoried--it is estimated that over 1.5 million works will eventually be catalogued--and its format: it has been conceived as an electronic database maintained by the RISM Central Editorial Office (Zentralredaktion) at Frankfurt, West Germany.

The major consideration in the decision to automate the project has been size: publication in book form of a catalogue of more than two million works would be prohibitively expensive, and could only be achieved after the several decades the project is expected to require.[4] By electing to treat the inventory as a database, each bibliographic record becomes available as soon as it is entered.

But other factors also argue in favor of the database format. Among these is the very nature of manuscript as a *type* of document. Unlike a print, every manuscript is a unique document, even when it is only one of several copies of the same piece. Moreover, manuscripts often present a complex and unpredictable myriad of bibliographic detail of potential significance in assessing their relative authority. This detail concerns physical attributes of the document (size, format, watermark information), information relevant to it origins (copyist names, former owners, provenance) and internal information regarding the music it transmits (instrumentation, key or mode, sectional organization, etc.). In evaluating a manuscript source, then, it is necessary to have access to an extremely broad range of data. And a database system can not only provide this data in the bibliographic records themselves, it can also provide access to these data *by* particular bibliographic or musical values, thereby opening a new set of possibilities for source-related research.[5]

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[3] Specific criteria for inclusion of manuscripts in Series A/II concern composers' date of birth and death, not simply the date of a source, and can be summarized as follows: works by composers born after 1570 and before 1770, and who died after 1610 and before 1810 will be inventoried; this includes manuscripts written before 1600 and up to the mid-nineteenth century. RISM Series A/II will not include manuscripts notated in tablature or monophonic works such as chorales, hymns, song tunes, etc. (such manuscripts would be inventoried in Series B).

[4] See Helmut Rösing, "Sinn und Nutzen des Versuchs einer weltweiten Erfassung von Quellen zur Musik," in *Quellenforschung in der Musikwissenschaft*, ed. Georg Feder, Wolfenbüttler Forschungen, 15 (Wolfenbüttel, 1982), 66; Norbert Böker-Heil, "Computer-Einsatz bei der Serie A/II RISM: Möglichkeiten, Bedingungen, Vorschläge," *Fontes artis musicae*, XXII (1975), 86-89; Kurt Dorfmüller, "The Changing Face of RISM," *Fontes artis musicae*, XXV (1978), 285-89; and Helmut Rösing, "RISM-Handschriftenkatalogisierung und elektronische Datenverarbeitung (EDV)," *Fontes artis musicae*, XXVI (1979), 107-09.

Bibliographic Standards and Data Format

Because of the variegated nature of music manuscripts and the special demands of music manuscript bibliography, RISM has adopted a rigorous cataloguing standard, based on the *Code international de catalogage de musique*,[6] and has developed a data format and database record structure that provide optimal searching, sorting, and analytic manipulations of data. The various bibliographic categories covered by the standard and the corresponding data elements have been arranged in the form of a "Checklist." Example 1 reproduces the Checklist, and also indicates which data elements are indexed.[7]

Project Methodology and Status

RISM Series A/II is being compiled through contributions organized and directed through each participating country's RISM coordinating group. Bibliographic data is compiled with reference to the RISM Checklist, then submitted to the Central Editorial Office for processing. The working methods of the various national groups varies: some prepare handwritten or typescript bibliographic descriptions, while others, including France, Great Britain, Italy, and the United States, are exploring the possibility of submitting data in electronic format while maintaining individual national databases.

Once received by the Central Editorial Office, however, all data is subject to a systematic editorial process that makes full use of electronic resources to guarantee a high level of data validity and consistency. The process involves the following steps:

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[5] See Helmut Rösing, "Zur Katalogisierung von Musikdrucken und Musikhandschriften der Serie A: Konzept und Realisation der Series A/II des Internationalen Quellenlexikon der Musik," *Acta musicologica*, LI (1979), 184.

[6] See volume II of the *code*, *Rules for Full Cataloguing*, ed. V. Cunningham (Frankfurt, 1971), and vol. IV, *Rules for Cataloguing Music Manuscripts*, ed. M.L. Göllner (Frankfurt, 1975).

[7] Concerning the design rationale of the RISM Series A/II database see Helmut Rösing, "Zur Katalogisierung von Musikdrucken und Musikhandschriften der Serie A: Konzept und Realisation der Serie A/II des Internationales Quellenlexikon der Musik," *Acta musicologica*, LI (1979), 184.

- Preparation of data for input (standardization of names, identification of compositions, enhancement of records through additional research, encoding of musical data, etc.)
- Data entry
- Data verification (data-entry program verifies characteristics of various data elements, e.g., string length, valid or invalid characters, etc.; a post-processor verifies forms of personal names against the RISM authority file (a separately maintained, linked database), verifies thematic catalogue abbreviations, etc., and verifies the syntax of encoded music incipits)
- Database processing (processing of the record structure, rebuilding of tree-structured data-sets, etc.)

To date, more than 280,000 cataloguing records have been contributed to the Central Editorial Office. Of these, some 60,000 have been processed and reside in the database.

Uses of the Database, Access, Published Products

Various uses of the database have already been indicated: as a finding tool, the system has already become an indispensable resource for musicians and scholars. But its potential for research extends far beyond this basic bibliographic function. For example, the ability of the system to isolate repertories of works by copyist, provenance, genre, etc., and to provide comparative statistics on their size and distribution, will undoubtedly be exploited to serve the growing interest in studying the sociological aspects of music. Another example concerns genre terms. Two genre categories exist in the RISM Checklist: original genre terms (category 192) and standardized genre codes (category 194). The latter employs the two-letter genre codes used in the US-MARC scores format (MARC fields 008/18-19 and 047) and can be used to locate works by broad generic categories. This ability has obvious utility for historical studies of genres or in locating works for performance. Used in conjunction with category 192, however, it can also provide significant data for the study of musical terminology.

The ability of the RISM Series A/II database system to manipulate specifically musical data--namely, encoded musical excerpts from the beginning of each work--represents perhaps its most exciting potential use. One of the lingering problems of music manuscript studies of the period 1600-1800 is the identification of the vast numbers of musical works which have been handed down without composer attributions or with ascriptions to the wrong composer. In the case of the classical symphony, for example, it has been estimated that misattributions affect about 7 percent of all known sources, or nearly 900 compositions from that repertory.[8] With the development of software to compare encoded musical incipits, RISM has begun to place this aspect of manuscript stud-

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[8] Jan LaRue, "Symphony, I, §1-2: 18th Century, Introduction and Sources," *New Grove Dictionary* (London: Macmillan, 1980), XVIII, 438-39; see also Jan LaRue, "A Union Thematic Catalogue of 18th Century Symphonies," *Fontes artis musicae*, VI (1959), 18-20.

Example 1. RISM Series A/II Checklist

Category	Index	Description
000	X	RISM record number
[001]		[reserved for future use]
002	X	Main entry: Composer name
004		Life dates
012	X	Uniform title
014	X	Instrumentation, general description
022	X	Thematic catalog
024	X	Opus number
026	X	Key or mode
032		Title transcription
042	X	Text author
044	X	Arranger/Collaborative composer
046	X	Performer
048	X	Dedicatee
052	X	Autograph Ms or copyist's Ms
054	X	Date of Ms
056	X	Copyist name
062		Collation
072		List of parts
082		Size of ms. in centimeters
		Format
		Manuscript type
		Watermark description
092		Sections of pieces or Ms contents
102	X	Text incipits
112	X	Music incipits
122	X	Solo voices, SATB
124	X	Other solo voices
132	X	Choir voices, SATB
134	X	Additional choir voices
142	X	Solo instruments
152	X	String instruments (vl 1, 2, vla, vlc, cb)
154	X	Woodwinds (ob, fl, cl, fag)
156	X	Brasses (cor, trp/clno, trb)
158	X	Additional instruments
162	X	Bass, keyboard, and accompanying instruments
172		Variant composer name from source
182	X	Variant title
192	X	Original genre names
194	X	Standardized genre codes
202	X	Character names, dramatic roles
212	X	Provenance, personal names
214	X	Provenance, corporate names
216	X	Manuscript atelier
218	X	Place of origin, place names
222		Internal cross-references, Ms collections
232		Former call number
242		Date references
252		References to other RISM series
262		Other information from the source
272		Information from secondary sources
282	X	RISM country siglum
284	X	RISM library siglum
292		Call number
302	X	Composer cross-references
312	X	Other names cited in the source

ies on a level unattainable hitherto.

The first trials of this program have had intriguing results. Approximately 2,000 bibliographic records representing Czechoslovak manuscripts were compared among themselves. Surprisingly, about ten percent of the music incipits in the sample found "matches," of three distinct kinds: (1) Identical music incipits from manuscripts of different provenance and with attributions to the same composer--a result that can lead to a more precise identification of works and a more complete view of their bibliographic history. (2) Identical music incipits from manuscripts in which the identity of the composer in one or more of the sources was questionable, again yielding a significant improvement in the bibliographic control of manuscript sources in general. (3) Identical music incipits, but in sources where attributions are in conflict. In such cases, conflicts can only be resolved through further musicological and bibliographic investigation.

It is clear from the trial, then, that the database will, indeed, play a major role in identifying the composers of works transmitted without attributions. It also indicates, however, that the problem of conflicting attributions might be more common than previously assumed, and that borrowing of material among composers was perhaps more widespread than research has indicated to date. In other words, the program should be able to solve certain problems of attribution, but it also raises specifically musical questions which must be addressed through further research.

Direct access to the Series A/II database is currently possible only at the Central Editorial Office. The office, which recently relocated from Kassel to Frankfurt, welcomes visitors and accepts inquiries from the international musical community. Inquiries should be sent to:

Internationales Quellenlexikon der Musik (RISM)
Zentralredaktion
an der Stadt und Universitätsbibliothek
Sophienstrasse 26
D-6000 Frankfurt am Main 90
Federal Republic of Germany
Telephone: (49) (069) 70 62 31

Long-term planning calls for a gradual but steady broadening of access to the database. While significant technical questions remain to be resolved, the Central Editorial Office has long had the goal of providing direct access to RISM Series A/II data via networked bibliographic systems. In the interim, a provisional means of access to a selected subset of information in the database is provided by the RISM Series A/II microfiche, produced by RISM and distributed internationally by the Bärenreiter Verlag. This computer-output microfiche includes the following data elements: composer name and life dates (002, 004), uniform title, instrumentation, thematic catalogue references, opus number, key/mode (012, 014, 022, 024, 026), location (282, 284), call number (292), and RISM record key (000). It offers, then, a basic means of locating sources, as well as for requesting further information from the database. A sample page from the microfiche is reproduced as Example 2.

Example 2. RISM Series A/II Microfiche Database Index: Enlarged Section.

Cherubini, Luigi

Deux journées ou le porteur d'eau, Les. Selections
D-ddr Bds Slg.Spiker 100,1 0021715

4 Duetti. V (2), pf
CS BER HU 509 0019134

Ecce panis angelorum. S, orch. – B♭
CS ND III/64-200 0019123

Eliza
D-ddr LEm PM 4704 0021700

Evviva Bacco. V (X), pf
A RB R 65,66,67 0033444

Faniska
D-ddr Dl Mus. 4011 F 32 0021701

Faniska
H Bb 1235 0030147

Faniska
S St No signature indicated 0000052

Faniska. Excerpts. S, orch. – F
D-ddr RUh RH-C 25 0021703

Faniska. Excerpts. V (3), orch. – A
D-ddr Zl Slg.Exner 0021702

Faniska. Excerpts. V (5), orch. – C
D-ddr Zl Slg.Exner 0021704

Faniska. Excerpts. orch. – F
CH W Dep.MK 463 (Ms.7693) 0014974

Faniska. Selections. Arr. fl (2)
D-brd BFb C-he 82 0002989

Graduals. T, orch. – B♭
CS POa DU 229 0019119

Hôtellerie portugaise, L'
D-ddr Bds Slg.Spiker 99 0021705

Hotellerie portugaise, L'. Excerpts. orch. – d
CH W Dep.MK 462 (Ms.7692) 0014972

Hôtellerie portugaise, L'. Excerpts. V (3), orch. – E♭
D-ddr Zl Slg.Exner 0021706

Ifigenia in Aulide. Excerpts. V (3), orch. – E♭
D-brd BFb C-he 60 0002981

Ifigenia in Aulide. Excerpts. V (3), orch. – E♭
D-ddr Bds Slg.Spiker 101 0021707

Iste dies. V (2), orch. – B♭
I BGc 305.20 0047124

Lauda anima mea. S, orch. – E♭
CS ND III/65-201 0019124

Lauda Sion. V (2), orch. – B♭
D-ddr Zl Slg.Exner 0021691

Laudate dominum. S, choir, orch
H VEs Grad.49 0029623

Laudate dominum. S, choir, orch. – C
CS Pnm XXXVIII A 365 0019129

Litanies. V (4), orch, org. – c
CS Pnm XXXVIII B 39 0019130

Litanies. V (4), orch, org. – A
CS Pnm XXXVIII B 42 0019133

Litanies. V (4), orch, org. – E♭
CS Pnm XXXVIII B 41 0019132

Litanies. V (4), orch, org. – F
CS Pnm XXXVIII B 40 0019131

Lodoiska
CH Bu kr I hoch a No.35 (Ms.547) 0006390

Lodoiska
D-ddr WRdn Op.73,SM 103 0021708

Lodoiska. Arr. winds
H KE 2056 0001553

Lodoiska. Arr. winds
I BGc E.2.19 0047128

Lodoiska. Excerpts. V (2), strings, winds
H Bb 1221 0030148

Lodoiska. Excerpts. orch. – D
CH W Dep.MK 747 (Ms.7764) 0014971

Lodoiska. Excerpts T, orch. – E♭
D-ddr WRdn Op.73 hoch 3 0021712

Lodoiska. Excerpts. T, orch. – E♭
D-ddr WRdn Op.73 hoch 1 0021714

Lodoiska. Excerpts. V (2), choir, orch. – C
D-ddr WRdn Op.73 hoch 2 0021713

Lodoiska. Excerpts. orch
CS CH S-40-73-1298 0019117

Lodoiska. Excerpts. Arr. fl, strings
D-ddr Zl Slg.Exner 0021710

Lodoiska. Excerpts. Arr. pf 4hands. – D
D-ddr HAu 12 C 57 0021711

Lodoiska. Excerpts. Arr. winds
D-ddr Zl Slg.Exner 0021709

Lodoiska. Selections. Arr. fl (2)
D-brd BFb C-he 82 0002988

Masses. V (3), orch. – A
D-ddr Dl Mus. 4011 D 7 0021687

Masses. V (3), orch. – A
D-ddr Dl Mus. 4011 D 7a 0021688

Masses. V (3), orch, org. – F
CS ND I/119 0019127

Masses. V (4), choir, orch. – d
CS ND I/120 0019128

Médée. Excerpts. orch. – f
CH W Dep.MK 461 (Ms.7691) 0014975

Médée. Excerpts. orch. – f
S St No signature indicated 0000054

Mille volte mio tesoro. V (2), orch. – A
D-brd BFb C-he 65 0002983

Miserere. V (6), org. – c
I Fa 247-2429 0046237

Nel lasciarti idolo amato. S, orch. – A
D-brd BFb C-he 75 0002987

Non mi negate. V (X), pf. – B♮
A RB R 65,66,67 0033444

O deus ego amo te. A, strings. – E♭
CS ND III/66-202 0019125

O salutaris hostia. V (2), orch. – E♭
I Rrostirolla MS MUS 562 0046708

Diverse possibilities exist for the production of other types of formatted output from the database. The indexing of the database and its searching and sorting possibilities enable the compilation of specialized bibliographies, e.g., catalogues of works by names (composers, librettists, etc.), genre, or location. A concrete example of the latter type has, in fact, already been prepared and published in printed form: the catalogue of the Benedictine Abbey at Ottobeuren, West Germany, compiled by Gertraut Haberkamp.[9] A sample page from the catalogue is provided as Example 3. Examples 4 and 5 select a single entry from this page--Honorat Reich's Mass in C--and show, respectively, illustrations of the original document and the bibliographic data in RISM standard format.

Technical Description

Computing hardware employed at the Central Editorial Office is manufactured by Computer-Technik Müller (CTM) and consists of a CTM 9000 computer accessing two CTM magnetic disk drives (one @ 80 megabytes, one @ 96 megabytes), CTM magnetic tape drives, four terminals, and high-speed printers; a Tandon Plus microcomputer has also been installed for use in maintaining RISM authority records and in terminal-emulation mode with the CTM minicomputer. Further use is made of IBM mainframe computing equipment (IBM 4381-M02) at the Gesellschaft für Information und Dokumentation at Frankfurt/Main; this equipment is used for preparation of computer-output microfiche and the preparation of catalogues in conjunction with a Siemens/Hell Digiset 40T20 photo-typesetter capable of printing music in conventional staff notation.

Software has been developed for CTM machinery by programming consultant Volker Kube in the CTM MASS 70 (macro assembler) programming language; mainframe operations employ the IBM STAIRS data-retrieval system in conjunction with custom software written in PL1.

Excursus: Processing of Music Incipits

With respect to software, the treatment of musical data demands particular attention. Each bibliographic record includes one or more music incipits--a melodic excerpt from the beginning of the musical work of sufficient length to be of value in identifying

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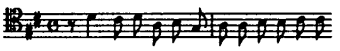
[9] *Die Musikhandschriften der Benediktiner-Abtei Ottobeuren: Thematischer Katalog*, Kataloge Bayerischer Musiksammlungen, 12 (München: G. Henle, 1986).

Example 3. Sample page from *Die Musikhandschriften der Benediktiner-Abtei Ottobeuren*, ed. Gertraut Haberkamp (Munich: G. Henle, 1986; used by permission).

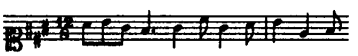
VSol 1111. orch 11001. keyb: org
Ge: Missa
Schreibervermerk am Ende einiger Stimmen: descripsit F. Augustin Bayrhamer Prof. Ottob.
D-brd. OB. MO 298 — RISM: 0050774

[Pruneder, Franz] 1692-1764 **0810**
Masses. V (4), strings, org.— D
Without title
Ms. 1750c
8 parts: 4, 5, 5, 5; 4, 4, 5, 5f — S, A, T, B; vl 1, 2, org (2x)
29,5 x 22 cm
1.1: T. Allegro



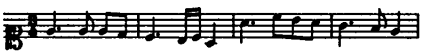
VSol 1111. orch 11000. keyb: org
D-brd. OB. MO 996 — RISM: 0050775

Ramer **0811**
8 Dances. org.— A; A; a; a; a; a; a; a
[Nr. 1:] Gigue Di Sign. / Ramer
Ms. 1695. Reich, H[onorat]
1 part: p91-94 — org
33 x 21,5 cm. wm: OB 55
2 gigues, 1 dance without designation, 1 sarabande, 2 doubles, 1 allemande and 1 courente
1.1: org. Gigue

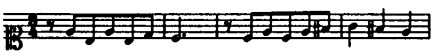


2.1: org.

3.1: org. Sarabanda

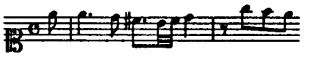


4.1: org. Double

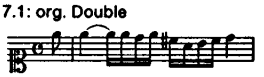


5.1: org. Gigue

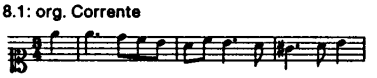
6.1: org. Allemanda



7.1: org. Double



8.1: org. Corrente



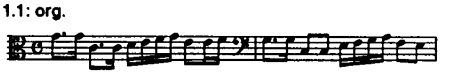
keyb: org
Ge: Gigue; Sarabanda; Double; Allemanda; Corrente
Nur ein Stück (Nr. 2) ohne Überschrift, die übrigen mit Kopftitel versehen: 1. Gigue Di Sign. / Ramer; 3. Sarabanda Eiusdem; 4. Le Double; 5. Gigue Eiusdem; 6. Allemanda; 7. Eiusdem Authoris / Le Double; 8. Corrente / Eiusdem — Siehe H. Tilsen, Eine Musik-Handschrift des Benediktiner-Klosters Ottobeuren aus dem Jahre 1695, Dissertation, München 1925
coll: 0051157
D-brd. OB. MO 1037 — RISM: 0051163

Reich, Honorat 1677-1750 **0812**
Masses. V (8), orch, org.— C
MISSA / IUBILAEI SACERDOTIS / à 20. Voc. / Ad Solennes Secundas Primitias / GORDIANI / Rev:mi / Ampl:mi S. R. J. Praelati. / ac Domini Lib: & Imp: Mofrii Ottob: / Abbatis Vig:mi Sacerdotis Jubilaei Vener:mi / Domini, Patris gratios:mi Observandiss.mi / Composita, ac demissis:me / oblata / à P. Honorato Reich elusdem / Mofrij Professo & c. / 1710 / 1. Jan:
De: Scherrich, Gordian
Au. 1709. Reich, Honorat
22 parts: 2, 2, 2, 2, 2, 2, 2, 2; 2, 2, 2, 2, 2, 3, 3; 1, 1, 1, 1, 1, 1; 1f — S 1, 2, A 1, 2, T 1, 2, B 1, 2; vl 1, 2, vla, t-vla, b-vla, org (2x); Conc: clno 1, 2, ad lib: clno 1, 2, tr 1, 2; timp
39 x 25 cm. wm: OB 7
1.1: S. Allegro

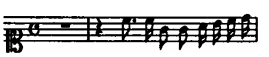
VSol 2222. orch 11300. orch 060. orch: timp. keyb: org
Ge: Missa
Datierungen am Ende einiger Stimmen: 1709 30 1obr, 31 1obris
D-brd. OB. MO 41 — RISM: 0050778

[Reich, Honorat] 1677-1750 **0813**
Pieces, sacred. V (X), bc
BASSUS / CHORALIS / Vocibus Psallentium / In Templo Ottoburano / ACCOMMODATUS / ANNO MDCCI.
?Au?. 1701. ?Reich, Honorat?
score: 83p
29,5 x 20 cm. wm: OB 1b
VSol 000X. bass: bc
Prov: Jordan, P. Ambrosius; Ottobeuren, Chor — olim: Ott.K.3
Besitzvermerk: Dono dedit monasterio Ottoburano P. Ambrosius Jordan O. S. B. et Beneficiatus Mindelheimi. 1858.- Das Manuskript enthält Messen, Hymnen usw. in Choralnotation mit bc
D-brd. OB. MO 41a — RISM: 0051187

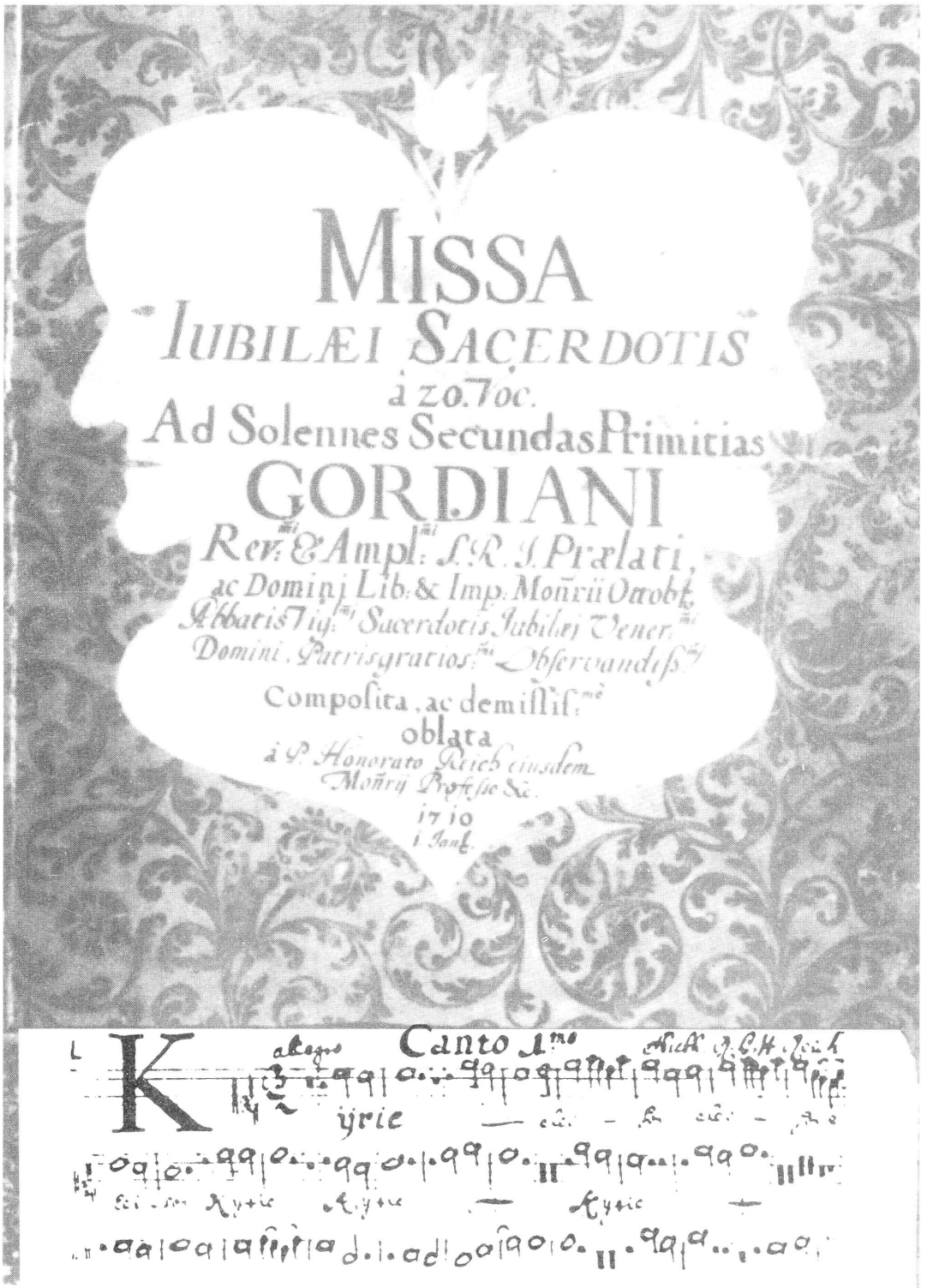
Reich, Honorat 1677-1750 **0814**
Vesperae. Excerpts. V (4), orch, org.— C
Domine Dixit / & / Magnificat / A / 4 voc: 2 Violinis, 2 Violis / 2 Clar: Ex C. Tymp: con org: et Violone / Authore / P. R. P. Honorato Reich
Ms. 1736
17 parts: 1, 1, 1, 1; 1, 1, 1, 1; 1, 1, 1, 1, 1, 1; 1, 1; 1f — Conc: S, A, T, B; Rip: S, A, T, B; vl 1, 2, vla, t-vla, vlne, org; clno 1, 2; timp
35 x 21 cm. wm: OB 1
Domine ad adiuvandum (1.2); Dixit dominus (2.2); Magnificat (3.2)
1.1: org.



1.2: S.



Example 4. Honorat Reich: Mass in C Major
Cover and p. 1 from D-brd:OB, Ms. MO 41.



Honorat Reich: Missa C-dur
Autograph 1709/10 (MO 41)

Example 5. Honorat Reich: Mass in C Major
Bibliographic Record in RISM Standard Format

Category	*Data*
000	0050778
002	Reich, Honorat
004	1677-1750
012	Masses
014	V (8), orch, org
026	C
032	MISSA / IUBILAEI SACERDOTIS / à 20. Voc. / Ad Solennes Secundas Primitias / GORDIANI / Rev:mi / Ampl:mi S. R. J. Praelati / ac Domini Lib: & Imp: Moñrii Ottob: / Abbatis Vig:mi Sacerdotis Jubilaei Vener:mi / Domini, Patris gratios:mi Observandiss.mi / Composita, ac demissis:me / oblata / â P. Honorato Reich eiusdem / Moñrij Professo & c. / 1710 / 1. Jan:
048	Scherrich, Gordian
052	Au
054	1709
056	Reich, Honorat
062	*22 parts: 2, 2, 2, 2, 2, 2, 2, 2; 2, 2, 2, 2, 2, 3, 3; 1, 1, 1, 1, 1, 1, 1; 1f
072	S 1, 2, A 1, 2, T 1, 2, B 1, 2; vl 1, 2, vla, t-vla, b-vla, org (2x); Conc: clno 1, 2, ad lib: clno 1,2, tr 1, 2; timp
082	39 x 25 cm. wm: OB 7
112	➞1.1: S. Allegro%C-1@3/2 𝅗𝅥 = 2/2-"C'B/"1C2-/=/2-"ED/1C
122	VSol 2222
152	orch: 11300
156	orch: 060
158	orch: timp
162	keyb: org
192	Missa
194	ms
262	Datierungen am Ende einiger Stimmen: 1709 30 1obr, 31 1obris.
282	D-brd
284	OB
292	MO 41

the work. At the early stages of project planning, a decision was made to adopt the "Plaine and Easie Code" developed by Barry S. Brook and Murray Gould.[10] The code's major advantages are its simplicity and its use of conventional text-characters: it is therefore easily learned and interpreted, and can be used in building a tree-structred data-set according to conventional principles of database indexing. Searching the database by specifically musical criteria is therefore not problematic. The code, however, does not possess two qualities desirable in a system of encoding music electronically: a syntax that allows melodies to be sorted readily by melodic or rhythmic criteria and the ability to drive a type-setting or graphics output device. The reason for this is that the code is context-sensitive: symbols used to encode pitch register and rhythm remain in effect for all subsequent pitches until a change of octave register of rhythmic value occurs.

In order to acquire qualities that enable effective sorting or printing in staff notation, this context-sensitivity must be removed. This is accomplished at the RISM Central Editorial Office by the processing of music incipits in the Plaine and Easie Code into another coded value--a "Meta-Code"--using algorithms developed by Norbert Böker-Heil. This computer-generated code permits the sorting of incipits and successfully drives the Siemens/Hell type-setter used by RISM for the production of printed catalogues. Examples 6-9 offer four examples, illustrating music incipits in the Plaine and Easie Code, in the Meta-Code, and in staff notation (type-set from the Meta-Code).

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[10] See Barry Brook and Murray Gould, "Notating Music with Ordinary Typewriter Characters (A Plaine and Easie Code System for Musicke)", *Fontes artis musicae*, XI (1964), 142-55, and "The Simplified Plaine and Easie Code System for Notating Music: A Proposal for International Adoption," *Fontes artis musicae*, XII (1965), 156-60. The version of the code currently used by RISM incorporates numerous modifications, the majority of which are described by Norbert Böker-Heil, "Erläterungen zur Codierung der Musikincipits," in "Fürstlich-Hohenlohe-Langenburg'sche Schlossbibliothek: Katalog der Musikhandschriften," *Fontes artis musicae*, XXV (1978), 408-11.

Example 6. G. Latilla [?]. In te spero o sposo (RISM 0050623)

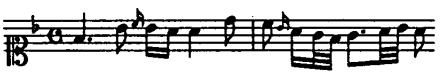
a) Plaine and Easie Code

%C-1$bB@c # '4.F8Bq''6C§'BA&4A''8D/Cq'6B§A3GF&§8.G3AB&8A

b) Meta-Code

hA1 ivG------ j044W a4TpDwL(I$ a5UpGvL(I$ d6UqAwL(I/
a6UpGvL = I$ a4UpFwL(I$ a5UqBwL(I$ k1 a5UqAwL(I$ d6UpGvL(I/
a6UpFwL = I$ a7UpEwL:I$ a7UpDwL,I$ a5TpEwL = I$ a7UpFwL:I$
a7UpGvL,I$ a5UpFwL(I$

c) Staff notation



Example 7. W.A. Mozart. Così fan tutte: Il core vi dono (RISM 0050615)

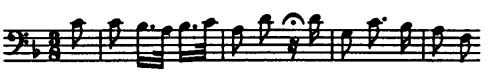
a) Plaine and Easie Code

%F-4$bB@3/8 # '8C/C.6.3§,BA&§,B'C&/,8A'D6(-)D/,8G'8.C,6B/8AF

b) Meta-Code

hD4 ivG------ j035 a5UpAwL(I$ k1 a5UpAwL(I$ a6ToGvL = I$
a7UoFwL,I$ a6ToGvL = I$ a7UpAwL,I$ k1 a5UoFwL(I$ a5UpBwL(I$
b6U(I$ $----% a6UpBwL(I$ k1 a5UoEwL(I$ a5TpAwL(I$ a6UoGvL(I$ k1
a5UoFwL(I$ a5UoDwL(I$

c) Staff notation



Example 8. Sartini. Kyrie in D (RISM 0050813)

a) Plaine and Easie Code

%G-2$xFC@c # 6A/§''8D6-'A&q8G§G6ED&8A§''6E'A&§''F'A''G'A&/§''8F6GE&

b) Meta-Code

hE2 ixDA----- j044W a6UpFwL(I$ k1 a5UqBwL = I$ b6U:$ a6UpFwL,I$ d5UpEwL(I/ a5UpEwL = I$ a6UpCwL:I$ a6UpBwL,I$ a5UpFwL(I$ a6UqCwL = I$ a6UpFwL,I$ a6UqDxL = I$ a6UqEwL:I$ a6UpFwL,I$ k1 a5UqDxL = I$ a6UqEwL:I$ a6UqCwL,I$

c) Staff notation

Example 9. A. Neckh. Stabat mater (RISM 0050718)

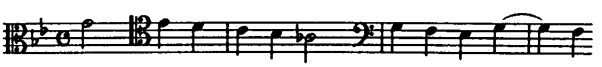
a) Plaine and Easie Code

%C-3$bBE@c # '2G*%C-4*ED/C,B2bA*%F-4*/4GFEG + /GF

b) Meta-Code

hA3 ivGC----- j044W a3UpEwL(I$ hA4 a4UpCvL($I a4UpBwL(I$ k1 a4UpAwL(I$ a4UoGvL(I$ a3UoFvL(H$ hD4 k1 a4UoEwL(I$ a4UoDwL(I$ a4UoCvL(I$ a4UoEwJ(I$ k1 a4UoEwJ(I$ k1 a4UoEwM(I$ a 4UoDwL(I$

c) Staff notation



Research Library Information Network (RLIN)

Compiled by Kären Nagy

The Research Libraries Group (**RLG**) is a non-profit corporation owned and operated by member universities and research institutions. RLG operates an integrated set of cooperative library programs in collection development and management, shared resources, preservation, general bibliographic access and control, and access to and management of specific forms of research information. RLG's automated information system, **RLIN** (the Research Libraries Information Network), supports the consortium's activities. A nationwide (U.S.) network with some overseas users, RLIN provides services to both RLG member and non-member users, including all types of libraries and archives.

Online Bibliographic Information

The RLIN database is an online union catalogue of library materials held by the main and special libraries and archives of RLG's 88 member institutions and of more than 100 additional academic, public, corporate, and other special libraries. It includes listings for books, serials, sound recordings, musical scores, maps, visual materials, computer files, archival/manuscript materials, and "special databases". Researchers interested in Arnold Schoenberg, for example, can find cataloguing for books by and about him in several languages, journals devoted to his work, his musical scores and recordings, photographs and films connected with him, collections of his personal correspondence and papers, and even his annotated atlas of maps of Vienna.

The main database within RLIN contains nearly 30 million cataloguing records; included in that number (as of May 1988) are records for over 430,000 musical scores and over 200,000 recordings. In addition to members' cataloguing, Library of Congress music cataloguing is regularly added to RLIN. Cataloging for special scholarly efforts, such as the U.S. RISM projects (Series A/II), is being added to the database as well. A core of information in RLIN dates back to the early 1970s, but many member institutions began contributing to the database as they joined RLG in the late 1970s and early 1980s. Most libraries have therefore begun retrospective conversion projects to transfer the older information in their card catalogs into the new online environment.

Information retrieval in RLIN was designed with scholars and researchers in mind. The system's indexing features allow users to search according to these categories:

Personal names
Title words (in any order)
Conference titles
Corporate [institutional] **names**
Subject headings
More than 40 additional indices (*e.g.*, music publishers' and record manufacturers' numbers)

In addition, search results can be limited by language, place and date of publication, and holding library. Boolean operators permit selective and combination searches. Word or phrase truncation permits searching with incomplete information. Subject searching by keyword means that access is provided not just through Library of Congress subject headings but through words and phrases in the titles of materials as well.

Special Databases

Several special databases offer access to scholarly information in specific subject areas within RLIN. Currently available are the *On-line Avery Index to Architectural Periodicals*, the *Eighteenth Century Short Title Catalogue* (ESTC), and *SCIPIO*, an art sales catalogue database. The Music Program Committee, organized by Michael Keller in 1981 and now chaired by Edwin Quist, serves as an evaluation panel and advocate for databases in music. It is currently considering several special databases within the subject area. Lynne Toribara serves as liaison between RLG and the RLIN Music Committee.

To provide illustrations for this report, the Center used the *Eighteenth Century Short Title Catalogue*, which contains bibliographical records for publications printed from 1701 to 1800 in Great Britain and its colonies, as well as publications in English from any other part of the world. Officially, the ESTC excludes musical scores, but we found that many were listed. Within the context of genre searches, the "song" category (s) offers access to information about printed song texts. On the following two pages we have indicated some of the available search categories, results of searches for broad categories of information, results of highly selective searches, and a few notes on how the results compared with similar searches in widely used hardcopy reference works.

Questions about the *Eighteenth Century Short Title Catalogue* may be directed to either of the following addresses:

ESTC Editorial Office
Humanities and Social Sciences
The British Library
Great Russell Street
London WC1B 3DG UK

ESTC/NA
College of Humanities and Social Sciences
Sproul Hall
University of California
Riverside, CA 92521-0132 USA

The prospect of an RLIN special database of Beethoven bibliography is near at hand. The database would include more than 12,000 records amassed by the American Beethoven Society and currently maintained by the Ira S. Brilliant Beethoven Center in San Jose, CA.

Cooperative Projects

Several major cooperative projects are broadening the access that RLIN can provide for its users. The Linked Systems Project (LSP) presently being tested will allow RLIN direct linkage with other similar bibliographic utilities including OCLC. This project will also allow an online exchange of authority work, *i.e.*, the researched verification of personal names and uniform titles that produces uniformity and cross-references in our library

RLIN Search Categories:
Eighteenth Century Short Title Catalogue

tw	Title word
tp	Title phrase
pn	Personal name
pe	Personal name, exact form
cw	Corporate name word
cp	Corporate name phrase
gnr	Genre
ngw	General note word
ipl	Place of publication [Imprint Place]
iyr	Date of publication [Imprint Year]

Searches can be refined by the use of Boolean operators (AND, OR, NOT) and can be conducted using truncations of various kinds. Proper nouns that are not personal names may be found under several categories; users gain insights into searching strategies by using the system.

Sample Searches--General Results

1. **fin cw Haymarket** 51 results

Obviously an incomplete listing of activities at the Haymarket Theatre, but an interesting miscellany.

2. **fin pn Jennens** 49 results

Most listings are for reprints and revisions for Handel's Messiah, for which Charles Jennens was the librettist.

3. **fin pn Avison** 13 results

Eight of the 13 citations for Charles Avison were of period prints of his music.

4. **fin cp Ancient Music** 10 results

These listings included specific dates and titles of works performed before the Academy of Ancient Music. There is no entry under 'A' in The New Grove.

5. **fin ngw Concert** 3430 results

A rich miscellany of information principally about special occasions.

Sample Searches--Specific Results

Searches combining parameters yield very specific information. Here are some examples:

1. **fin pn Jennens and iyr 1740** 1 result

Jennens, Charles, 1700-1773.

Saul, an oratorio; or sacred drama. Set to music by Mr. Handel, and perform'd by the Academy of Ancient Music, on Thursday, April 24, 1740. London, printed in the year, 1740.

This performance is listed neither in the Handel work list in Grove nor in the more extensive list of 'remarks' in the Baselt Verzeichnis (HWV 53).

2. **fin cp Ancient Music and iyr 1753** 1 result

Esther: an oratorio, or sacred drama. Set to music by Mr. Handel. And performed by the Academy of Ancient Music, on Thursday, Feb. 22, 1753. London, printed in the year, 1753.

The libretto only, sometimes attributed to John Arbuthnot and Alexander Pope, with additions by Samuel Humphreys.

Such a performance is absent from the Grove work list and the Baselt catalogue (HWV 50a, b).

3. **fin gnr s and iyr 1740**: Selected items 39 results

A new song, in praise of the Greenland fishery. To the tune of Alley Croaker. London, Printed and sold in Grub-Street, 1740.

Amidst the arts which on the ice appear, To tell the wonders of this icy year, . . . [London], Printed on the ice of the River Thames, February 13, 1740.

The Bishop of Hereford's entertainment by Robin Hood, and Little John, &c. in merry Barnsdale. To an excellent new tune. London, printed and sold by William Dicey and Company in Bow church-yard, and at their warehouse in Northampton, [1740?].

Fair Margaret's misfortunes: or, sweet William's frightful dreams on his wedding night. With the sudden death and burial of those noble lovers. London, Printed and sold by William and Cluer Dicey, London, 1740.

Jones, Mary, Miss, of Oxford. The lass of the hill. London, 1740.

The wanton wife of Bath. Tune of, The Flying fame, &c. Newcastle upon Tyne, 1740.

catalogues. A number of member libraries are currently using the RLG LSP link to contribute authority records online to the Library of Congress.

A major national cooperative retrospective conversion effort is currently underway for music materials. This project is of particular interest to scholars because it includes an agreement to have the resulting cataloguing appear in both RLIN and OCLC, thereby providing much broader access to unique older materials.

Non-bibliographic Research Information

In 1985, RLG initiated a program in the area of non-bibliographic research information. The Program for Research Information Management (PRIMA) fosters activities that encourage the organization and computerization of new data resources. Four pilot projects are currently in operation. One of these is a research-in-progress database undertaken in collaboration with the Modern Language Association.

Access to RLIN

Both RLIN and OCLC operate on a membership basis. Prospective non-institutional users of RLIN pay a fee of $135 a year for membership in RLIN's subsidiary, CLASS, an annual search fee ($175 for the first year and $50 a year thereafter), an hourly connect time fee ($45 an hour), an hourly Telenet network charge ($10), and a monthly Telenet access charge ($4). The amounts in parentheses represent recent quotations; local variations may occur and price increases are anticipated. The fee scale was designed for institutional users. When users do not have direct access to RLIN, library reference staff will usually be glad to do such searches on their behalf. Many academic libraries that are not RLG members have "search only" accounts for RLIN. Questions regarding RLG or RLIN access through CLASS may be addressed to:

The Research Libraries Group, Inc.	CLASS
Jordan Quadrangle - Oak	1415 Koll Circle, Suite 101
Stanford, CA 94305-4124	San Jose, CA 95122-4698
(415) 328-0920	(408) 289-1756

RLG is currently supporting a pilot effort, called the Research Access Project, to provide scholars with direct access to the RLIN database. Several member institutions are offering special RLIN searching accounts to individual scholars who have computers with modems in their offices or at home. For $99 an individual can have 10 hours of connect time for searching RLIN. In some instances this cost is being absorbed by institutions for their scholars and in other instances it is being paid for by individuals. In an attempt to offer this service to a group of scholars outside the RLG membership, it has been extended to members of the American Society for Eighteenth Century Studies as well, since the special *Eighteenth Century Short Title Catalogue* database supports their work strongly. The success of this pilot project may encourage even broader direct access to RLIN for scholars in the future.

Online Computer Library Center
(OCLC)

Compiled by David Fenske

The Online Computer Library Center (OCLC), founded in the late 1960's, is the oldest national bibliographic network in the United States. It now holds almost 18 million discrete bibliographical records. These have been contributed by 7900 libraries in the United States, Canada, the Far East, and Western Europe. New records are contributed daily to the Online Union Catalog (OLUC). While this is a database serving all academic disciplines, there are nearly 400,000 records for musical scores and nearly 600,000 for sound recordings. Roughly 500,000 books about music are integrated in the main book listing.

Searching Capabilities

OCLC data can be searched by the following elements of information:

Title (first four words)
Name/Title
Personal name
Corporate [institutional] **name**

In a database with 18 million records, the search result can sometimes overwhelm the system. It may be usual in such cases to further limit the search by such considerations as the following:

Type (books, maps, scores, etc.)
Form of reproduction (*e.g.*, microfiche)
Date of publication

The system does not yet support subject searches.

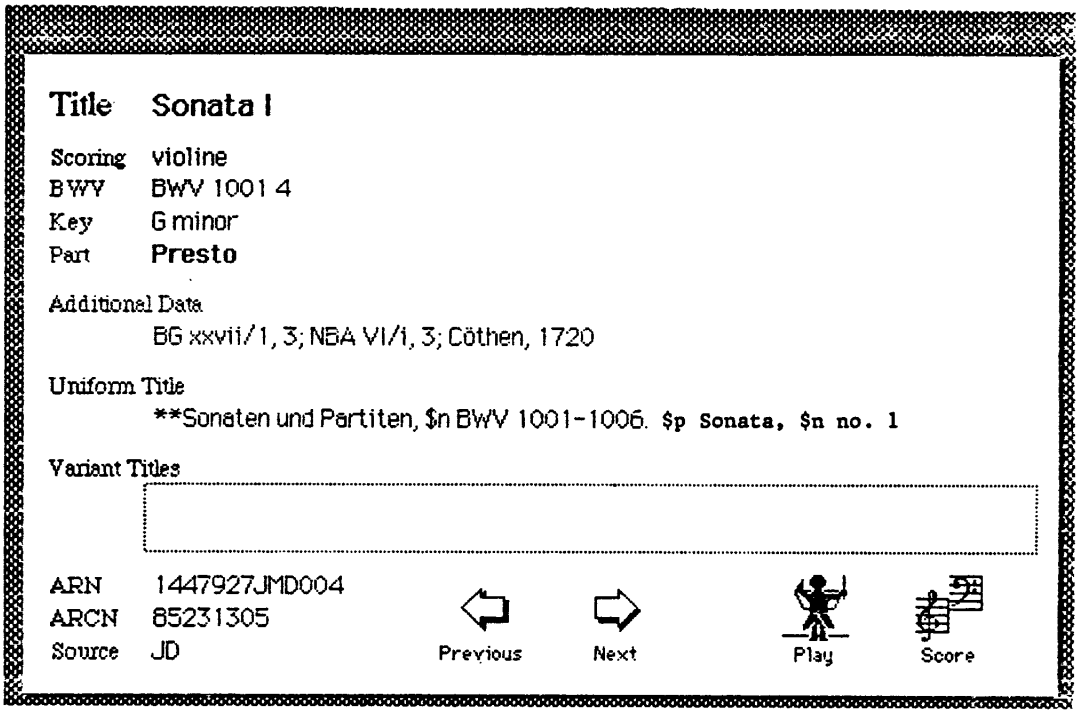
Special Projects in Music

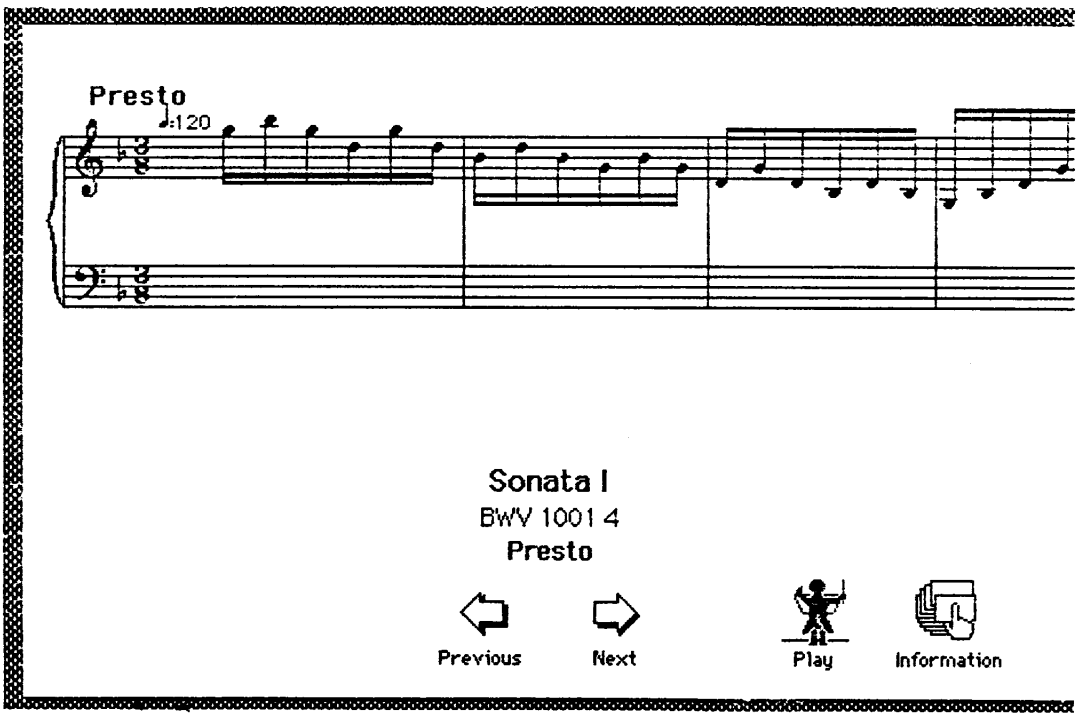
OCLC has recently demonstrated, as a sample Hypermedia project, a "see and hear" subset of bibliographical entries from the Schmieder catalogue of the works of J. S. Bach. The Hypermedia Music Reference System, designed to run on an Apple Macintosh with MIDI output, has been developed by a team consisting of Jeanette Drone, Mark Crook, Duane Rice, and Craig Henderson. It was demonstrated at the annual meeting of the Music Library Association in Minneapolis in February 1988. The music information is managed by a commercial product, Concertware+MIDI (produced by Great Wave Software). Sample screens are shown in the accompanying illustration.

Several additional "drop out" bibliography projects in music are under discussion.

OCLC Hypermedia Reference System

Sample screen displays for BWV 1001/4





Access to OCLC

OCLC access is regulated by subscription. OCLC membership, which is currently $200 a year, is limited to libraries and academic institutions. The system can be accessed with IBM PC-type microcomputers; no special communications software is required, although OCLC markets a product called Terminal Software Version V ($250), which is specially designed for using the system. Use charges are by the record ($1.39 during prime time; $1.17 at other times). Further information about OCLC may be obtained at the address below:

OCLC Online Computer Library Center, Inc.
6565 Frantz Road
Dublin, OH 43017
(614) 764-2026
TWX 81-339-2026

Many educational institutions make the OCLC database available to the public through dedicated terminals in libraries. Some are making the database available through campus computing networks. At many universities, faculty members are now able to complete bibliographic searches in either of these ways and thus to capture information directly for use in word processing programs and personal databases.

Certain portions of the OCLC database are available through the commercial firm Bibliographic Retrieval Services (BRS). Material entered within the past three years, for example, is available under the title "OCLC Easi Reference". Books, scores, and recordings are incorporated in this listing, which is searchable by subject. A subset of the book database has recently been released on compact disk. Through participation in the linked systems project, OCLC and RLIN records may one day become mutually accessible.

BLAISELINE

The United Kingdom's first online database for music bibliography has recently been made available via the British Library's BLAISELINE service. The database includes more than 12,000 catalogue records for printed music published since 1981 in the U.K. and overseas. The Music Database is the online equivalent of the printed *British Catalogue of Music since 1981.*

Users can trace material for a specific instrument or by a particular composer and can differentiate between multiple versions of the same piece (*e.g.*, between parts and a score). During the coming year the coverage will be extended to include unpublished music offered by publishers' hire libraries and microfilmed by the British Library.

In other developments in the United Kingdom, the possibility of closer bibliographic cooperation among the 30 member institutions of JANET (the Joint Academic Network) is being explored. A one-year study of potential bibliographical uses of the French Teletel service by British universities was initiated in March 1988.

News

Standards for Musical Information

SMDL [Proposed ANSI Standard]

The American National Standards Institute subcommittee charged with developing a capability for machine interchange of musical information (called MIPS for Musical Interchange Processing Standards, its official name is ANSI X3V1.8M) held week-long meetings in New York City (September 1987) and in Valencia, CA (February 1988). It was scheduled to meet from July 11 to 14 in San Jose, CA.

The MIPS secretariat has been placed under the auspices of the Computer Music Association, and copies of its documents may be obtained from Craig R. Harris, P.O. Box 1634, San Francisco, CA 94101-1634. The CMA hopes to be able to sponsor two of its members as full MIPS participants and to establish from its membership a board of specialists to advise them in this undertaking. Charles Goldfarb (IBM) continues to serve as chairman with Steven Newcomb (Center for Music Research, FSU) as vice chairman and Alan Talbot (New England Digital) as secretary.

MIPS views its charge as being the development of a language that can express any music that can be written in standard notation. According to official communications from the subcommittee, the standard is intended as a storage and interchange format for musical ideas. Provisionally, the subcommittee has decided to differentiate these kinds of musical data: the underlying musical form ["core data"], a set of performances ["gestural data"], a set of scores ["visual data"], and a set of theoretical analyses ["analytical data"]. This hierarchical structure will be codified in terms of elements; each element has a related information set consisting of attributes. The coding is compatible with Standard Generalized Markup Language (SGML), a tool developed by Goldfarb for generic description of the elements of text documents. The result of the committee's work will be called Standard Music Document Language (SMDL).

A detailed report on the February meeting, written by Harris with additional material from Newcomb and Goldfarb, can be found in the Computer Music Association's newsletter, *Array* (issue for Winter-Spring 1988), pp. 6-12. Comments on the committee's work by Roger Dannenberg and Gareth Loy follow on pp. 12 and 13.

SMX

A method of data representation called "Standard Music eXpression" (SMX) has been developed in Tokyo to facilitate data transfer among the following systems and devices: (1) the Automatic Score Recognition System and (2) the Automatic Translation System of Printed Music in Braille developed in the Ohteru Laboratory at Waseda University; and (3) the Dai Nippon Music Processor (DMP), a microcomputer-based score processor developed by the Dai Nippon Corporation. An SMX-MIDI conversion capability is currently under development.

TMF

A Time-Stamped MIDI Data File Format (TMF) has been developed at the University of Helsinki by Kai Lassfolk and Timo Lehtinen. TMF is designed to facilitate the standardized representation of music and other timed events in a sequential file. TMF, which stores data in packets, can accommodate changes of tempo, key signature, and instrumentation. Based on MIDI protocol V1.0, TMF has been put before the International MIDI Association in draft form.

Text Encoding Initiative

Under the aegis of the Association for Computers and the Humanities and other organizations, a committee has been formed to develop guidelines for the encoding of literary and linguistic data. The main objective of the group is to facilitate file interchange. The Text Encoding Initiative (TEI), which has been awarded a two-year grant from the National Endowment for the Humanities, welcomes comments, documentation and copies of sample passages of encoded material from scholars who have created machine-readable texts. Information on text formats required or permitted by developers of software products is also being sought. Such information may be sent to Nancy Ide, chair of the steering committee, at Vassar College, Poughkeepsie, NY 12601, or to the project editor, Dr. C. M. Sperberg-McQueen, Computer Center (M/C 135), University of Illinois at Chicago, Computer Center (M/C 135), Box 6998, Chicago, IL 60680.

Recent Events

BOLOGNA

A study session on "Databases and the Practice of Musicology" and a day long technical exchange on "Computer-Based Approaches to Musical Data and Musical Analysis" occurred as part of the Fourteenth Congress of the International Musicological Society in Bologna. The sessions occurred on August 29 and August 30, 1987.

In the study session there were two substantial presentations--one by Michael Keller on the collaborative project entitled "Italian Music and Lyric Poetry of the Renaissance" and one by Walter Hewlett on "Full-text Musical Databases: Creation, Distribution, and Use." These set the stage for a roundtable discussion, chaired by Stanley Sadie, on "Process and Product: The Changing Nature of Scholarly Publishing and Research Methods," in which the participants were Bruce Phillips, Etienne Darbellay, Dorothee Hanemann, Laura Callegari, Christoph Schnell, Norbert Böker-Heil, and John Hill.

In the technical exchange, chaired by Mario Baroni and Eleanor Selfridge-Field, there were discussions in the round of musical data and musical analysis, both in the present and as they may evolve over the next several years. Approximately 40 scholars from Italy, France, Germany, Spain, Switzerland, Poland, the USSR, Israel, Japan, and the US took part in this event. Reports of both events appear in the *Proceedings* of the congress.

CAMBRIDGE, MA

Christoph Schnell described and demonstrated the Alpha/TIMES system for musicological research at the Massachusetts Institute of Technology on March 22. His talk will appear in the proceedings of the RIAO for 1988.

LANCASTER [Condensed from a report by Lelio Camilleri]

A conference on "Computers in Music Research," hosted by the University of Lancaster from April 11 to 14, was attended by 110 people from 15 countries. Thirty-seven papers were given. In addition there were software demonstrations, a plenary session, and extensive opportunities for informal exchange. The meeting was organized by Alan Marsden under the auspices of the Centre for Research into the Applications of Computers to Music at the University.

In the plenary session, which took place on April 11, Lelio Camilleri (Florence) considered issues related to the development of a computational theory of music. After a critical overview of four computational approaches to models of musical knowledge, Camilleri focused on some hypothetical models emphasizing the relationship between music theory and music cognition. Marc Leman (Ghent), in the second paper, proposed that massive parallelism could be a suitable tool for the modelling of tasks in musical cognition.

Parallel sessions on music analysis and historical musicology occurred on April 12. In the session devoted to analysis, Arvid Vollsnes and Kjell Nordli (Oslo) described the MUSIKUS system and the window model of analysis on which it is based. Using their approach, a user can concentrate on a particular melodic or harmonic feature. The windows can be recursively defined. In the musicology session, John Stinson described the fourteenth-century projects (creation of a database of repertories, manuscripts, documents, bibliography, and discography) underway at La Trobe University in Australia.

Measurements of musical similarity were the chief topic of a subsequent session in which Clive Broadbent (Durham) described his use of an algorithm derived from acoustic theory to produce a similarity measure from several weighted variables. Tony and Christina Eastwood (Western Australia) discussed similarity assessment in the indexing of melodic incipits.

In a session on music representation, David Huron (Nottingham) favored protocol representations, which allow the user to represent only the information needed for the task to be carried out, over universal representation schemes. In an ensuing roundtable on musical data structures contrasting approaches were also presented: one viewpoint was that musical representation must strictly follow the content of a score without interpretation; the other, starting from the consideration that a score does not represent all aspects of a musical work, proposed the use of representations tailored to specific tasks. This discussion involved Stephen Page (DARMS), Alan Marsden (Lancaster), and Steven Newcomb (ANSI-MIPS).

Among papers dealing with ethnomusicological subjects, one by Jim Kippen (Queen's University, Belfast) describing the development of an expert system for the analysis of tabla music attracted considerable attention. The grammar underlying the system is gradually refined as new assumptions are tested.

A similar conference is planned for 1991.

GHENT

The contributions to a workshop on "Models of Musical Communication and Cognition" held at the University of Ghent in December 1987 will be published in the Autumn 1988 issue of *INTERFACE, Journal for New Music Research*. Papers by M. Balaban, L. Camilleri, M. Leman, C. Lischka, A. Marsden, and M. Reybrouck are included. The event was organized in connection with the twentieth anniversary of *Communication and Cognition*.

ST. AUGUSTIN

A workshop on artificial intelligence and music was to be held September 15 and 16 in St. Augustin, West Germany. The meeting was organized by Christoph Lischka of the Gesellschaft für Mathematik und Datenberarbietung.

ST. PAUL

A one-day workshop on artificial intelligence and music was scheduled to take place on August 24 in St. Paul, Minnesota, as part of the annual meeting of the American Association for Artificial Intelligence. The workshop was designed to consider expert systems in music analysis, printing, performance and listening; composition tools; and issues related to cognition. The workshop was organized by Mira Balaban, Kemal Ebcioglu, Marc Leman, and Linda Sorisio.

URBANA

"Music Notation Encoding and Printing" was the subject of a session chaired by Donald Byrd at the 1987 International Computer Music Conference, held from August 23 to 26 at the University of Illinois in Urbana-Champaign. Gerard Assayag, Dan Timis, Diane Cook, Stephen Dydo, John Free, Keith Hamel, Giovanni Müller, and Raffaello Giulietti participated. Their papers appeared in the *ICMC Proceedings*.

VENICE

A one-day meeting on the Computerized Venetian Music Archive was held at the Fondazione Levi, Venice, on May 28, 1988. Alessandro Moro, head of the project, presented a status report and numerous other participants gave demonstrations and perspectives on future use of the material (described in the Applications section of this Directory).

Newsletters and Networks

ASSOCIATION FOR TECHNOLOGY IN MUSIC INSTRUCTION

The Association for Technology in Music Instruction publishes a quarterly newsletter and a periodic *Courseware Directory*. The newsletter covers projects in progress, workshops, and general information and is available for $10 a year from the ATMI treasurer, Denis Moreen (College of Notre Dame, Belmont, CA 94002). The *Directory* is provided free with a one-year subscription.

COMPUTER-ASSISTED INSTRUCTION

Musletter is a newsletter of developments in computer-assisted instruction in music that is published by IBM's Los Angeles Scientific Center and the University of Southern California School of Music. It is edited by Linda Sorisio. It contains short notices and reports on projects in progress.

COMPUTER MUSIC ASSOCIATION

The Computer Music Association established in 1987 an electronic discussion of music printing by computer. The coorindator is Dan Timis. Contributions may be sent to *ucsbcs!musvax!timis@ucbvax.edu*.

MUSIC INFORMATION NETWORK

David Fenske, music librarian at Indiana University, is working to establish a Music Information Network that would support interlibrary bibliographical searches and facilitate on-demand electronic dispatch of rare out-of-print items. In a pilot phase, the Stanford and Indiana Music Libraries are cooperating in the project.

MUSIC LIBRARY ASSOCIATION

Notes: The Journal of the American Music Library Association will begin a column devoted to music software in its September 1988 issue. Robert Skinner is the contributing editor. The September issue will carry a review article on available software and discuss the relative merits of libraries providing music software and public access microcomputers. Future issues will contain software reviews and listings of newly published music software for microcomputers (music software vendors are invited to communicate with Mr. Skinner, Music Librarian, Owens Art Center, Southern Methodist University, Dallas, TX 75275-0356).

Technical Research: Automatic Transcription

Research in automatic transcription, the conversion of sound to a written representation of music, has been in progress for a number of years, especially in artificial intelligence environments in the US (Stanford University and the Massachusetts Institute of Technology) and Japan (Waseda and Osaka Universities). A system designed chiefly by Bernard Bel has been used with good results in a number of ethnomusicological studies. Outside Japan, successful results with automatic transcription have generally been demonstrated only with monophonic repertories or single-voice results.

Reasonable success in the automatic transcription of a four-part Bach chorale is reported and explained at considerable length in a preprint called "Recognition of Chords for Automatic Transcription of Polyphonic Music" by Andranick Tanguiane [see accompanying illustration]. The work is conducted at the Soviet Academy of Sciences under the auspices of the Composers' Union of the USSR and the Novosibirsk Conservatory. The procedure employed provides both vertical evaluation of chords and horizontal tracking of individual voices. The results are reported in spectrographs of harmonic frequencies and in numeric tables (a music printing system is currently under development). The aim is to facilitate the development of musical databases of polyphonic folk repertories. A Soviet SM-1420 computer and a Yamaha CX5ML are employed in the project.

Technical Research: Optical Scanning

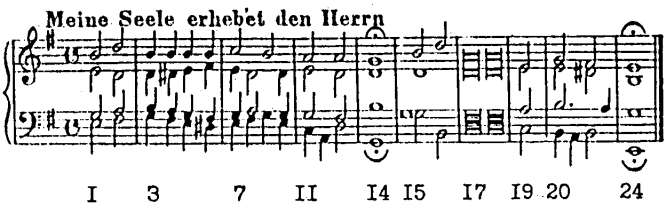
OSAKA UNIVERSITY (Inokuchi Laboratory)

A recognition system for printed piano music has been developed as part of a more comprehensive expert music system in the Engineering Science Department of Osaka University. The approach is described in the proceedings of the 33rd annual convention of the Japanese Information Processing Society (1986). The music is treated in bar units. Identification is accomplished in two stages--the pattern recognition phase and the semantic analysis phase. Extracted symbols are encoded into playable musical information. The rate of accuracy in recent experiments was determined to be 94.2% for Beethoven's "Für Elise" and 89.3% for Chopin's Etude No. 3. The average processing time is 90 minutes a page. The researchers are Haruhiro Katayose, H. Kato, Keishi Takami, Masakazu Imai, and Seiji Inokuchi.

THAMES POLYTECHNIC, LONDON (Neil G. Martin)

A brief review of the main approaches to optical character recognition is contained in Neil G. Martin's undergraduate honours project, "Towards Computer Recognition of the Printed Musical Score" (Thames Polytechnic, London, 1987). Following a general assessment of template matching, decision theoretic and syntactic approaches, Martin develops a modular system of his own design for reading and encoding information from printed musical scores. His approach involves the use of a dynamic dictionary of symbols in which measurement data are refined on the basis of experience. A preliminary impression of each symbol's identity is gained by the generation of a bounding box (a geometric description of the symbol's outer limits). The results shown in his paper are short ones of treble-clef notation.

Automatic Transcription:
Characteristics of Chord Recognition (Tanguiane)



In the work of Andranick Tanguiane and associates at the Soviet Academy of Science, chords are evaluated both vertically and horizontally. The chords of the Bach chorale shown above are listed alphanumerically in column 1. Chord profiles derived from recognition of overtones are shown in column 2. These profiles are compared with those for the previous chord (column 3) and the succeeding chord (column 4). The number of chords correctly recognized is shown in the third of the five lines that follow the chord listing. Errors and omissions in recognizing individual tones occurred only in the chords marked with an asterisk (*), a plus (+) or a minus (-). The system is intended for use in the transcription of multi-voice folk music.

Исходные аккорды	Достаточное число образов / Число побочных образов в множестве достаточных образов / Минимальное ÷ максимальное число последовательных частичных тонов в образах нот, необходимое и достаточное для верного распознавания аккорда		
	по образам интервалов	по образам голосоведения	
		с предыдущим аккордом	с последующим аккордом
①	②	③	④
1.[e,g,e1,h1]	4/ 0/ 1÷ 5		8/ 1/ 3÷ 5
2.[f#,a,d1,d2]	13/ 8/ 5÷ 5-d2	9/ 0/ 1÷ 5	24/ 11/ 5÷ 5-d2
3.[g,h,d1,h1]	4/ 0/ 1÷ 5	7/ 0/ 1÷ 5	5/ 0/ 1÷ 5
4.[f#,a,d#1,h1]	9/ 4/ 5÷ 5	5/ 0/ 1÷ 5	7/ 1/ 5÷ 5
5.[e,g,e1,h1]	4/ 0/ 1÷ 5	8/ 0/ 1÷ 5	8/ 1/ 3÷ 5
6.[d#,f#,f#1,h1]	4/ 1/ 3÷ 5	6/ 1/ 4÷ 5	8/ 3/ 4÷ 5
7.[e,g,e1,c2]	4/ 1/ 3÷ 5	12/ 2/ 3÷ 5	8/ 0/ 1÷ 5
8.[f#,a,d1,c2]	5/ 2/ 5÷ 5	7/ 1/ 5÷ 5	6/ 0/ 1÷ 5
9.[g,a,d1,h1]	5/ 0/ 1÷ 5	6/ 0/ 1÷ 5	7/ 0/ 1÷ 5
10.[e,g,d1,h1] *	13/ 8/ 4÷ 5-h1	24/ 12/ 4÷ 5-h1	24/ 10/ 4÷ 5-h1
11.[c,g,e1,a1]	12/ 8/ 4÷ 5-a1	6/ 2/ 4÷ 5	23/ 10/ 4÷ 5-a1
12.[A,g,e1,a1]	3/ 0/ 1÷ 5	23/ 13/ 5÷ 5-e1	7/ 1/ 5÷ 5
13.[d,f#,d1,a1]	3/ 0/ 1÷ 5	6/ 0/ 1÷ 5	8/ 0/ 1÷ 5
14.[G,h,d1,g1] *	13/ 8/ 6÷ 5+g	23/ 12/ 6÷ 5+g	23/ 15/ 6÷ 5-G+g
15.[g,g,d1,h1]	3/ 0/ 1÷ 5	5/ 0/ 1÷ 5	6/ 1/ 4÷ 5
16.[H,g,d1,d2]	13/ 9/ 4÷ 5-d2	7/ 1/ 3÷ 5	24/ 15/ 4÷ 5-d2
17.[d,f#,d1,a1]	3/ 0/ 1÷ 5	24/ 10/ 3÷ 5-a1	5/ 0/ 1÷ 5
18.[d,f#,d1,a1]	3/ 0/ 1÷ 5	5/ 0/ 1÷ 5	24/ 13/ 4÷ 5-a1
19.[c,a,e1,e1]	2/ 0/ 1÷ 5	7/ 1/ 3÷ 5	3/ 0/ 1÷ 5
20.[H,h,e1,g1]	4/ 1/ 3÷ 5	4/ 0/ 1÷ 5	10/ 1/ 3÷ 5
21.[A,h,e1,g1]	7/ 4/ 4÷ 5	5/ 1/ 4÷ 5	6/ 0/ 1÷ 5
22.[H,h,d#1,f#1]	3/ 0/ 1÷ 5	5/ 0/ 1÷ 5	4/ 0/ 1÷ 5
23.[H,a,d#1,f#1]	3/ 0/ 1÷ 5	4/ 0/ 1÷ 5	24/ 11/ 4÷ 5-f#1
24.[E,g,h,e1]	3/ 0/ 1÷ 5	7/ 2/ 5÷ 5	-
Наибольшие значения	13/ 9/ 6÷ 5	24/ 13/ 6÷ 5	24/ 15/ 6÷ 5
Средние значения	6/ 2/ 2÷ 5	9/ 3/ 3÷ 5	12/ 4/ 3÷ 5
→ Число верно распознанных аккордов	19	19	16
Наибольшие значения для верно распознанных аккордов	9/ 4/ 5÷ 5	12/ 2/ 5÷ 5	10/ 3/ 5÷ 5
Средние значения для верно распознанных аккордов	4/ 1/ 2÷ 5	6/ 1/ 2÷ 5	7/ 1/ 2÷ 5

UNIVERSITY OF OTTAWA (William McGee)

William McGee, in the Department of Electrical Engineering of the University of Ottawa, is exploring music manuscript capture and analysis using a Hewlett Packard ScanJet and an IBM-PC/XT computer. His software is written in Pascal.

UNIVERSITY OF SURREY (Nicholas Carter)

Nicholas Carter continues work towards a general solution to the problem of automatic pattern recognition of printed music, using a Gould minicomputer and a Hewlett Packard desktop workstation, both running UNIX. Printing utilizes SCORE and a laserprinter supporting PostScript. Success in capturing short monophonic examples from both printed and manuscript sources was reported in May 1988 and was featured in a report carried by the British Broadcasting Corporation. The work is supported by the Leverhulme Trust.

Two articles written in collaboration with Drs. Richard Bacon and Thomas Messenger are in press. They are entitled "Acquisition, Representation and Reconstruction of Printed Music by Computer: A Review" (*Computers and the Humanities*, Vol. 22) and "Automatic Pattern Recognition of Printed Music" (forthcoming in *Computer Vision, Graphics, and Image Processing*).

UNIVERSITY OF WALES (Alastair Clarke)

The thesis research of Alastair Clarke in the College of Cardiff (University of Wales) focuses on "optical character recognition of printed music notation" and is conducted using an IBM-PC compatible computer and an IBM 3117 scanner. Mr. Clarke and his supervisors, Drs. Malcolm Brown and Michael Thorne, presented a talk on "Inexpensive Optical Character Recognition of Music Notation: A New Alternative for Publishers" at the Lancaster conference. They reported success in reading symbols from a single melodic line.

Technical Research:
Perception, Cognition and Performance

The Center wishes to acknowledge the significant amount of activity being devoted to studies concerned with the relationship of the human subject to analytical domains. How music is perceived and how it is organized by the mind into units and structures are subjects receiving attention in many quarters. The technical and experimental nature of these studies has naturally led to the use of the computer in various capacities for data collection, sound generation, data analysis, etc. Because this field has developed an extensive literature of its own, including articles in the quarterly journal *Musical Perception* (published by the University of California Press), activities are not given a full report here. In relation to the study of musical performance, the following areas of research seem to be closely allied to projects reported elsewhere in this *Directory*.

One avenue of current research focuses on diverse ways of performing the same work (usually from recordings) for the purpose of explaining how emotion is communicated. In a few cases, the results are viewed in relation to the work as an intellectual entity. A case in point is Nicholas Cook's "Structure and Performance Timing in Bach's C Major Prelude (WTC I): An Empirical Study," *Music Analysis* **6/3** (1987), 257-272. An overview of such work, "Computer Synthesis of Music Performance" by Johan Sundberg, appears in a new book entitled *Generative Processes in Music: The Psychology of Performance, Improvisation, and Composition*; it is edited by John Sloboda and published by the Clarendon Press, Oxford (1988). In research supported by IBM at the University of Glascow, Stephen Arnold and associates are attempting to categorize performed derivations from notated norms and to study structural problems associated with multimedia representations.

Starting from such questions, research heads off in numerous directions. There are efforts to make machine music sound more human (Anders Friberg, Johan Sundberg *et al.*, Royal Institute of Technology, Stockholm), and it can be seen from the **Applications** section that any number of studies involving the development and refinement of rule systems may stray into or overlap the area of rules for performance. From the perspective of "the psychoneurology of music," Manfred Clynes claims to have uncovered two essential microstructural principles (hierarchical pulse and predictive amplitude shaping, both explained in his contribution to *Action and Perception in Rhythm and Music*, Stockholm, 1987). Some studies diverge towards artificial intelligence. Performance nuance is a constituent part of the comprehensive work being pursued at Osaka University. [see **Optical Scanning**.] While recognizing the inherent interest of such studies, the Center is largely unable to accommodate information about them in the *Directory*.

Theses and Dissertations in Progress

* Clive Broadbent, a postgraduate student at the University of Durham, is attempting to create an analytical workstation capable of tracing constructive routes from inception to finished composition. His efforts utilize a Sun workstation operating under UNIX and an extension of DARMS code.

* Christine Buyle (Belgium) is writing a thesis on computer implementation of a generative grammar for tonal music.

* Nicholas Carter (University of Guildford, Surrey) is seeking a general solution to the problem of automatic pattern recognition of printed music. His research is being conducted in a UNIX-based image processing context. [See **Technical Research**.]

* Alastair Clarke, a research student in the Department of Computing and Mathematics at the University of Cardiff, is working on computer typesetting of music and optical scanning. [See **Technical Research**.]

* Walter Colombo (Mathematics, University of Milan) has completed a thesis involving the development of a series of microcomputer programs to facilitate harmonic analysis based on Schoenberg's theory of tonal regions.

* Chiara Durante is preparing a thesis related to the computer analysis of grouping structure in the TELETAU environment of the CNUCE (Pisa) Musicology Division and the Florence Conservatory.

* Luigi Finarelli (Computer Science, University of Bologna) has completed a thesis involving the development of a series of UNIX-based programs for elementary analysis procedures. His programs use TAUMUS encoding.

* Bruce McLean (Engineering, SUNY Binghamton) completed his thesis, "The Representation of Musical Scores as Data for Applications in Musical Computing." He continues to work on retrieval, query, and analytical software for music applications.

* Neil G. Martin's final year project for a B.Sc. in computer science at Thames Polytechnic, London, "Towards Computer Recognition of the Printed Musical Score," was completed in May 1987. [See **Technical Research**.]

* Stephen Page (Computer Science and Music, Oxford University) continues work on a "Query System for Music Information Retrieval." His approach favors description-oriented queries over special-purpose programs and operates on DARMS-encoded data.

Comprehensive Publications (In press)

PASCAL PROGRAMMING FOR MUSIC RESEARCH

Alexander Brinkman's book on *Pascal Programming for Music Research* will be published by the University of Chicago Press in 1989.

COMPUTATIONAL MUSICOLOGY IN ITALY

Lelio Camilleri's "Computational Musicology in Italy: an Overview of Basic Concepts and Applications" will appear shortly in *Leonardo*. A shorter version of the same material will be published in "Musletter."

COMPUTER APPLICATIONS IN MUSIC

Deta Davis's bibliography, *Computer Applications in Musicology*, will be published by A-R Editions in September 1988. More than 4500 listings covering 25 topics are included.

JOURNAL OF COMPUTATIONAL MUSICOLOGY

As an outgrowth of the Lancaster meeting, Alan Marsden has proposed the initiation of a *Journal of Computational Musicology* to cover papers of three kinds: (1) musicological research using computers, (2) discussions of problems and issues in the use of computers in musicology, and (3) descriptions of software of actual and potential use to musicologists. Detailed planning is currently in progress.

MUSICIAN'S MUSIC SOFTWARE CATALOG

The third *Musician's Music Software Catalog* is an 81-page listing of commercial music software products offered by Digital Arts and Technologies (P.O. Box 11, Milford, CT 06460). Illustrations and detailed specifications are given for many products. The listing is current through January 1988.

MUSIKOMETRIKA

The first volume of *Musikometrika*, edited by M. G. Boroda, was to be issued in June 1988. It includes contributions from the United States, Canada, Romania, and the USSR on such topics as melodic analysis, rhythmic organization, generative grammars for musical analysis, and quantitative analysis of musical language and musical text.

Resource List for Humanities Computing Information

BITS AND BYTES . . .

Bits, Bytes, and Biblical Studies by John J. Hughes, the editor of the monthly academic software product report called *Bits and Bytes Review*, is a resource of value far beyond the confines suggested by its title. The lists of academic and computer abbreviations and acronyms appended to the preface will be very useful to many novice users trying to read technical literature, but the heart of the book is constituted by the 300 plus pages devoted to academic word processing programs. While these necessarily extend to programs primarily suited to ancient languages in non-Roman alphabets, they give succinct coverage to the most popular programs of general value in humanistic disciplines. *BBB* is available from the Zondervan Publishing House in Grand Rapids, Michigan.

HUMANITIES COMPUTING YEARBOOK

The first volume of *The Humanities Computing Yearbook* is scheduled for publication in the summer of 1988. The editors are Ian Lancashire and Willard McCarty and the editorial address is c/o the University of Toronto, 14th Floor, Robarts Library, 130 St. George St., Toronto, Ont. M5S 1A5, Canada. The publisher is Oxford University Press. The emphasis is to be on text-based disciplines.

THE SCHOLAR'S PERSONAL COMPUTING HANDBOOK

The Scholar's Personal Computing Handbook: A Practical Guide by Bryan Pfaffenberger is an introduction to electronic scholarship that explains basic concepts and principles and identifies widely used products and services. It is published by Little, Brown and Co. and is available in paperback.

Humanities Research Tools

DISSERTATION ABSTRACTS

University Microfilms International offers a CD-ROM version of *Dissertation Abstracts* from 1861 through 1984. Two archival disks (the first containing all listings through June 1980) and a current edition with more recent information constitute the set, which is priced at an institutional rate ($5,495 for the archival set; $1,695 for the update).

OXFORD CONCORDANCE PROGRAM

A microcomputer version of the Oxford Concordance Program, originally written by Susan Hockey for mainframe computers with a FORTRAN77 compiler and now revised for the IBM PC and compatibles with the help of Jeremy Martin, was released by Oxford University Press early in 1988. A description of its capabilities can be found in *Literary and Linguistic Computing* **2/2** (1987), 125-131. The program works with data in several input formats and it is claimed that it can perform its tasks with alphanumerically encoded musical data.

OXFORD ENGLISH DICTIONARY

The CD-ROM edition of the *Oxford English Dictionary* was published on December 3, 1987, by Oxford University Press. Eight tagged fields can be searched with appropriate software. The price of the two-disc edition is $1250.

RECORDS OF EARLY ENGLISH DRAMA

The Records of Early English Drama project, initiated in 1975 to locate and edit all surviving documentation concerning English drama and minstrelsy up to 1642, is seeking to make its materials available in machine-readable form. Several volumes are available in book form (from the University of Toronto Press, 5021 Dufferin Street, Downsview, Ontario M3H 5T8). The studies of Norwich and Cambridge are particularly rich in musical information.

THESAURUS LINGUAE GRAECAE

The "C" version of the *Thesaurus Linguae Graecae* became available on CD-ROM in May 1988. This disc has three main components: (1) a databank consisting of 41 million words of text (primarily in Greek), (2) an index to this material, and (3) a machine-readable version of the TLG Canon. At its headquarters in Irvine, California, the TLG continues to provide individual searches on request. A modest fee is charged.

TREASURY OF THE FRENCH LANGUAGE

"Le Trésor de la langue Francaise" was the title of a project started in France in 1963 to compile a dictionary of the French language by using a wordbank culled from machine-readable texts of the core works of modern French literature. In 1983 the database was made available through the University of Chicago. For further information, contact Robert Morrissey, Department of French, the University of Chicago, Chicago, IL 60637.

FRANTEXT is a textual database of 2600 French texts from the seventeenth century to the present and is largely drawn from the TLF. FRANTEXT may be searched by author, title, genre, and date. Dramatic works and poetry are included. For information concerning remote access, contact CNRS-Institut National de la Langue Française, Service FRANTEXT, 52 boulevard de Magenta, 75010 Paris, France.

Music Printing

Music printing continues to attract great interest and to show rapid progress. A general description of methods of music input was provided in the 1985 *Directory*, and a general description of the problems of printing music by computer appeared in the 1986 *Directory*. A comprehensive listing of past and (then) present systems plus a general description of the internal representation of musical data were given in the 1987 *Directory*.

The Center distributed for this directory selected musical examples for reproduction by currently active music software developers. For novice users and for software developers alike, the opportunity to compare results between systems is widely welcomed. We selected a six-part (unaccompanied) motet by Tallis and an excerpt from Beethoven's "Harp" Quartet, Op. 74. Samples of both works were distributed to all software developers on our list as of February 1988 (our current list of music printing software developers is given at the rear of the *Directory*). The Tallis examples, with non-coincident text overlay and underlay, proved to be problematical more frequently than did the Beethoven quartet, with its rhythmic juxtapositions (2:3, 3:4, 3:8), beamed grace notes and slurs. While both examples test the technical limits of some systems, they represent common needs of the traditional repertory and therefore of ordinary musicians. All contributions of these set pieces that we received are reproduced here.

Each developer was also given the opportunity to provide one page of additional material. Contributions that were received late or which contained material under third-party copyright could not be reproduced. Except for photographic reduction when required, all material is reproduced exactly as received.

This year's contributions come from the following categories: (1) proprietary systems, (2) music printing programs for personal computers (Apple Macintosh, IBM PC compatibles, Atari, and others), (3) academic research systems, and (4) products designed to produce musical examples in the context of running verbal text. A few developers fall into multiple categories. Amadeus Music Software, for example, operates a music printing service and makes systems available for purchase. A number of developers of software for personal computers also offer in-house typesetting services. Oberon Systems offers an archiving service for musical data. Contributors in the first and second categories have concentrated on the set pieces.

With regard to software for personal computers, prospective users should bear in mind that the input process may involve any of the following methods:

* alphanumeric encoding
* alphanumeric encoding with keyboard redefined for music
* alphanumeric encoding with keyboard for text and auxiliary keypad for music
* musical instrument (MIDI) entry of pitch and rhythm
* musical instrument entry of pitch with alphanumeric entry of rhythm
* assembly of score from screen icons
* assembly of score from lightpen identification of musical objects

In general, music entry software for Apple products favors MIDI (synthesizer keyboad) input and/or use of screen menus and icons, while IBM PC-oriented software favors alphanumeric input. To overcome the user-unfriendliness of raw alphanumeric systems of representation, several developers redefine the QWERTY keyboard with templates using familiar musical symbols. Two keyboard redefinition schemes are shown on the following page.

Input methods have important implications for the uses that may be made of the stored data. Users whose requirements extend to musical indexing and analysis will want to consider whether the musical information stored is sufficiently complete and adequately accessible to support these activities. Users whose only requirement is for music printing can base judgments on output only.

All contributors were asked to identify the equipment they used in creating the examples. Some volunteered additional information about input time, printing speed, and other benchmarks of their systems. Readers should bear in mind that some examples are reduced in size to fit our page and that reduction sometimes enhances clarity. Contributors were asked to specify whether reduction had already occurred, since some contributions arrived unretouched and others arrived carefully manicured. A few systems are fully automatic, most are largely automatic, and a few are hybrid systems in which notes are placed and printed automatically but other elements of the score--especially beams, slurs, and performance specifications--are added by graphic artists (for an example of this process, see illustrations 7 and 8). Not uncommonly, the ratio of automatic to manual features varies within one system according to the particular hardware devices used; multiple versions of a program are each intended to accommodate different hardware configurations.

Academic systems are generally intended for multiple uses, of which music printing is only one. Some systems, such as that of LaTrobe University in Australia, are tailored to the needs of particular repertories. Others, such as the one under development at Oslo University, are intended to support diverse activities (sound synthesis, artificial intelligence, musical analysis). Those shown this year have not been shown in previous directories.

We list below, in alphabetical order of product or system names the enterprises represented in the 54 accompanying illustrations. Illustration numbers are shown in square brackets. The illustrations are arranged by host computer type and alphabetically within each category. Businesses producing software for music printing are listed alphabetically in the address list. For specific product information, please contact these companies or the developers whose names appear in parentheses.

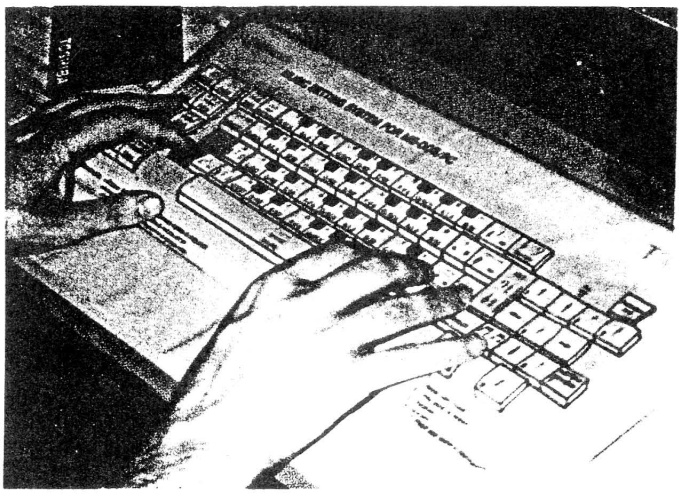
Contributors

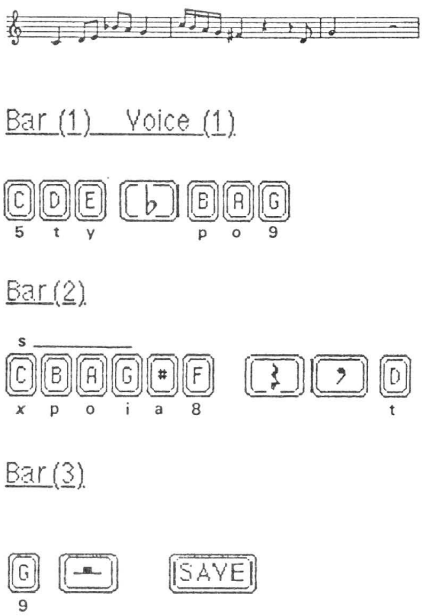
A-R Editions [#1 - #2]. Proprietary system developed by Tom Hall. Inhouse and contract typesetting of music.

Alpha/TIMES [#9]. Commercial (Apple). TIMES stands for Totally Integrated Musicological Environment System. Unusual input system (voice recognition device with light

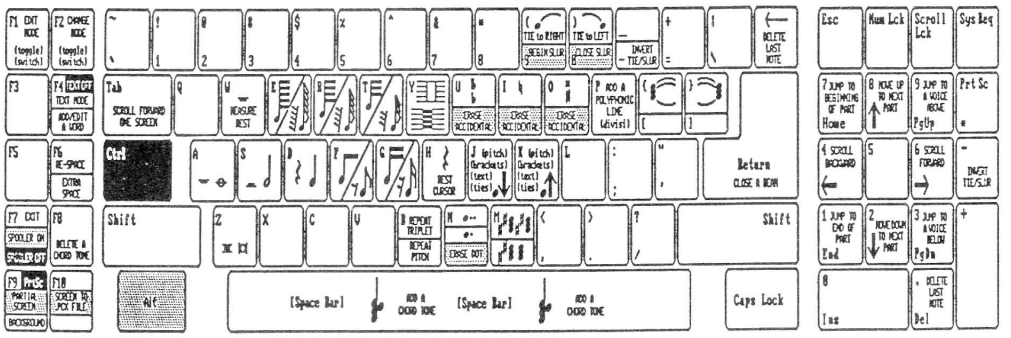
Keyboard Redefinition Schemes

(a) **La mà de guido**: all letter and number keys of the QWERTY keyboard have a pitch equivalent.





(b) **THEME: The Music Editor**--many alphabetic keys are used for rhythmic information.



Keyboard Layout and Keyboard Commands©1986,1987,1988
for THEME, The Music Editor©1986,1987,1988

Used by permission

pen) permits accurate reproduction of non-common notation. The system incorporates graphics editors, a font editor, and a communication system. It supports certain analytical tasks. Christoph Schnell is the developer.

Amadeus Music Software [#3 - #5]. Originally a proprietary system developed by Kurt Maas; now commercially available. Uses UNIX-like operating system. Contract typesetting for music publishers.

The Copyist [#18 - #19]. Commercial product (Dr. T's Music Software) for the Atari microcomputer. Cris Sion is the developer.

Dai Nippon Music Processor [#43]. Hardware/software combination dedicated to the production of musical scores. Includes file interchange with research system at Waseda University. Previously proprietary, the system is now available in a commercial version.

Dal Molin Musicomp [#6 - #8, #32]. Proprietary system (Columbia Pictures). Commercial version for IBM PC using auxiliary keypad for pitch entry is in preparation. Armando Dal Molin is the developer.

ERATTO [#47 - #48]. Parisian research center in which the encoding, printing, and analysis of lute music have flourished for many years. Current capabilities are shown in the illustrations. Current software development is by Bernard Stepien; Hélène Charnasse is the resident musicologist.

EZ-Score Plus [#20]. Commercial product for the Atari 1040ST sold by Hybrid Arts. Tom Bajoras is the developer.

la mà de guido [Guido's Hand; #21 - #23]. This previously proprietary system from Spain is now available for the IBM PC XT and AT. Alphanumeric input usesg redefined QWERTY keyboard (see illustration). Contract typesetting for music publishers. The developer is Llorenç Balsach.

MUSED [#51 - #54]. This research system under development at Oslo University supports interactive analysis and music printing. Programs are currently being modified to move to VaxStation II.

Music Editor [#24 - #25]. Commercial product for IBM PC compatibles offered by Oberon Systems. Includes custom fonts. Data archiving service available to users.

Music Processor [#26 - #27]. Academic input and printing system developed by Etienne Darbellay for IBM PC compatibles. Commercial development is under consideration.

Music Publisher [#10 - #11]. Commercial product (Graphic Notes) for the Apple Macintosh. Trevor Richards is the developer. Requires separate "presto pad" for input.

Musicwriter II [#40 - #42]. System for printing musical examples with a modified typewriter (IBM Wheelwriter). Cecil Effinger is the developer.

MusiKrafters [#44 - #46]. Software company providing special-purpose products for musical excerpts and unusual notations for the Apple Macintosh. Robert Fruehwald is the developer.

MusScribe [#12 - #14]. Commercial product for the Apple Macintosh by Keith Hamel, whose company is now called SoftCore Music Systems.

Nightingale [#15 - #16]. Commercial product under development by Don Byrd for the Apple Macintosh. His company is called Advanced Music Notation Systems.

Note Processor [#28 - #29]. Commercial product for IBM PC compatibles developed by Stephen Dydo. Uses alphanumeric input with mouse editing. MIDI input is under development. Contract typesetting available for music publishers.

PARD [#30 - #31]. Music printing system under development in Milan. The system is mainframe based, with plotter output. The developers are Walter Prati and Giorgio Ceroni.

Professional Composer [#17]. Commercial product for the Apple Macintosh offered by Mark of the Unicorn. MIDI output provided by Professional Performer.

SCORE [#33 - #36]. Originally an academic research system developed by Leland Smith at Stanford University. A PC version is now available from Passport Designs. System is currently in use by several commercial music publishers and some research facilities (*e.g.*, optical scanning unit at the University of Surrey). Includes alphanumeric input, forty music fonts and PostScript text font compatibility.

SCRIBE [#49 - #50]. Academic research system developed jointly by La Trobe and Melbourne Universities for fourteenth-century music. Can interleave red and black neumes to reproduce colored notation in its original format. Some programs available on site-license basis for IBM PC compatibles. Software development by John Griffiths; John Stinson is the head musicologist.

THEME, The Music Editor [#37 - #39]. Academically oriented commercial product for IBM PC compatibles. Alphanumeric input using redefined keyboard (see illustration). Provision for MIDI output. Mark Lambert is the developer.

Correspondents

Much additional activity is taking place in the field of computer-assisted music printing. We list below additional sites and products whose directors or developers have been in recent touch with the Center:

ETH (Zurich). Giovanni Müller and Raffaello Giuletti, who work at the Eidgenössische Technische Hochscule in Zurich, are attempting to define a class of naturally parameterizable formatting operations in the continuing development of a high-quality music printing system at their institute.

Finale. A commercial program for the Apple Macintosh currently being beta-tested. A version for the IBM PC is under development. Coda Software, a division of the Wenger Music Learning Corporation, is the distributor.

HB Music Engraver. A recently-released commercial program for the Apple Macintosh. Alphanumeric input using keyboard redefinition. Supports both PostScript "Sonata" font and a custom font called "Interlude." Can convert files from Professional Composer. The distributor is HB Imaging, Inc.

Laboratorio Informatica Musicale. The LIM printing system, under development by Goffreddo Haus, Luigi Finarelli and associates at LIM (University of Milan), utilizes an Apple Macintosh in a research and electronic music setting. The system is designed to accept data in several codes and formats.

Oxford Music Processor. A commercial product for the IBM PC used with Epson dot matrix printers and HPGL plotters currently being beta-tested. Alphanumeric input using keyboard redefinition. The distributor is Oxford University Press.

Ohio State University. Extensive research project concerned with the development of a MusiCopy Language Processor terminated in late 1987. The project was headed by John Gourlay. Actual printing was oriented towards the Xerox 2700, a character-oriented laser printer. Dean Rousch's "Music Formatting Guidelines" (OSU-CISRC-3/88-TR10) is a systematic listing of the main graphic elements of common musical notation (CMN). The algorithm described in "Optional Line Breaking in Music" (OSU-CISRC-8/87-TR33) by Wael Hegazy and John Gourlay represents an effort to extend the line-breaking model developed by Donald Knuth for TeX.

Staatliches Institut für Musikforschung. Music printing programs written in FORTRAN in the early 1970's by Norbert Böker-Heil for IBM 360 input and output from a Digiset T 41 typesetter are currently under revision. The new programs will be written in C, will operate initially under MS-DOS and later under the UNIX operating system, and will be PostScript compatible. The existing system has been used to produce scores for music publishers. Questions regarding its use may be directed to the firm of Satz-Rechen-Zentrum in Berlin.

Illustration 1

Proprietary Systems
A-R Music Engraving System (A-R Editions, Inc.)

Input device: DG S-130
Output device: Linotron 202

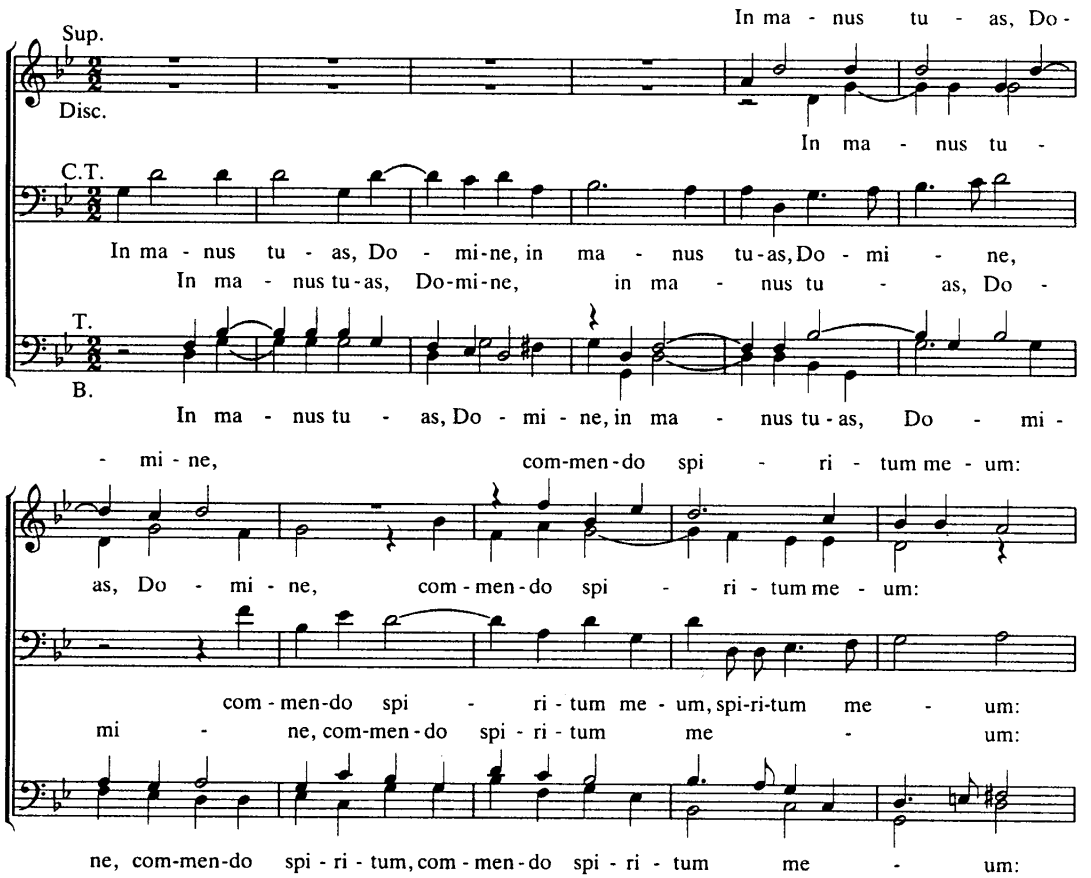


Illustration 2

Proprietary Systems
A-R Music Engraving System (A-R Editions, Inc.)

Input device: DG S-130
Output device: Linotron 202

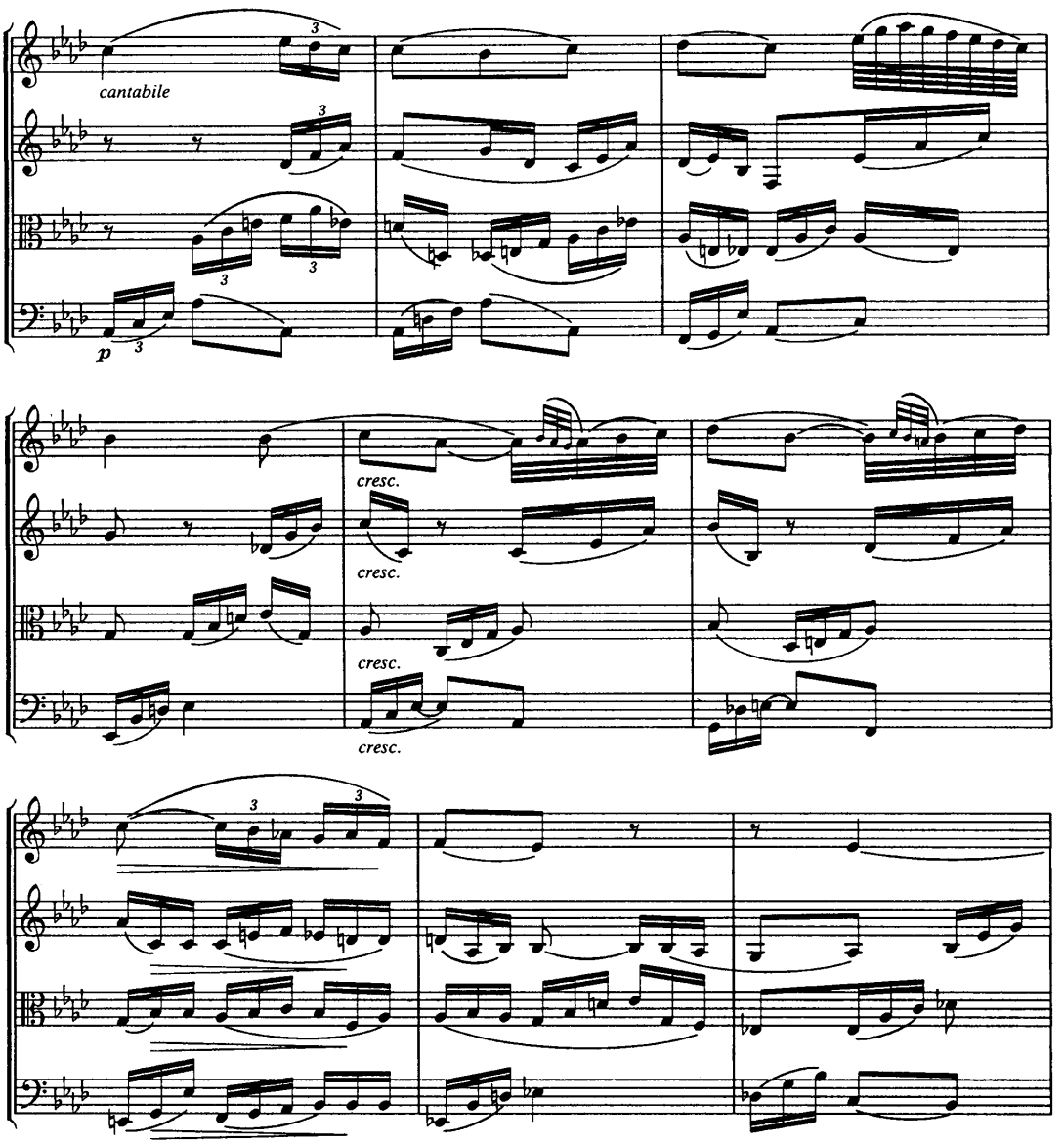


Illustration 3

Proprietary Systems
Amadeus Music Software GMBH (Notenversand Kurt Maas)

Input hardware: PDP-11 (UNIX), Atari workstation, MIDI keyboard
Output device: Amadeus Lasersetter
Alternative output devices: various dot matrix printers, plotters, Monotype Lasercomp

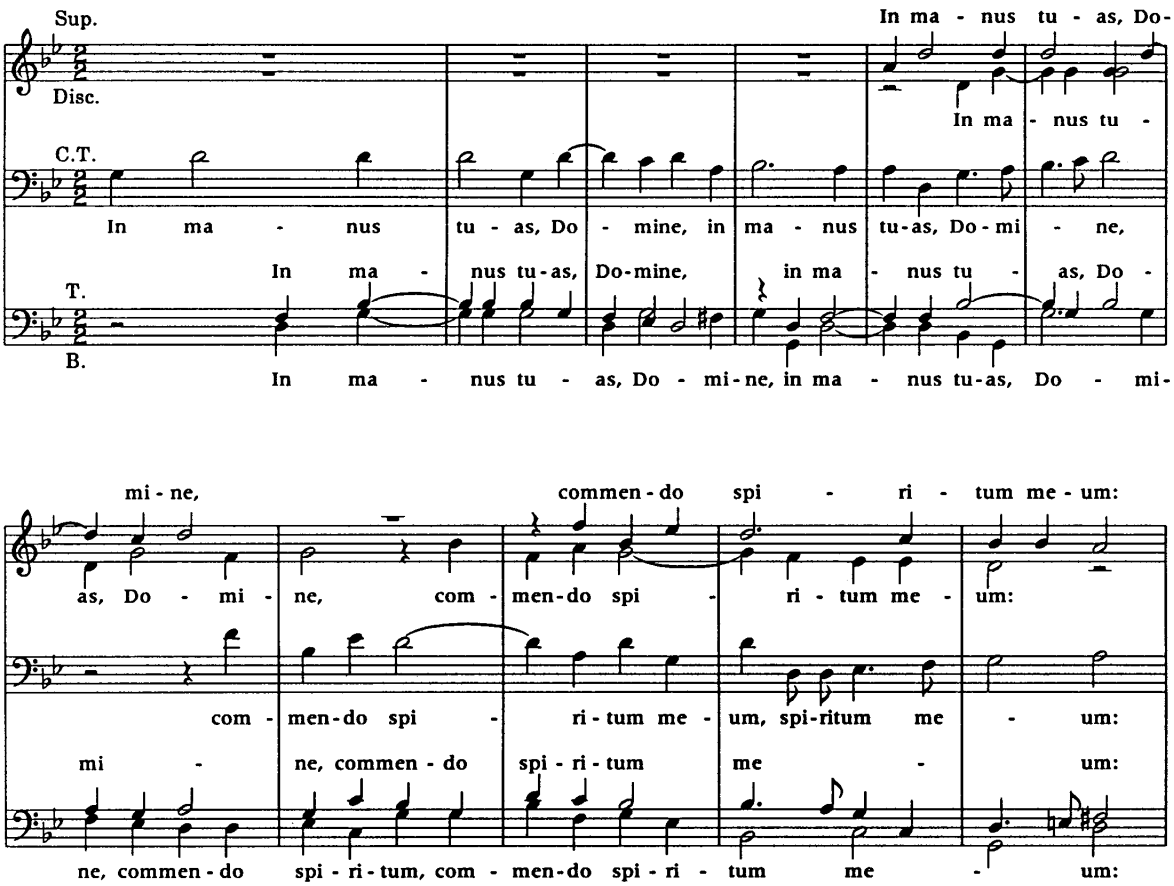


Illustration 4

Proprietary Systems
Amadeus Music Software GMBH (Notenversand Kurt Maas)

Input hardware: PDP-11 (UNIX)
Output device: Amadeus Lasersetter
Alternative output devices: various dot matrix printers, plotters, Monotype Lasercomp

Reduced

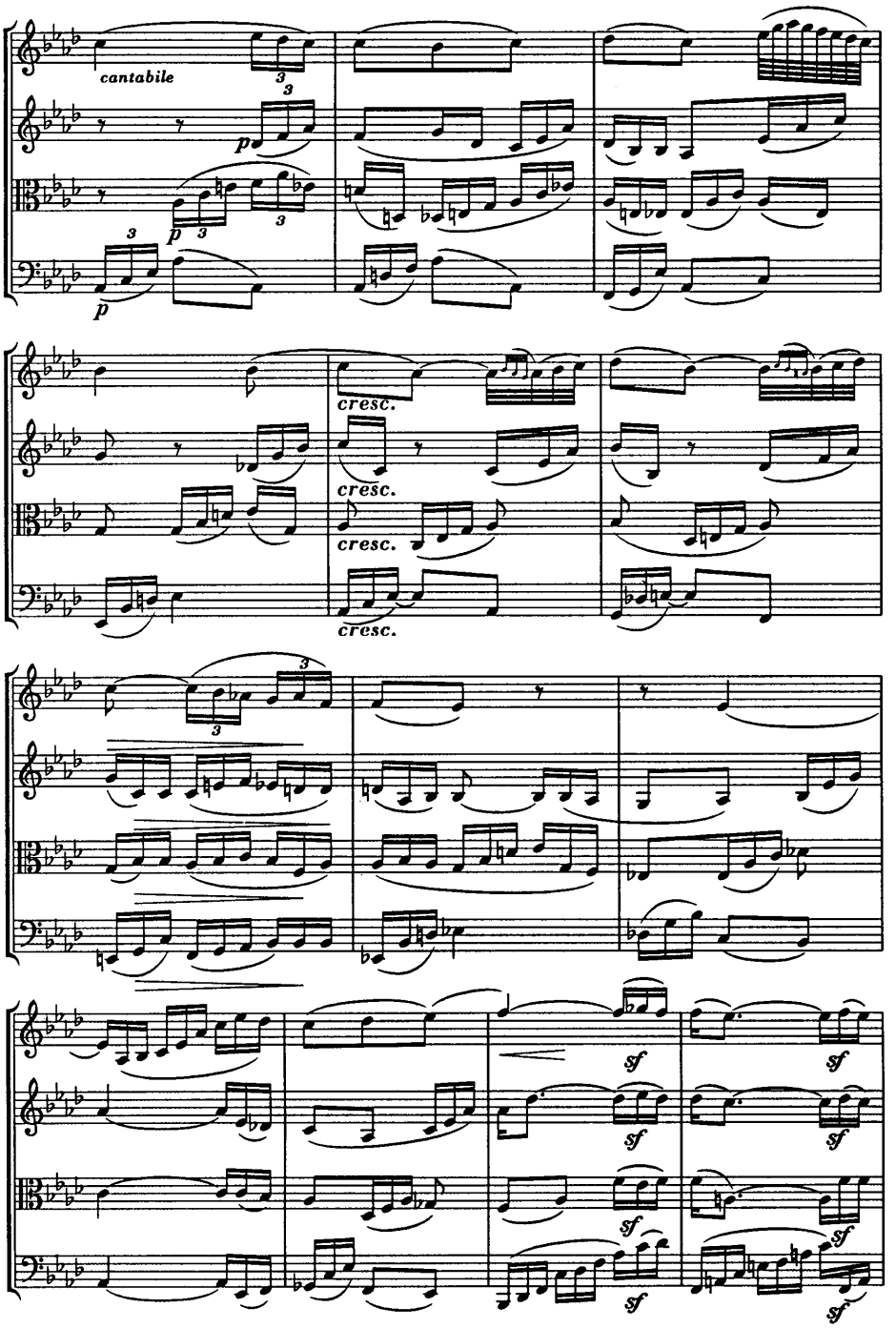


Illustration 5

Proprietary Systems
Amadeus Music Software GMBH (Notenversand Kurt Maas)

Input hardware: PDP-11 (UNIX), Atari workstation, MIDI keyboard
Output device: Amadeus Lasersetter
Alternative output devices: various dot matrix printers, plotters, Monotype Lasercomp

Reduced

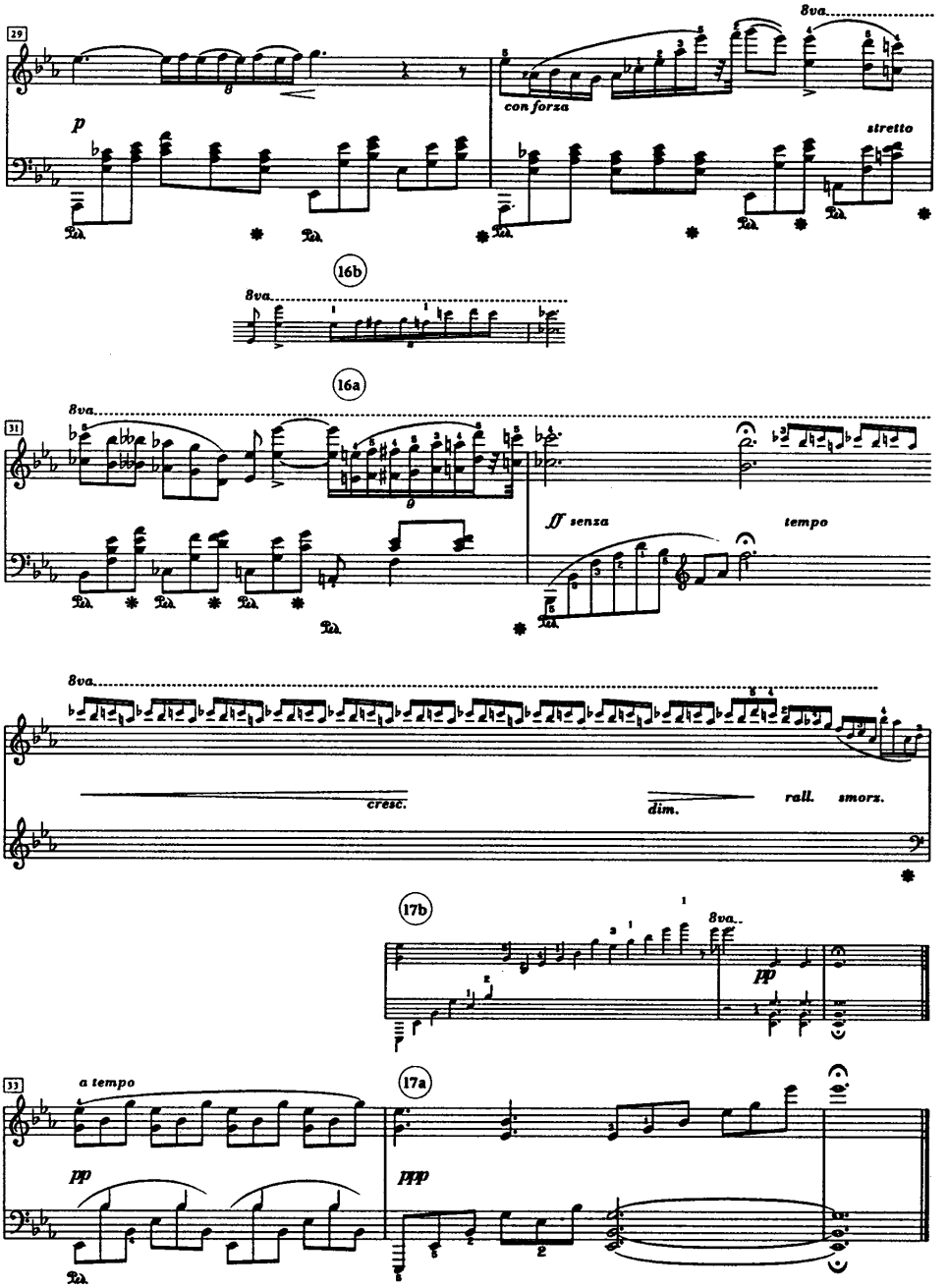


Illustration 6

Proprietary Systems
Dal Molin Musicomp-Rev. 3 (Columbia Pictures Publications)

Input device: Musicomp PCS-500 terminal
Output device: Linotype Omnitech laser typesetter
Music font: Linotype Universal Music (revised)

Input time: 23 min.
Printing time: 3 min.

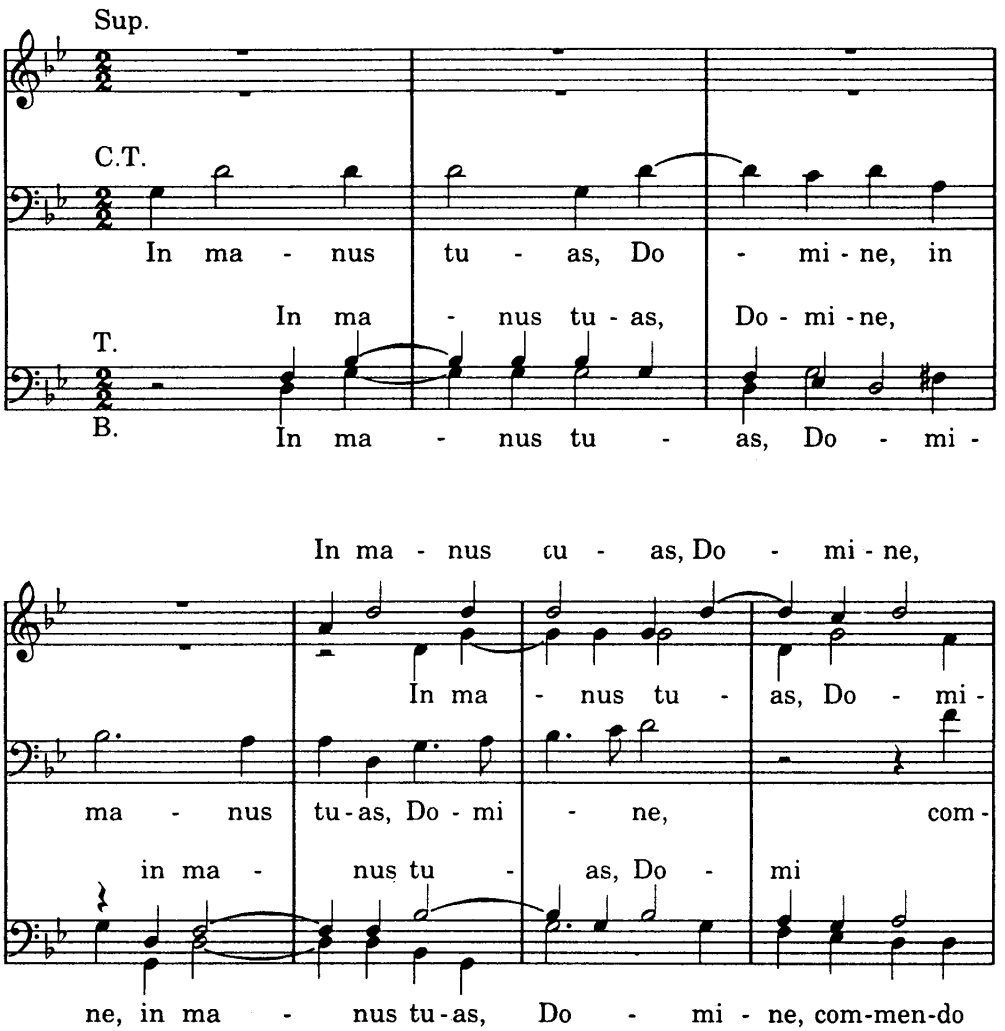


Illustration 7

Proprietary Systems
Dal Molin Musicomp-Rev. 3 (Columbia Pictures Publications)

Input device: Musicomp PCS-500 terminal
Output device: Linotype Omnitech laser typesetter--automatic elements
Music font: Linotype Universal Music (revised)

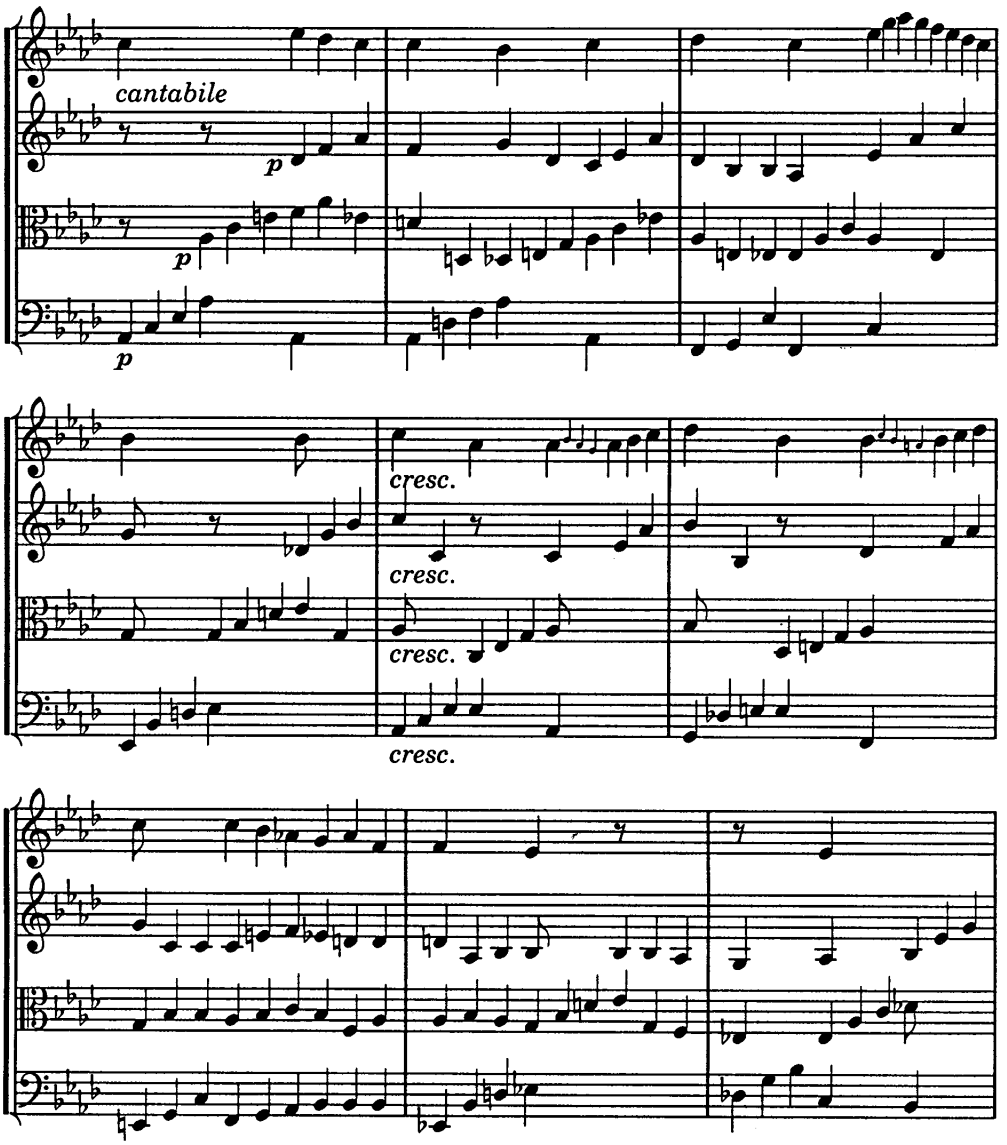


Illustration 8

Proprietary Systems
Dal Molin Musicomp-Rev. 3 (Columbia Pictures Publications)

Input device: Musicomp PCS-500 terminal
Output device: Linotype Omnitech--graphic completion
Input time: 30 min. (input: Steve Einbinder)
Graphic additions: 30 min. (artist: William Moy)
Printing time: 3.5 min.

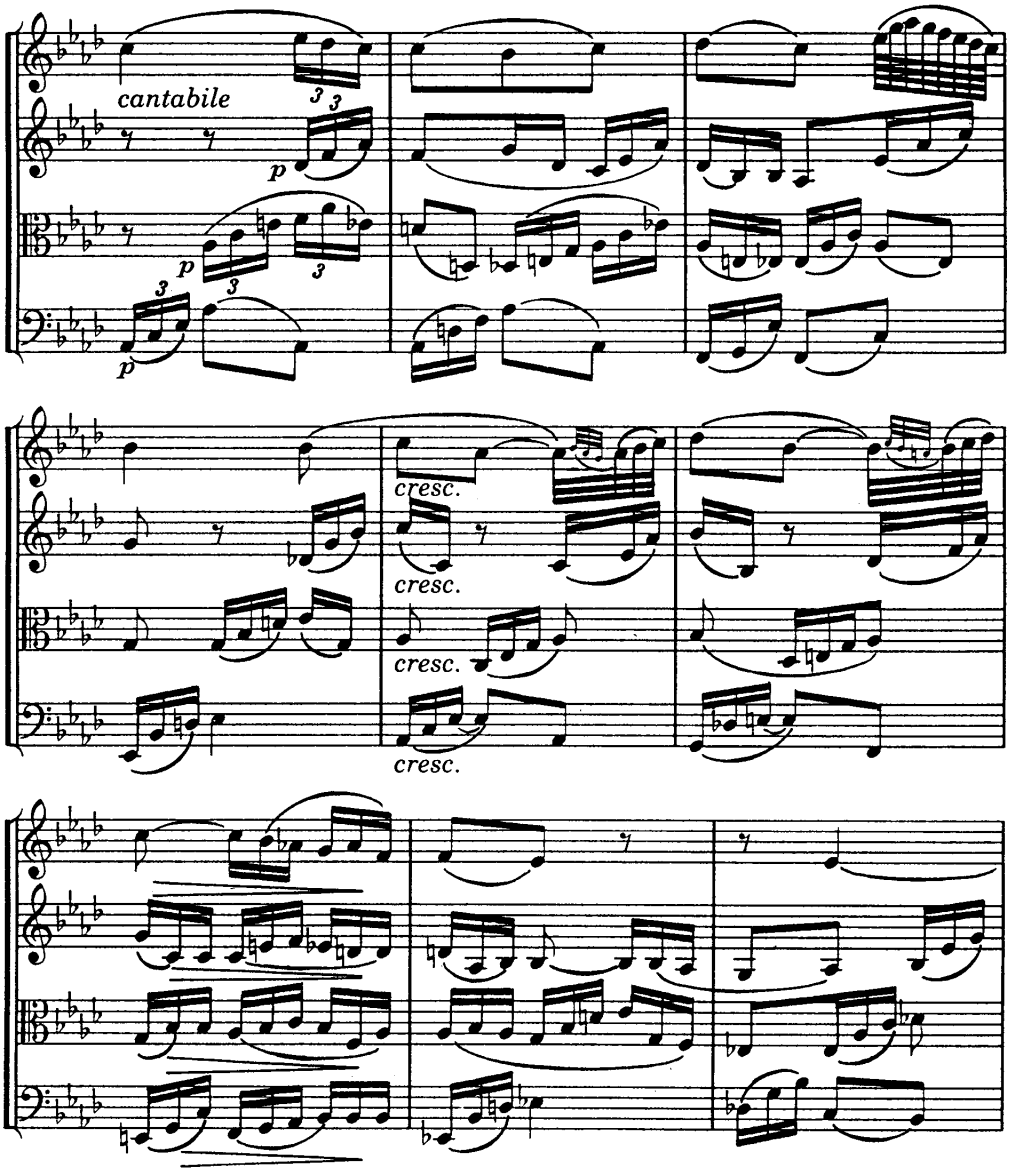


Illustration 9

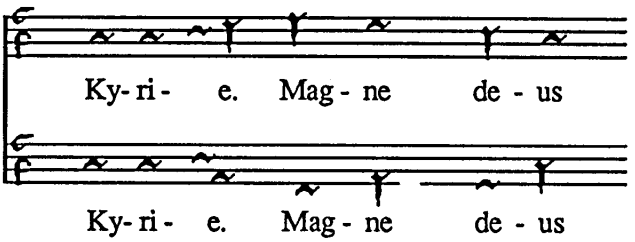
Commercial Software--Apple Macintosh
Alpha/TIMES (Christoph Schnell)

Input device: Ultrasonic digitizer
Host computer: Macintosh SE or II
Output device: Unspecified laser printer
Status: available as part of a comprehensive system

A. Spacing of original manuscript (Engelberg 314) preserved

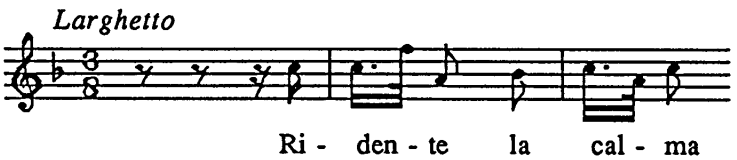
B. Incipit followed by automatically generated (1) DARMS code, (2) sequence of scale degrees, and (3) sequence of melodic intervals ["gr" = grosse (major), "kl" = kleine (minor)]

A. Kyrie. Magne deus potencie liberator



DARMS: 23!F 24P 24P 25P 26V 27V 26P 25V 24P
73!F 74P 74P 75P 72P 70P 72V 71P 74V

B. Ridente la calma Wolfgang Amadeus Mozart



(1) 23!G !K-25 !M3/8 RE RE RS 26S / 26S. 29T 24E 25E / 26S. 24T 26E
(2) c 1 4 ,6 ,7 1 ,6 1
(3) re1 +re4 -kl6 +kl2 +gr2 -kl3 +kl3

Illustration 10

Commercial Software--Apple Macintosh
Music Publisher (Graphic Notes)

Input device: Macintosh SE with Graphic Notes Presto Pad
Output device: Variatyper VT600 (600 d.p.i.); PostScript compatibles
Status: available

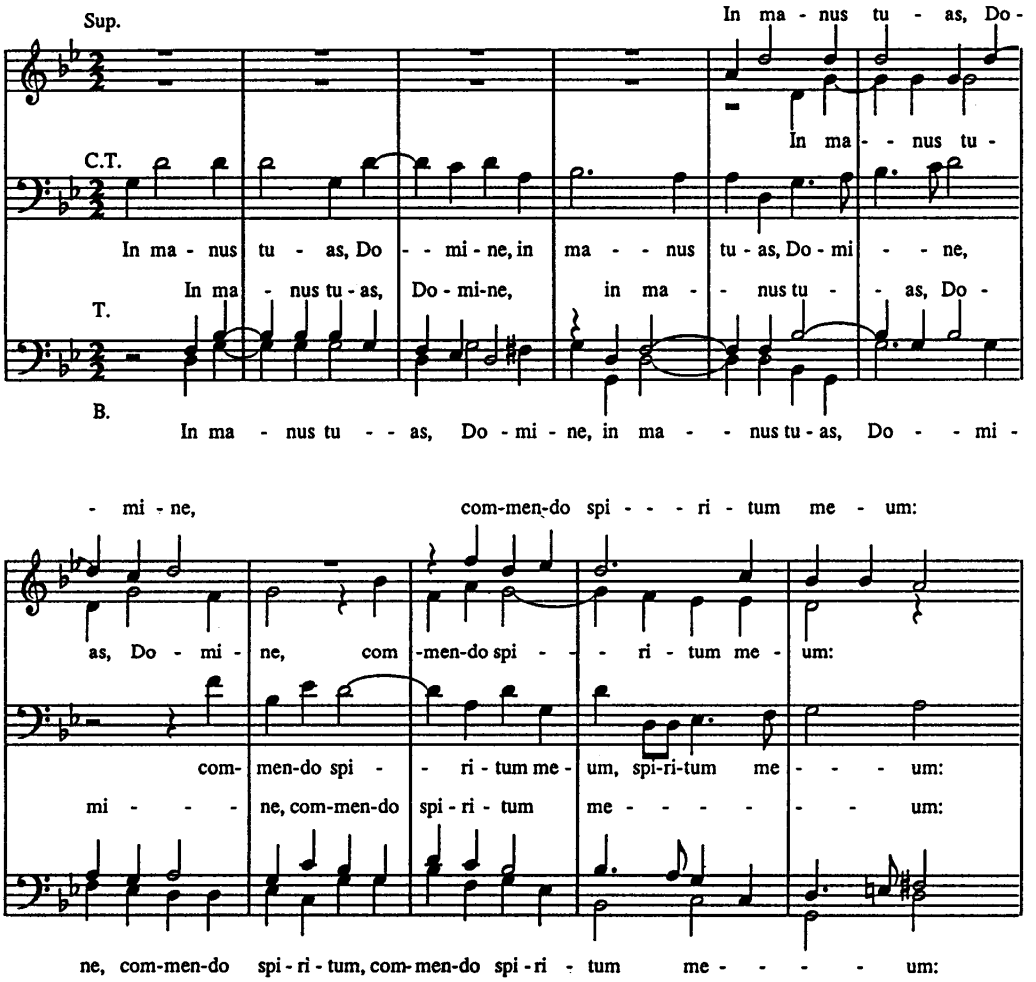


Illustration 11

Commercial Software--Apple Macintosh
Music Publisher (Graphic Notes)

Input device: Macintosh SE with Graphic Notes Presto Pad
Output device: Variatyper VT600 (600 d.p.i.); PostScript compatibles
Status: available

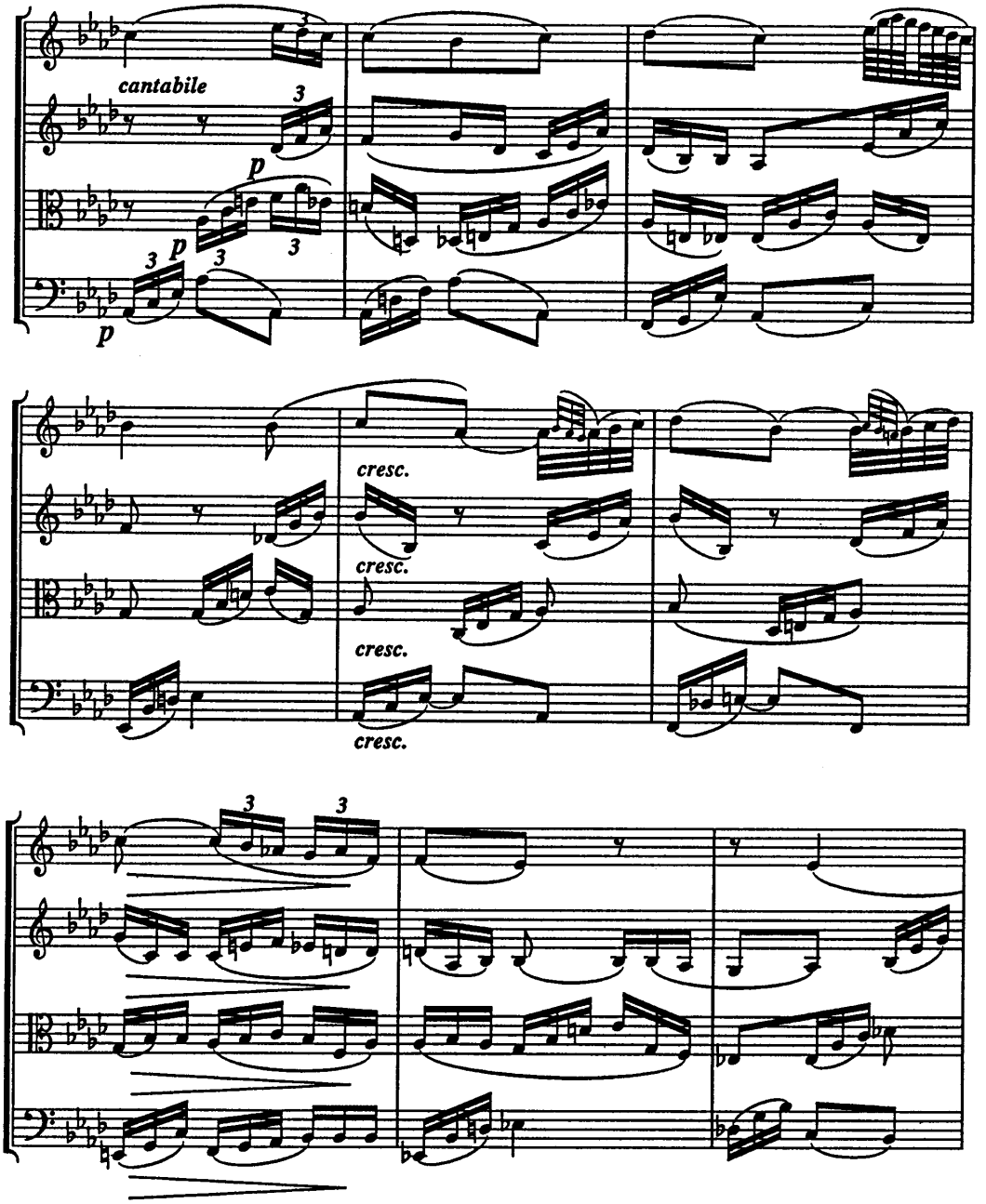


Illustration 12

Commercial Software--Apple Macintosh
MusScribe (Keith Hamel/ SoftCore Music Systems)

Input device: Macintosh
Output device: Linotronic L100 phototypesetter (1270 dots per inch)
Status: available

70% reduction

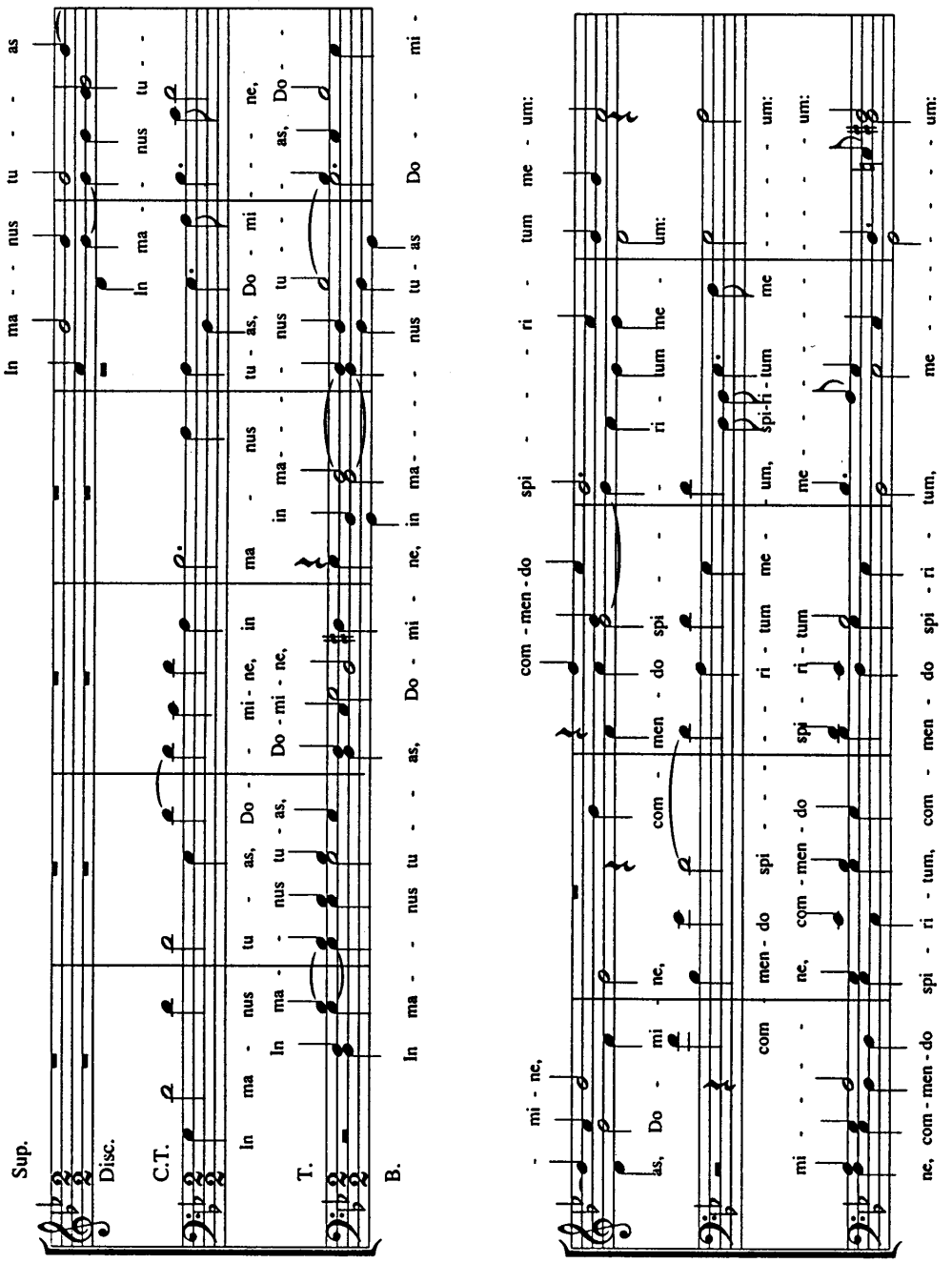


Illustration 13

Commercial Software--Apple Macintosh
MusScribe (Keith Hamel/ SoftCore Music Systems)

Input device: Macintosh
Output device: Linotronic L100 phototypesetter (1270 dots per inch)
Status: available

80% reduction

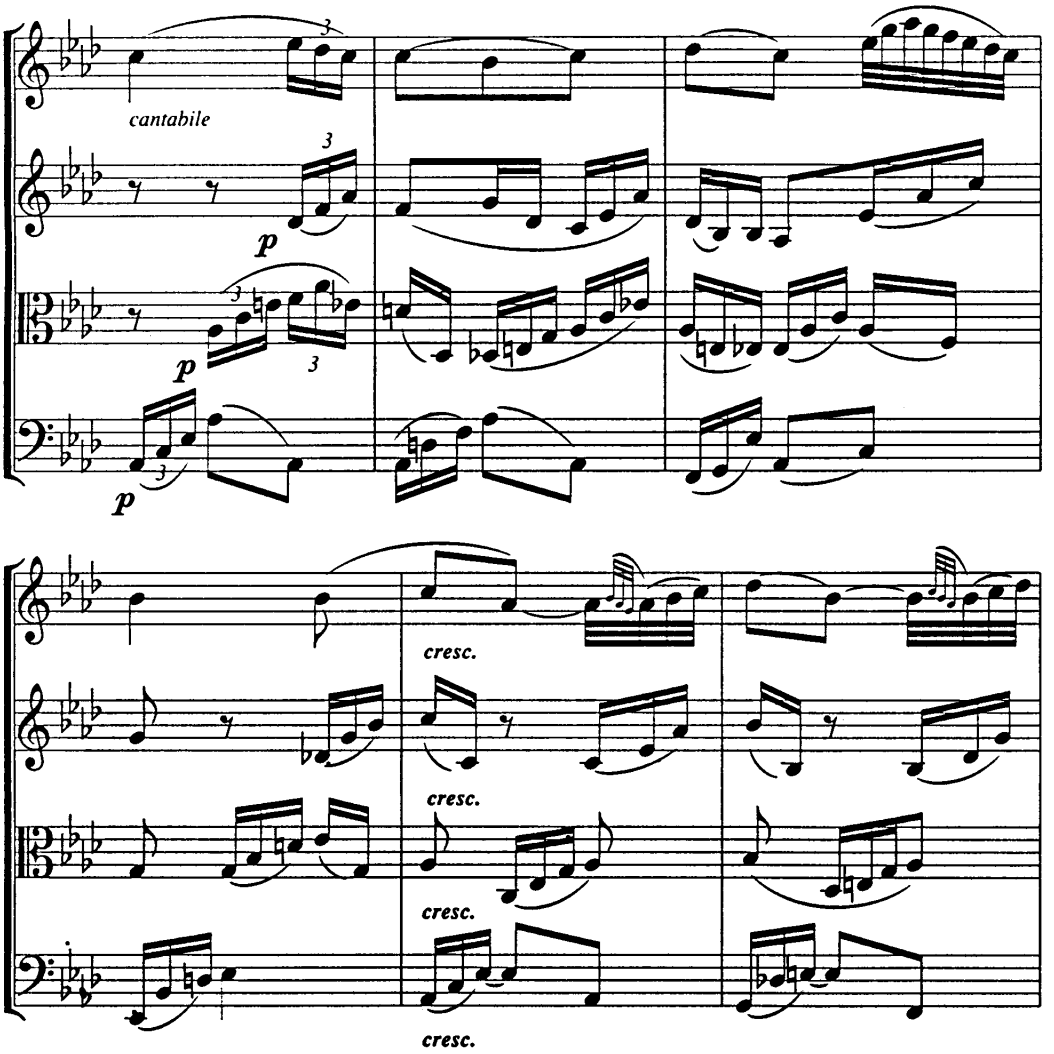


Illustration 14

Commercial Software--Apple Macintosh
MusScribe (Keith Hamel/ SoftCore Music Systems)

Input device: Macintosh
Output device: Apple LaserWriter
Status: available

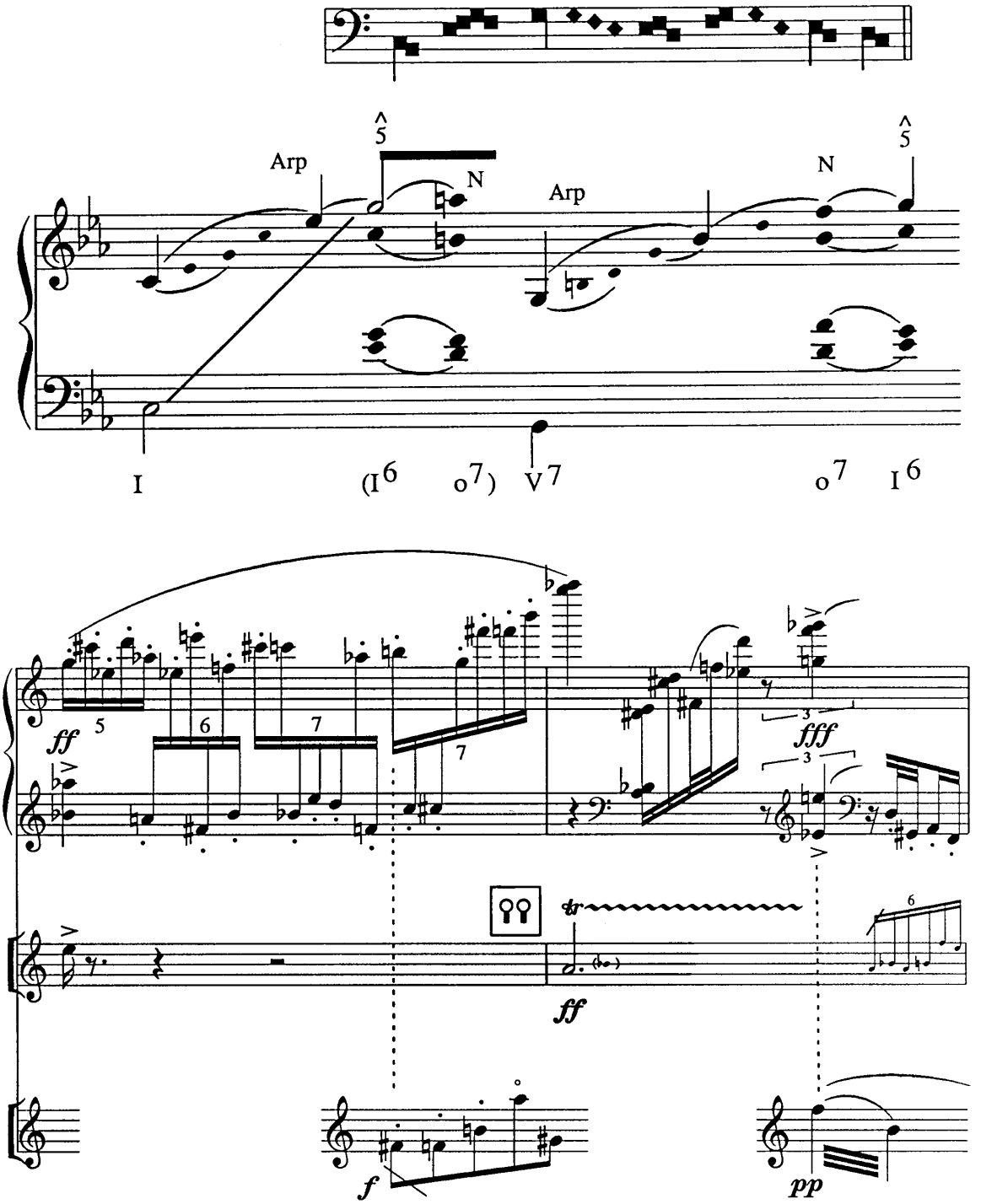


Illustration 15

Commercial Software--Apple Macintosh
Nightingale .70 (Don Byrd/ Advanced Music Notation Systems)

Input device: Macintosh
Output device: Linotronic 300
Status: under development

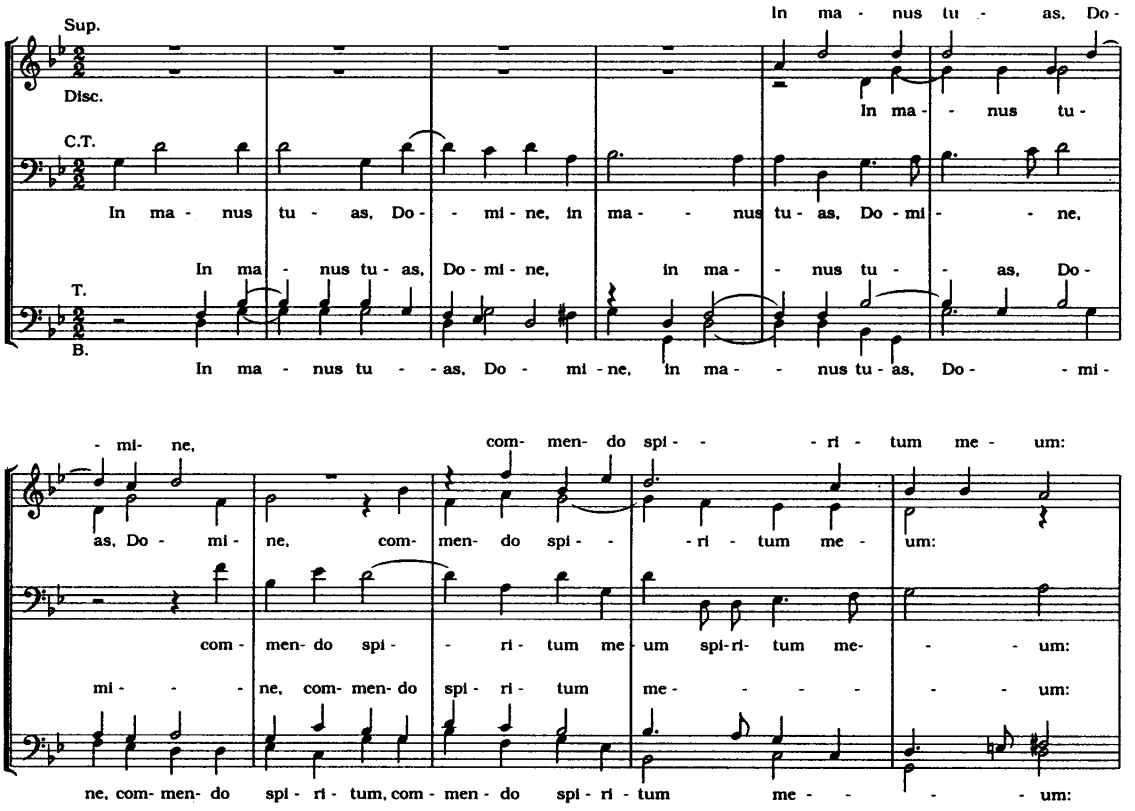


Illustration 16

Commercial Software--Apple Macintosh
Nightingale .70 (Don Byrd/ Advanced Music Notation Systems)

Input device: Macintosh
Output device: Linotronic 300
Status: under development

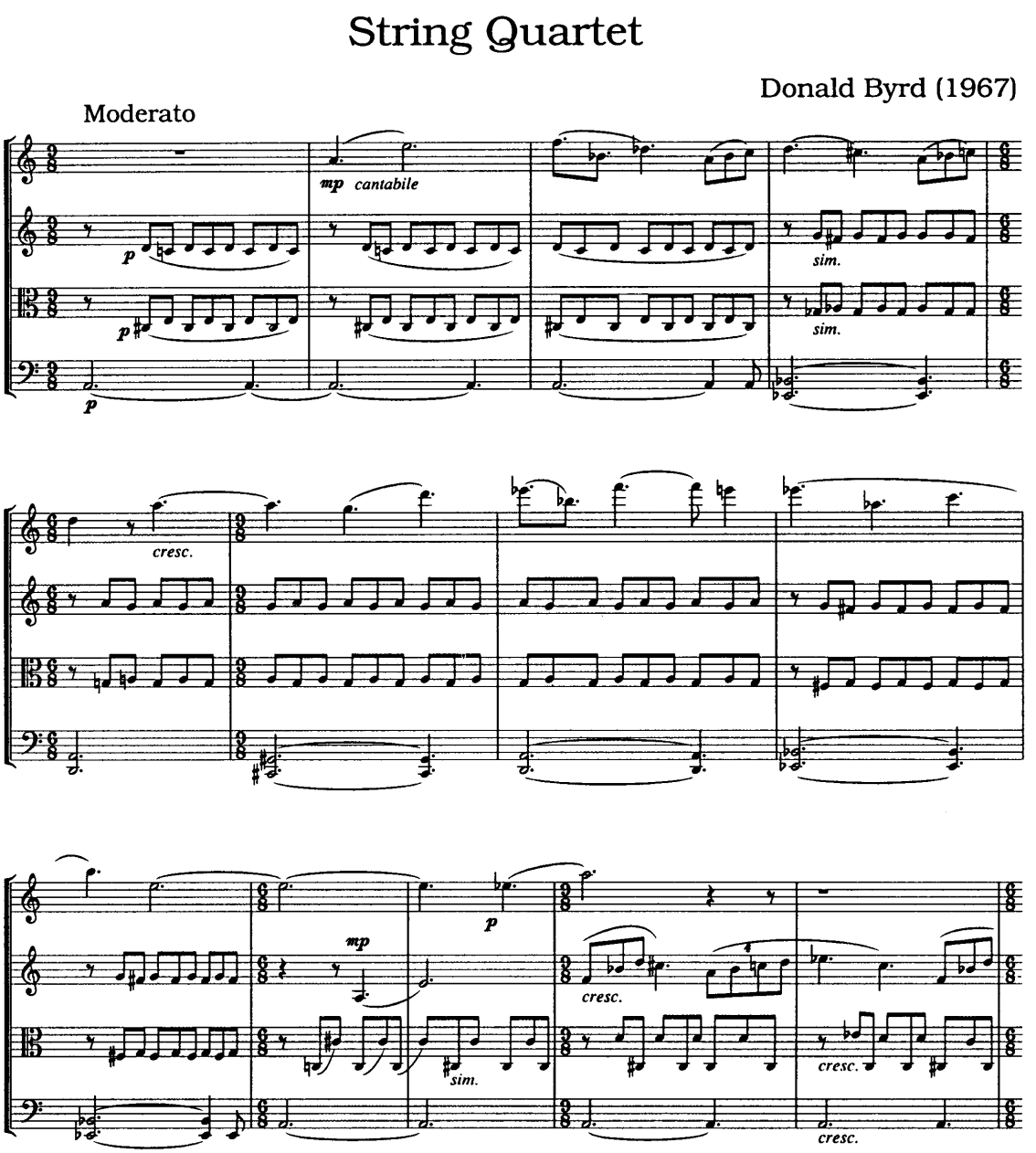


Illustration 17

Commercial Software--Apple Macintosh
Professional Composer (Mark of the Unicorn)

Input device: Macintosh
Output device: unspecified Linotronic typesetter
Status: available

Reduced

Beethoven Quartet No. 13 in B-flat Major, Op.130

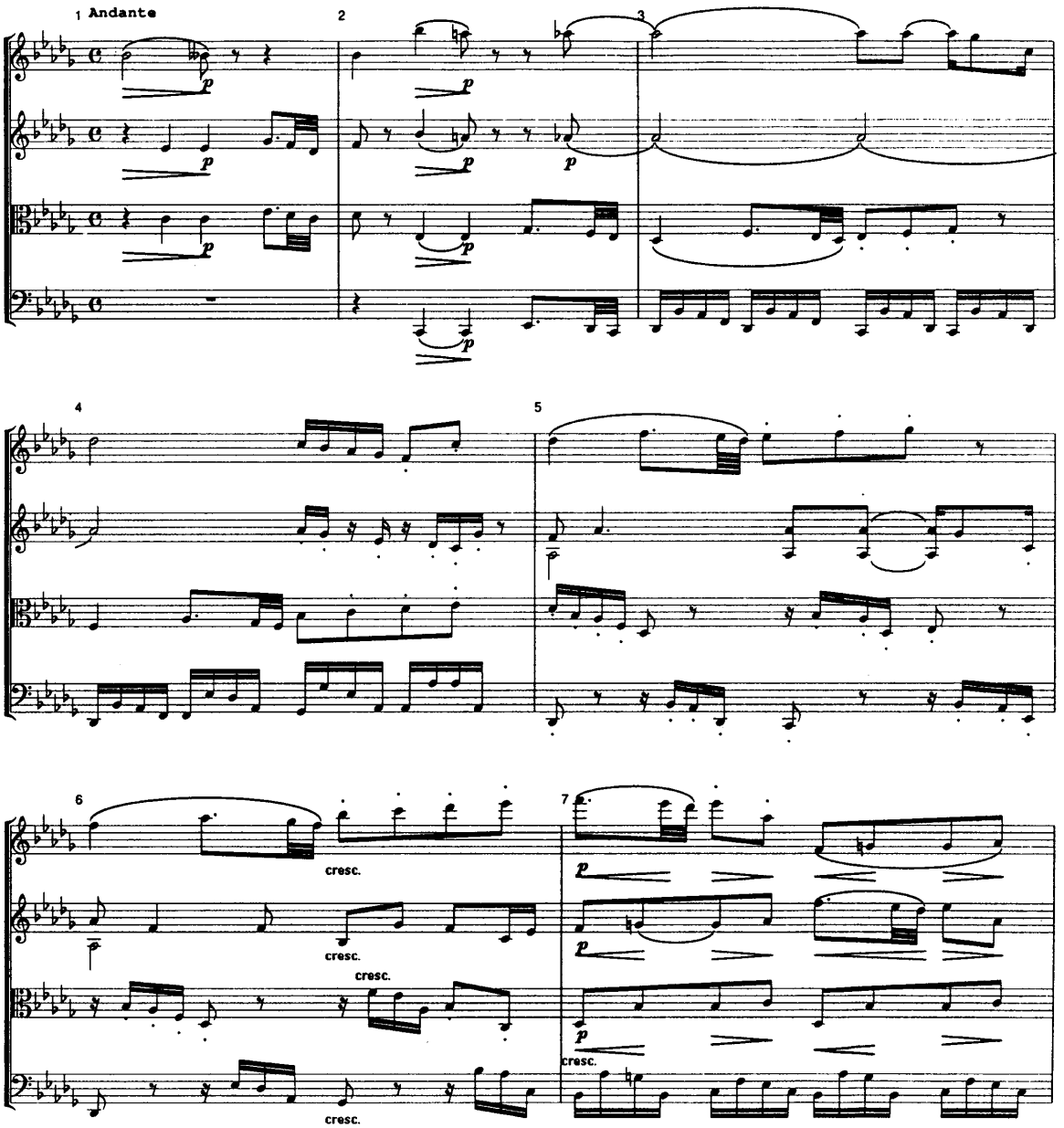


Illustration 18

Commercial Software--Atari
The Copyist (Dr. T's Music Software, Cris Sion)

Input device: Atari 1040ST (IBM PC version also available)
Output device: QMS PS-800 (also supports HP LaserJet, Epson dot matrix compatibles, and HPGL plotters)
File interchange provisions: (see commentary)
Status: available

Reduced

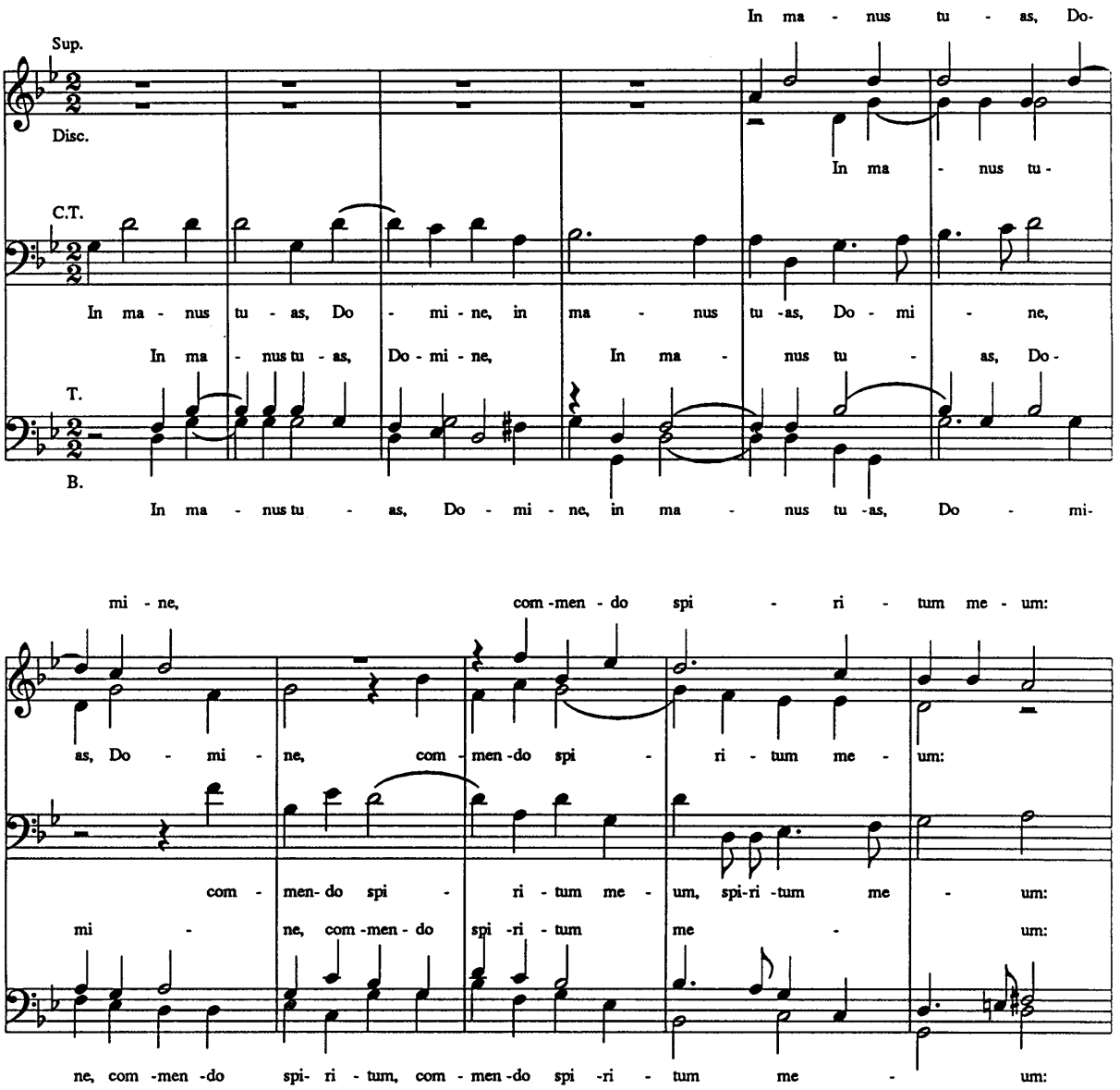


Illustration 19

Commercial Software--Atari
The Copyist (Dr. T's Music Software, Cris Sion)

Input device: Atari 1040ST (IBM PC version also available)
Output device: QMS PS-800 (also supports HP LaserJet, Epson dot matrix compatibles, and HPGL plotters)
File interchange provisions: (see commentary)
Status: available

Reduced

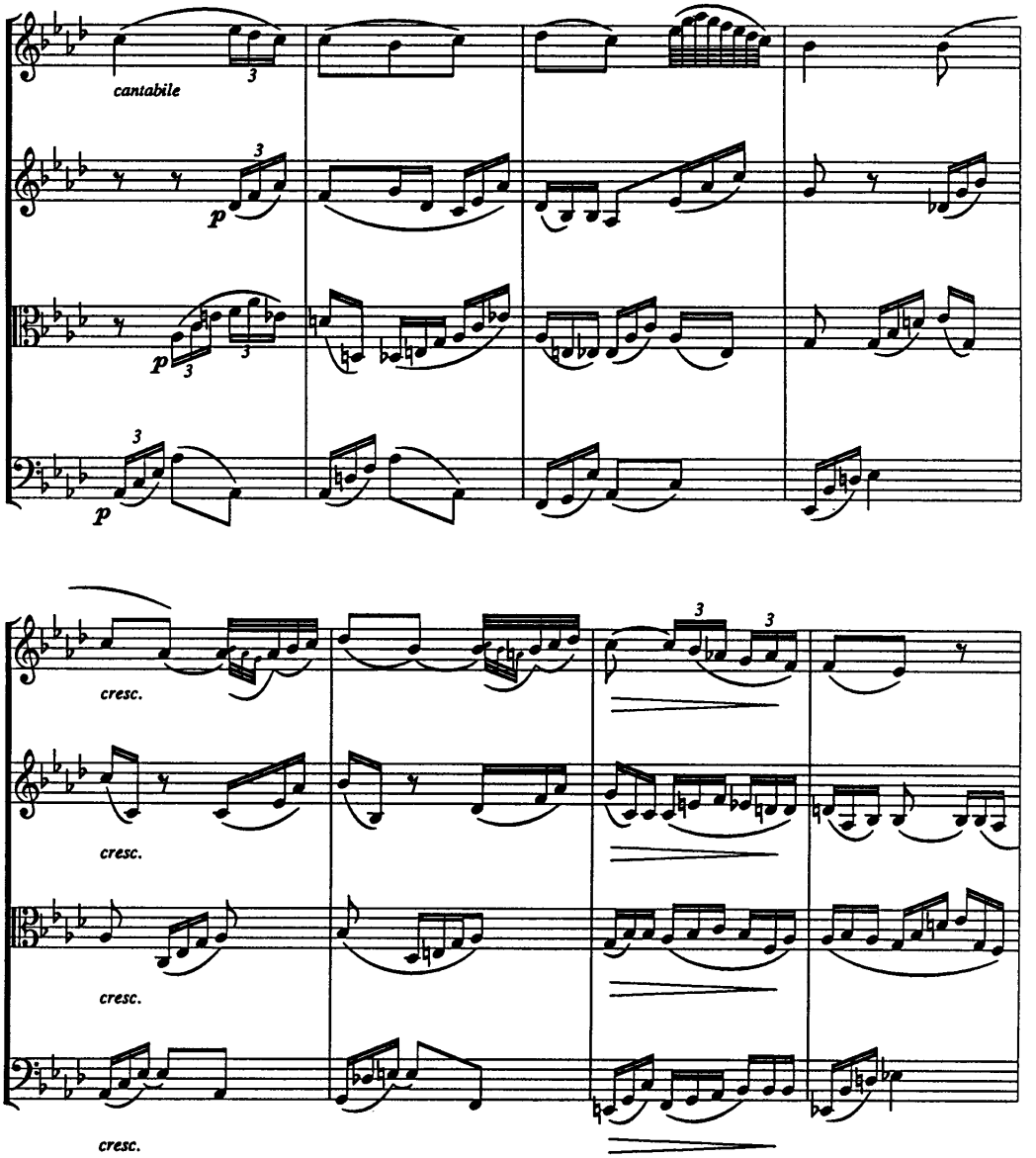


Illustration 20

Commercial Software--Atari
EZ-Score Plus 1.0 (Hybrid Arts, Tom Bajoras)

Input device: Atari 1040ST (alt. 520ST)
Output device: Star SG-10 (or any Epson compatible)
Status: available

Reduced

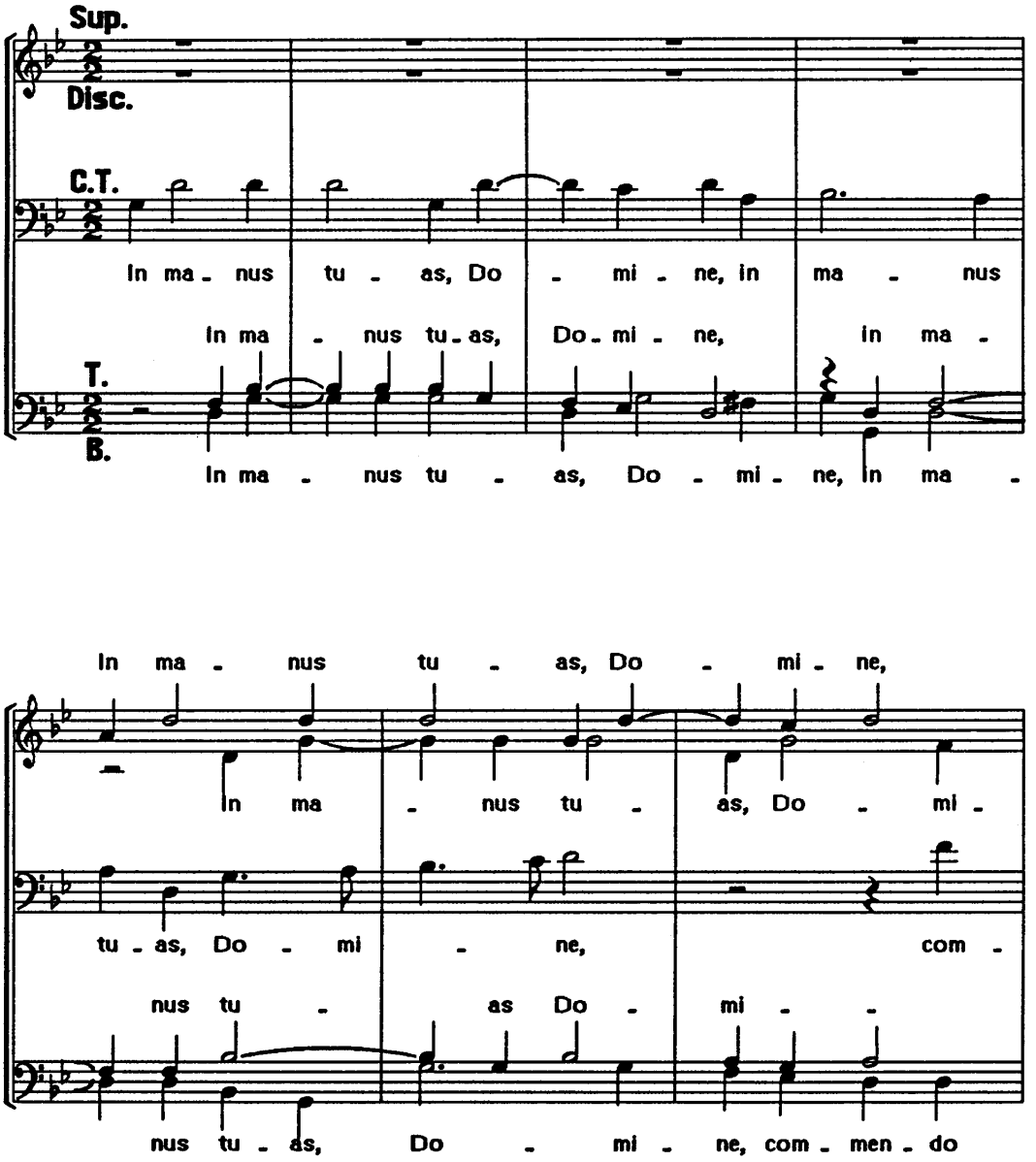


Illustration 21

Commercial Software--IBM PC and compatible microcomputers
la mà de guido (Llorenç Balsach)

Input device: IBM PC XT/AT
Output device: HP 7475 plotter (also other plotters and laser printers)
Status: available

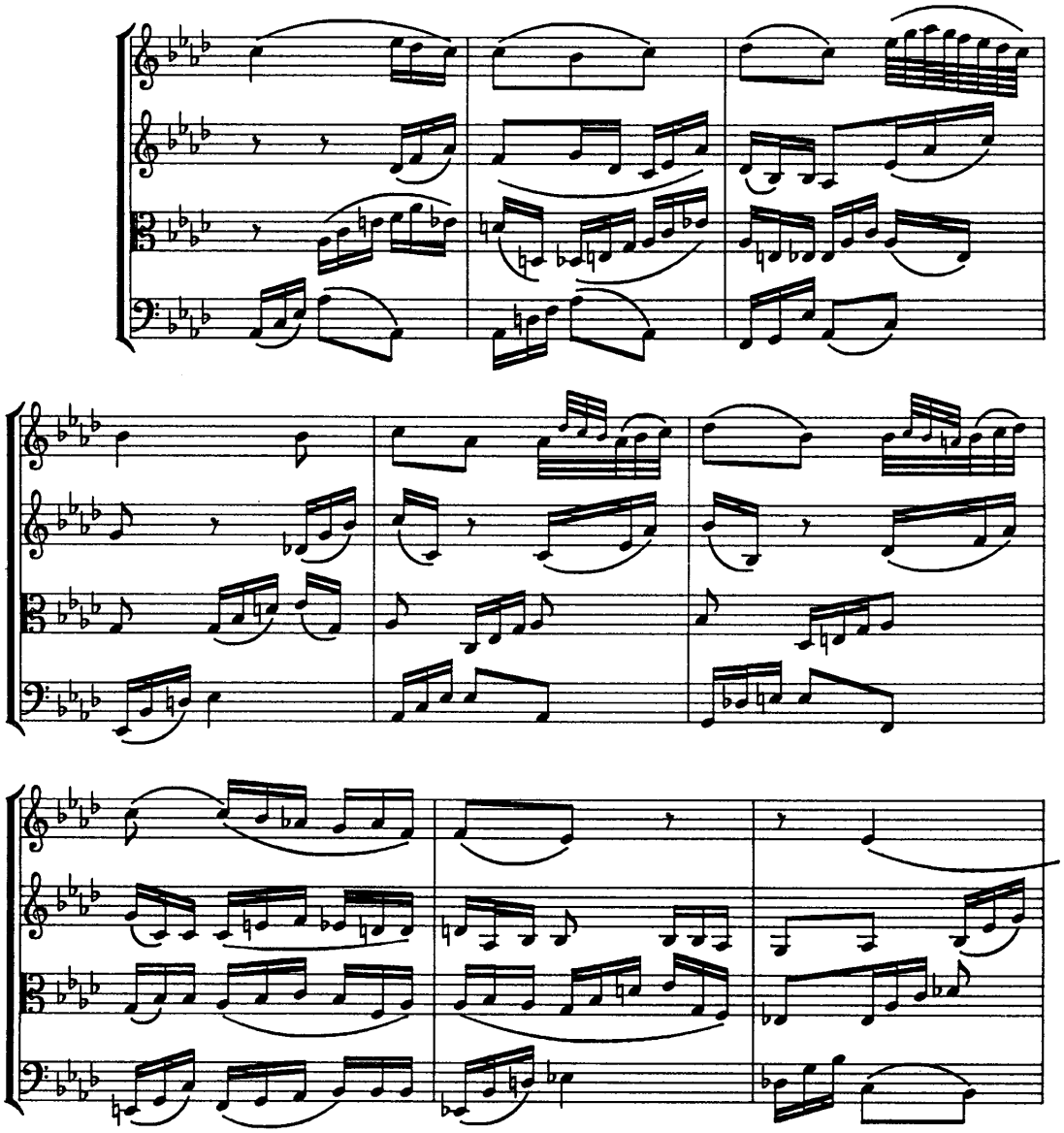


Illustration 22

Commercial Software--IBM PC and compatible microcomputers
la mà de guido (Llorenç Balsach)

Input device: IBM PC XT/AT
Output device: HP 7475 plotter (also other plotters and laser printers)
Status: available

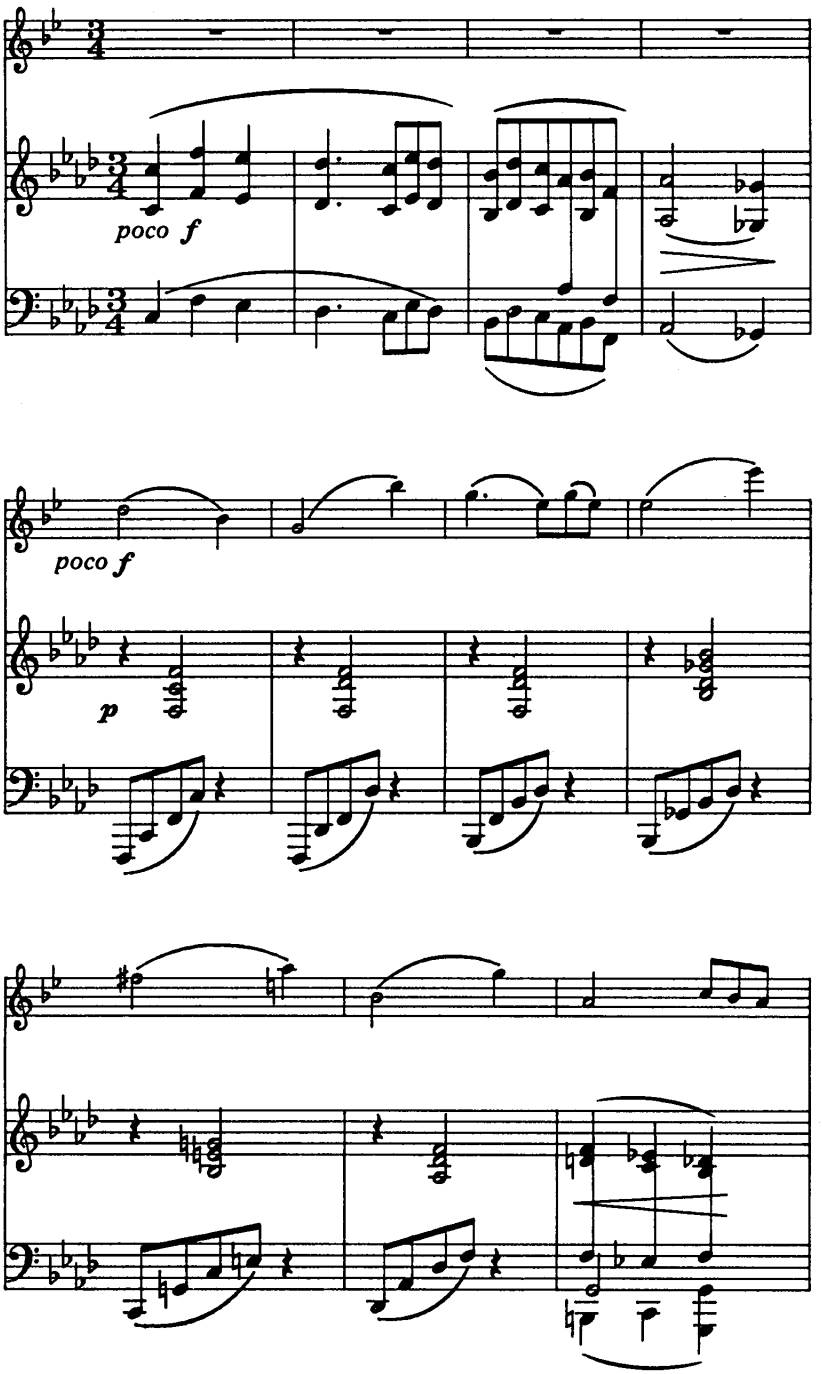


Illustration 23

Commercial Software--IBM PC and compatible microcomputers
la mà de guido (Llorenç Balsach)

Input device: IBM PC XT/AT
Output device: HP 7475 plotter (also other plotters and laser printers)
Status: available

Reduced

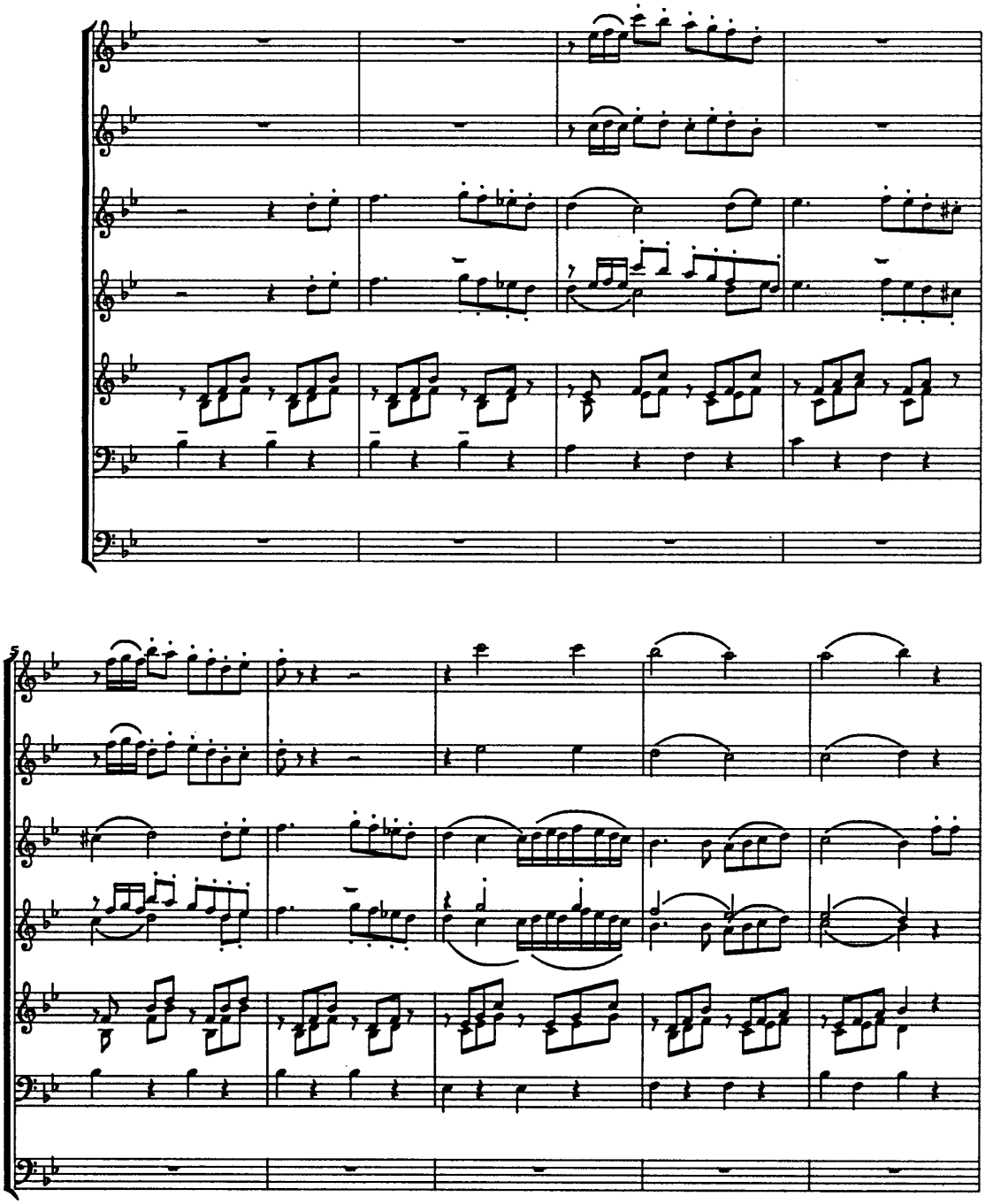


Illustration 24

Commercial Software--IBM PC compatibles
Music Editor (Oberon Systems, Nancy Colton)

Input device: HP Vectra (AT compatible)
Output device: HP LaserJet (11" x 17" capability on HP 2000)
Status: available

Reduced

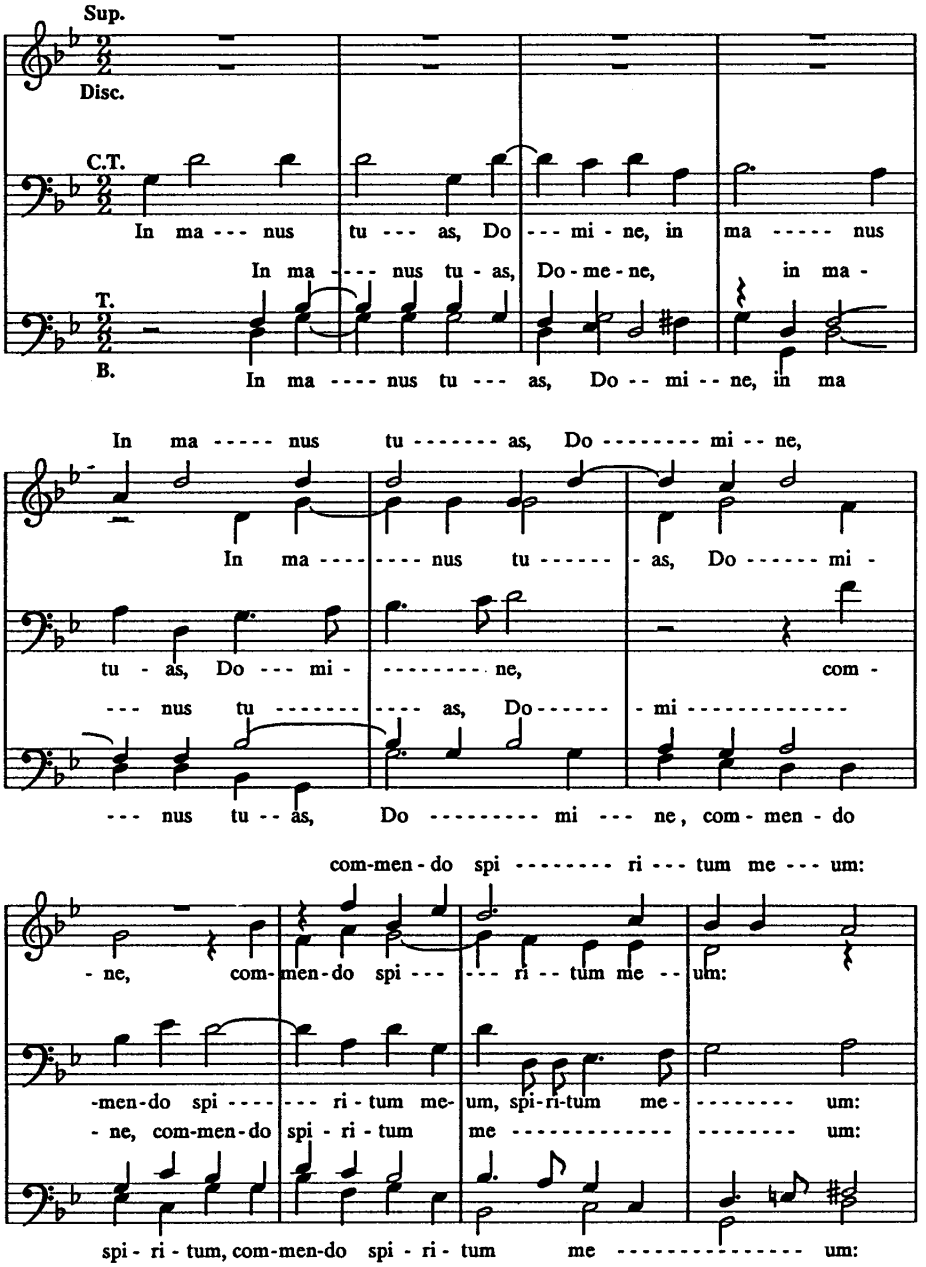


Illustration 25

Commercial Software--IBM PC compatibles
Music Editor (Oberon Systems, Nancy Colton)

Input device: HP Vectra (AT compatible)
Output device: HP LaserJet (11" x 17" capability on HP 2000)
Status: available

Reduced

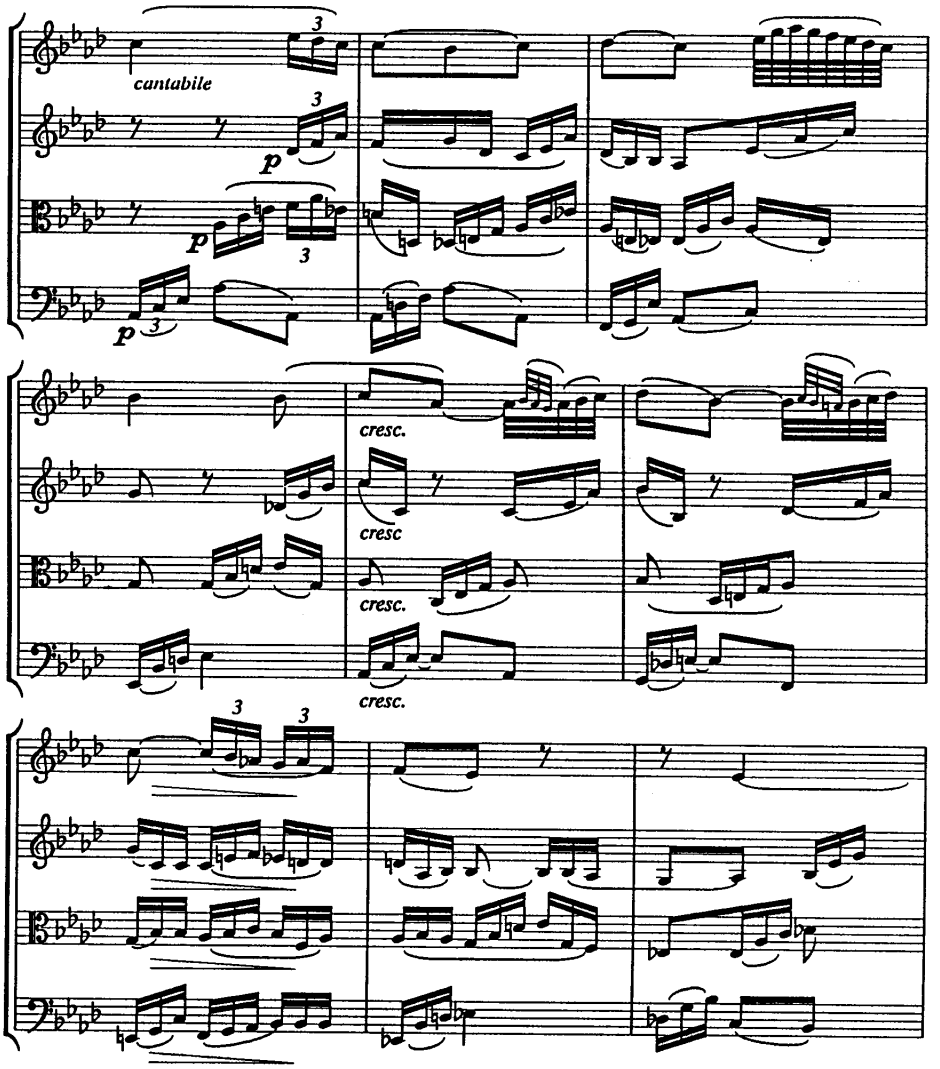


Illustration 26

Commerical Software--IBM PC compatibles
Music Processor (Etienne Darbellay)

Input device: IBM PC AT compatible, Hercules graphics card
Output device: IBM Proprinter X24
Status: under development

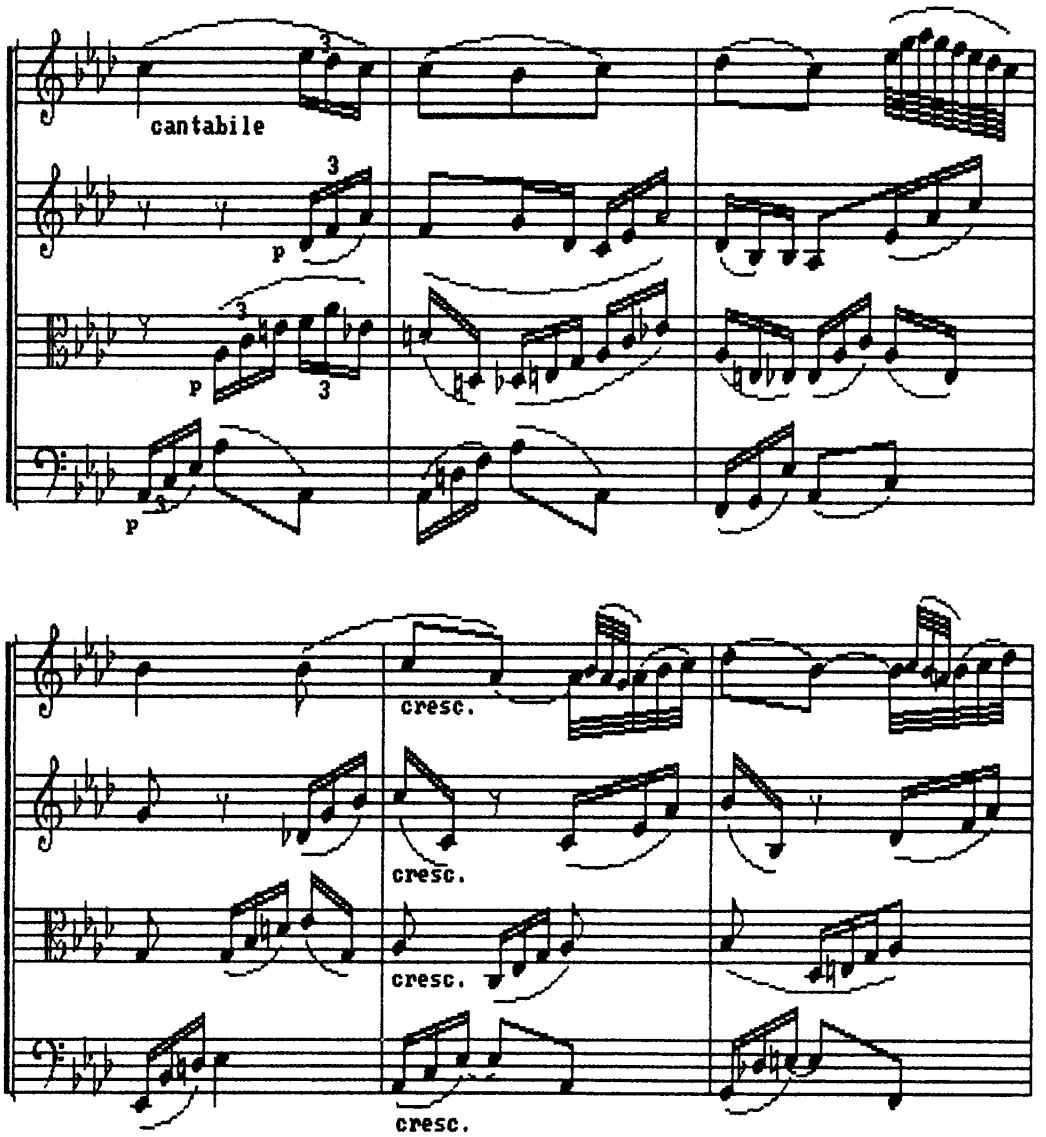


Illustration 27

Commercial Software--IBM PC compatibles
Music Processor (Etienne Darbellay)

Input device: IBM PC AT compatible, Hercules graphics card
Output device: Gemini Star
Status: under development

Reduced

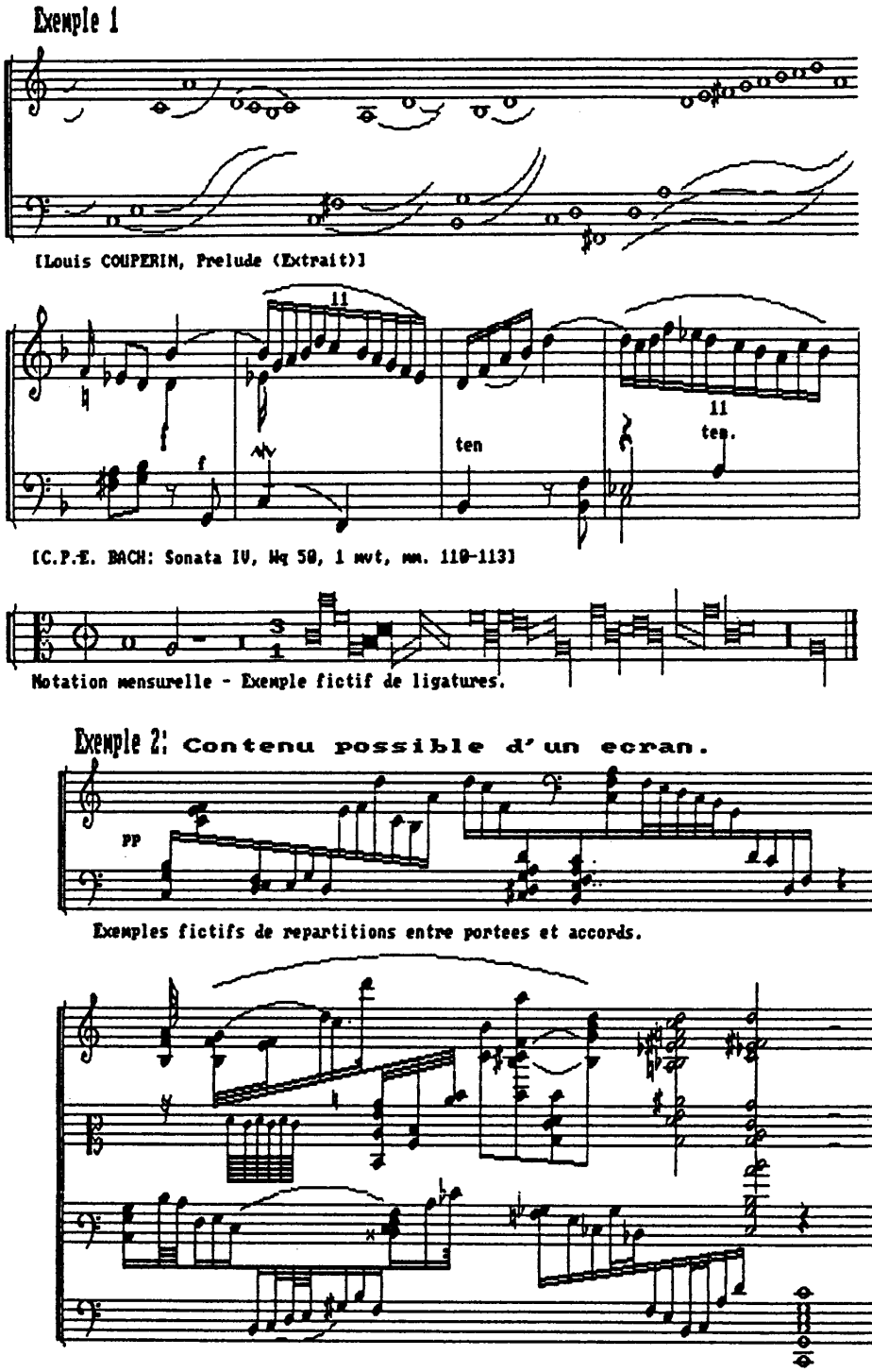


Illustration 28

Commercial Software--IBM PC compatibles
Note Processór (Thought Processors, Stephen Dydo)

Input device: IBM PC compatible, mouse
Output: NEC P7 (Epson dot matrix and HP LaserJet compatibility)
Music font: proprietary **Text font:** HP Softfonts
Status: available 78% Reduction

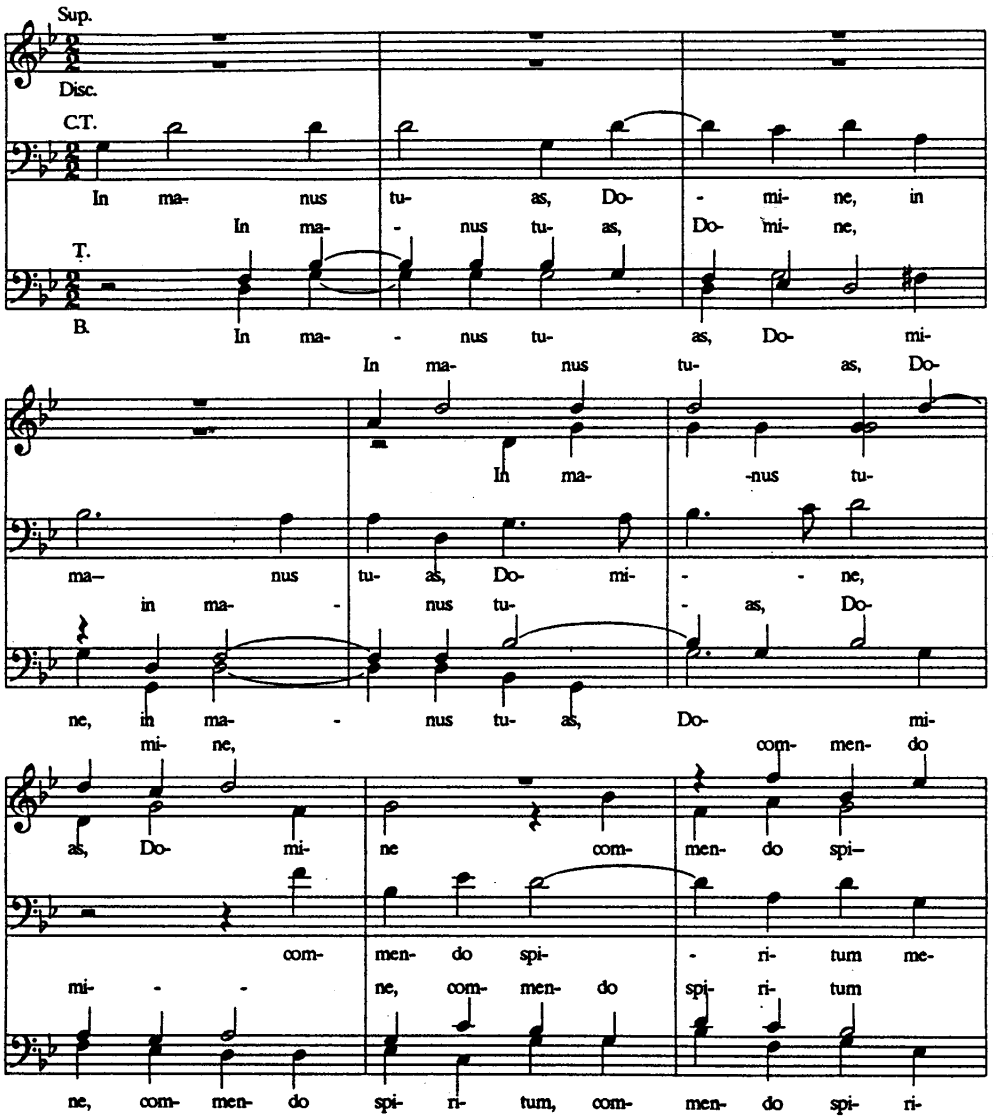


Illustration 29

Commerical Software--IBM PC compatibles
Note Processor (J. Stephen Dydo)

Input device: IBM PC compatible, mouse
Output device: NEC P7 (Epson dotmatrix and HP LaserJet compatibility)
Status: available

Reduced

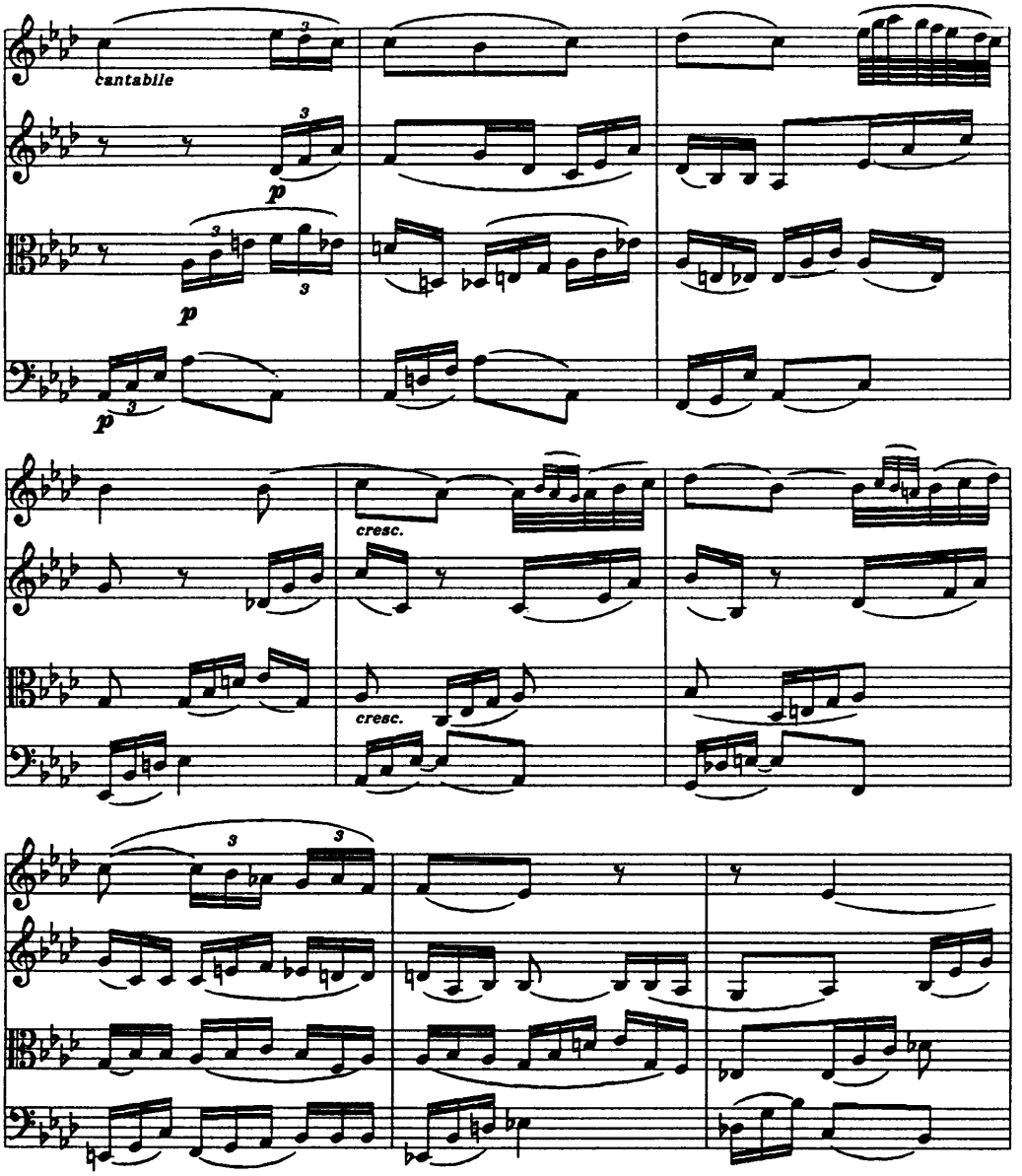


Illustration 30

Commercial Software--IBM PC compatibles
PARD (PARD S.R.L., Walter Prati and Giorgio Ceroni)

Input device: IBM 8580 PS/2
Output device: HP plotter
Status: under development

Reduced

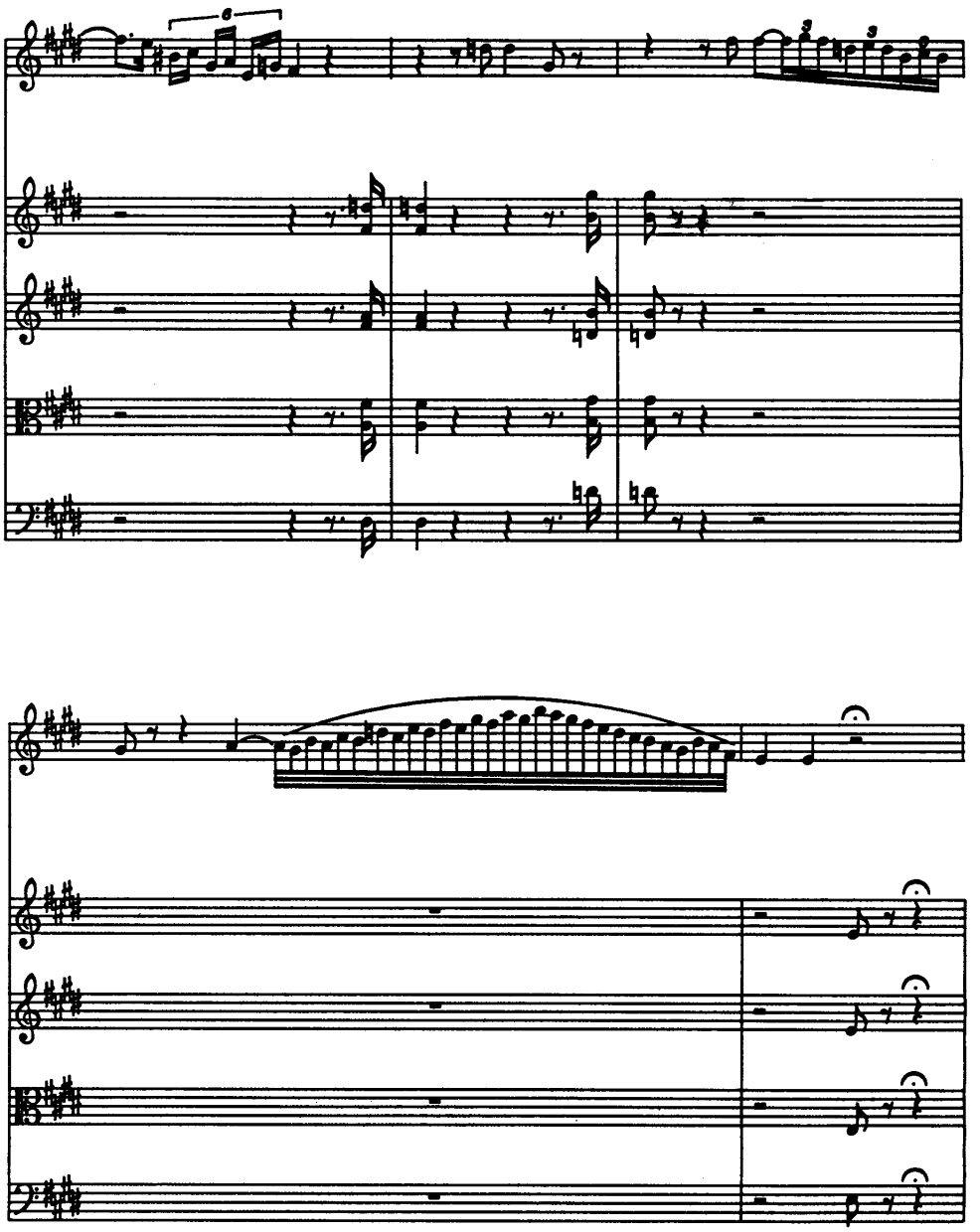


Illustration 31

Commercial Software--IBM PC compatibles
PARD (PARD S.R.L., Walter Prati and Giorgio Ceroni)

Input device: IBM 8580 PS/2
Output device: HP plotter
Status: under development

Reduced

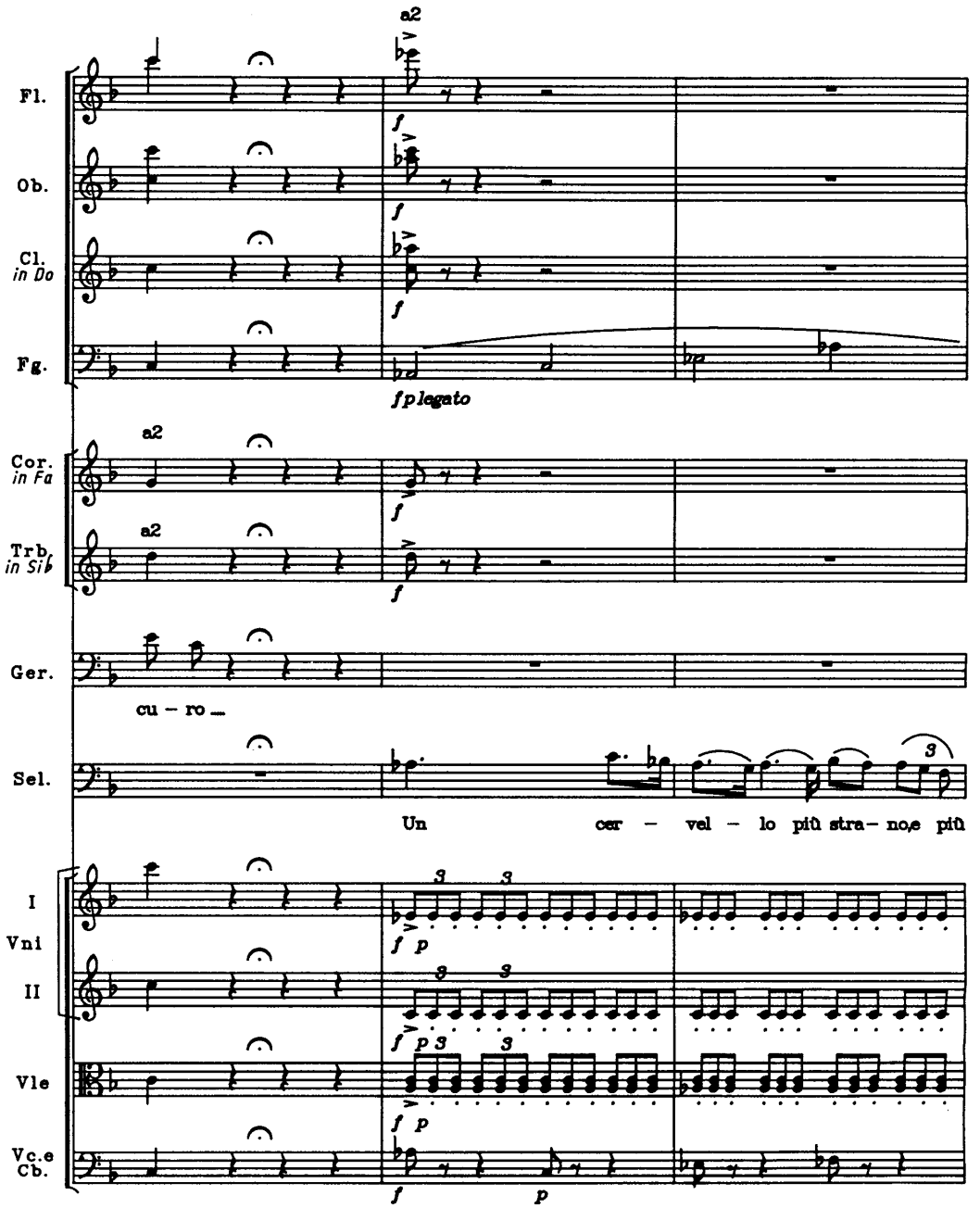


Illustration 32

Commerical Software--IBM PC compatibles
PC-MusiComp Rev. 2 (Armando Dal Molin)

Input device: IBM PC with monographics
Output device: Okidata 192
Status: under development

Input time: 47 min.
Print time: 4'50"

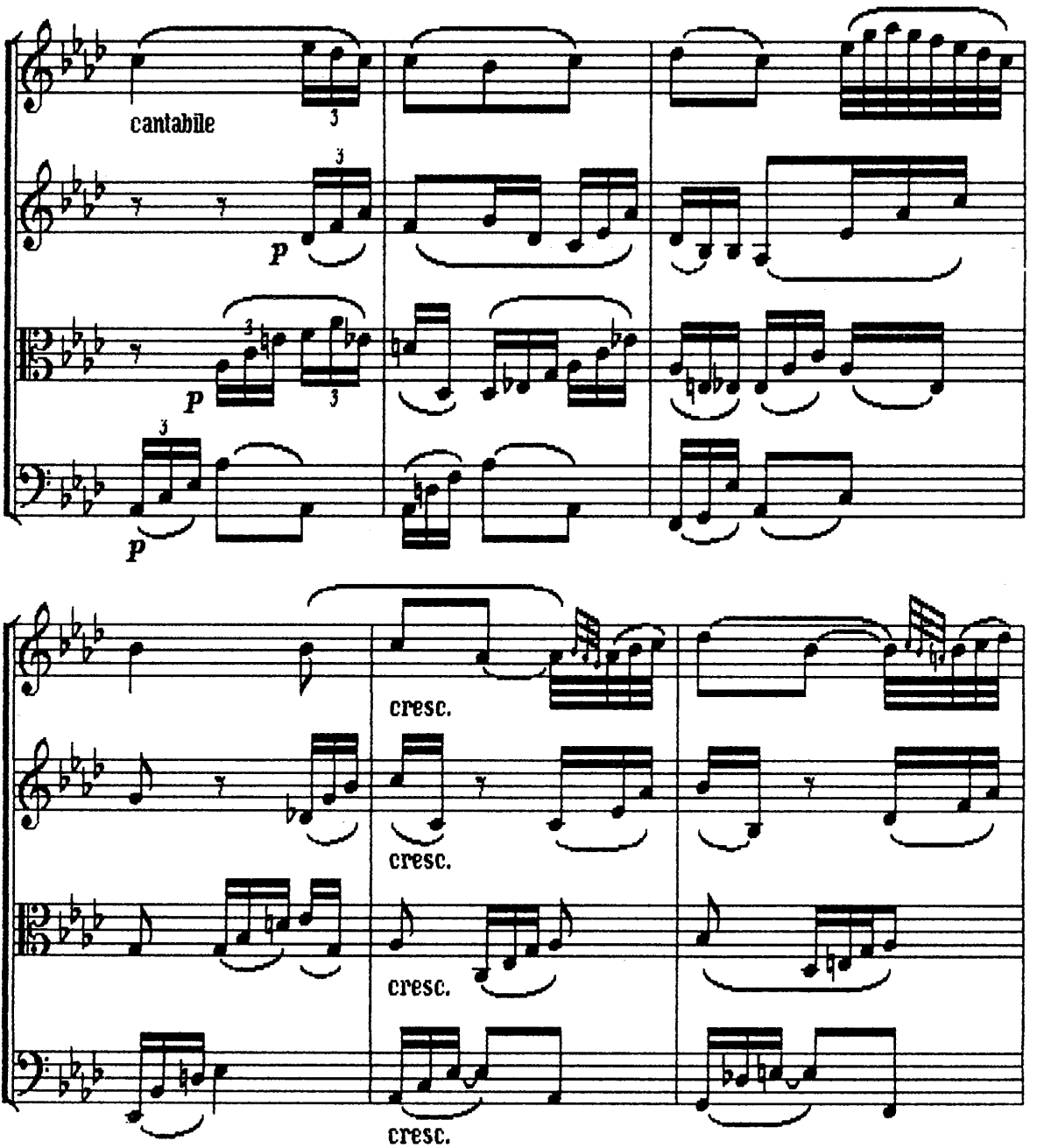


Illustration 33

Commercial Software--IBM PC compatibles
SCORE (Passport Designs, Leland Smith)

Input device: IBM PC compatibles
Output device: Varitype (600 d.p.i.)(support for LaserWriter et al.)
Text fonts: Postscript
Music fonts: SCORE font shown (39 other music fonts available)
Status: available

Reduced

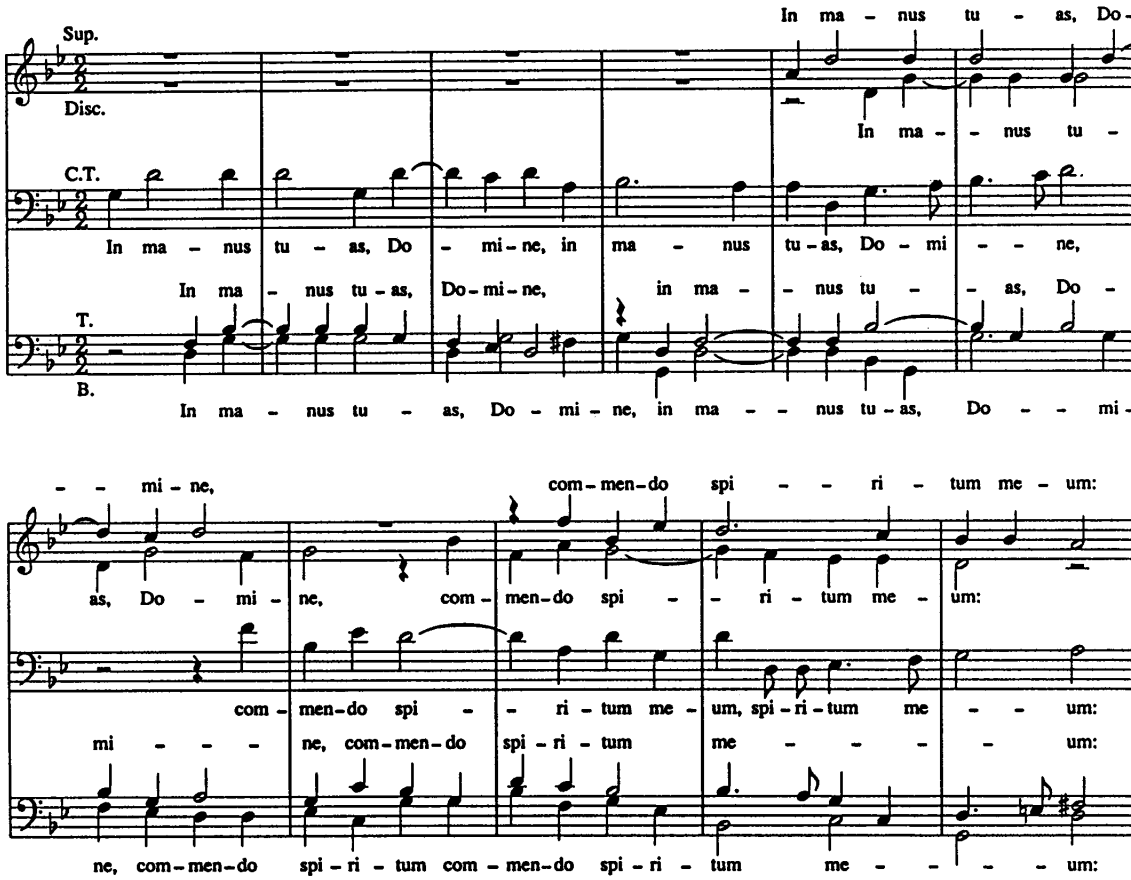


Illustration 34

Commerçial Software--IBM PC compatibles
SCORE (Passport Designs, Leland Smith)

Input device: IBM PC compatibles
Output device: Varitype typesetter (600 d.p.i.)(LaserWriter support)
Status: available

Reduced

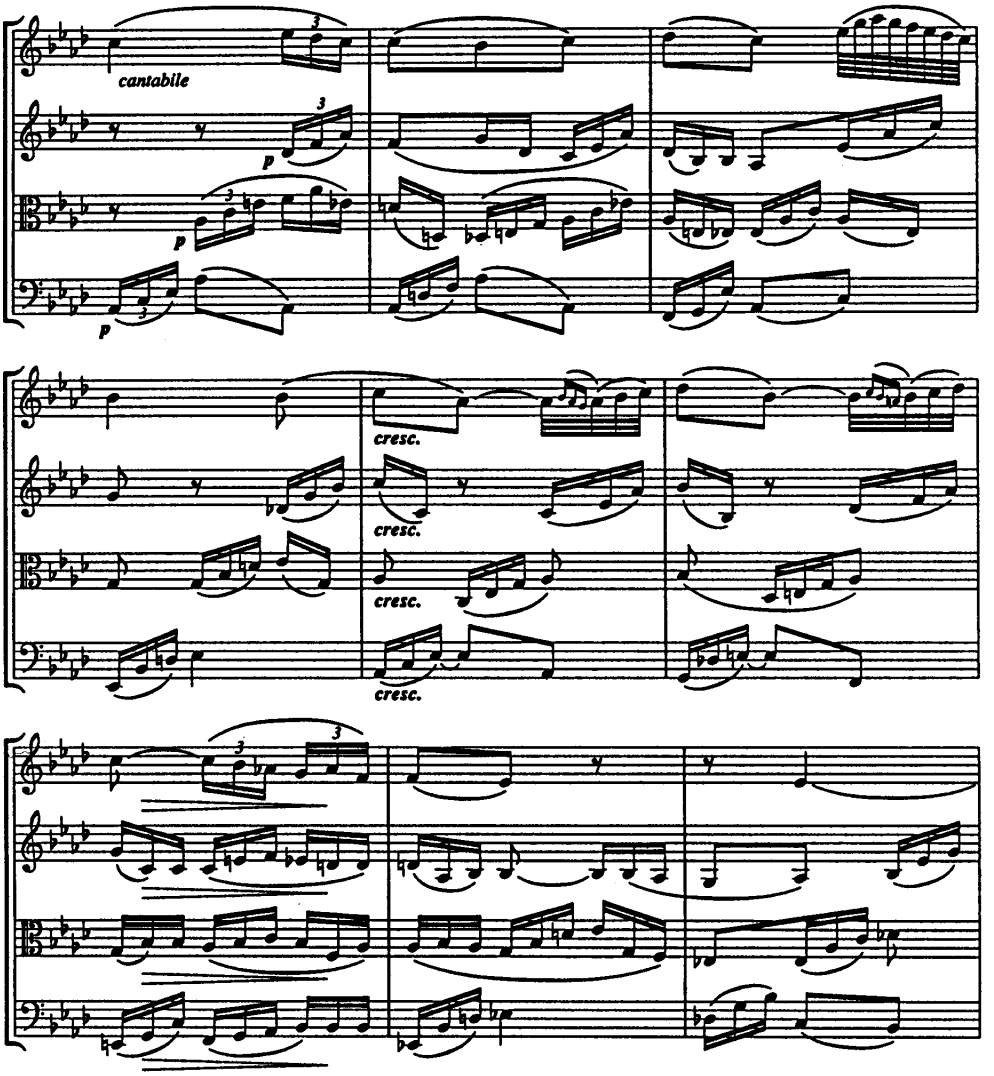


Illustration 35

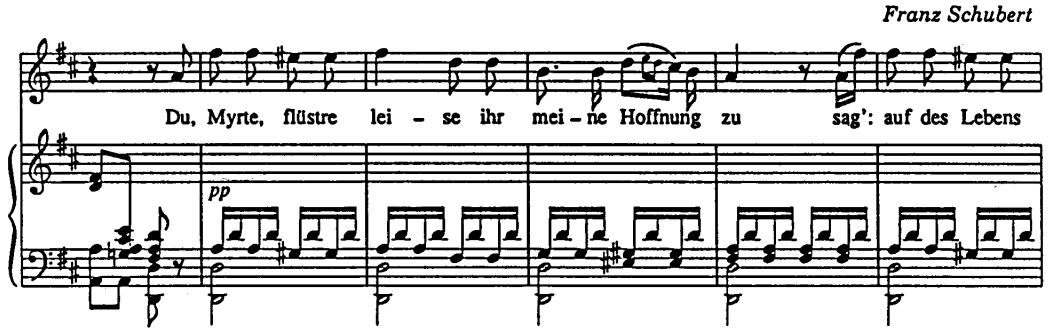
Commercial Software--IBM PC compatibles
SCORE (Passport Designs, Leland Smith)

Input device: IBM PC compatibles
Output device: Varitype typesetter (600 d.p.i.)(LaserWriter support)
Status: available

Reduced

Transposition capability

A. Original



B. Transposition

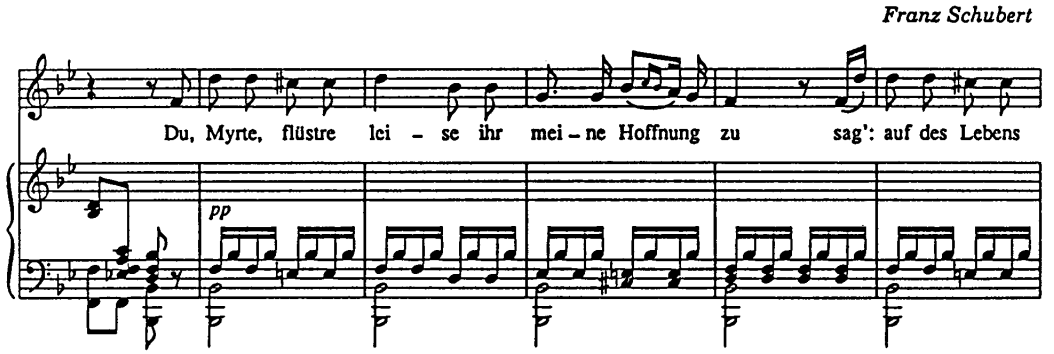


Illustration 36

Commercial Software--IBM PC compatibles
SCORE (Passport Designs, Leland Smith)

Input device: IBM PC compatibles
Output device: Varitype (600 d.p.i.)(support for LaserWriter et al.)
Text fonts: Postscript
Music fonts: SCORE font shown (39 other music fonts available)
Status: available

Reduced

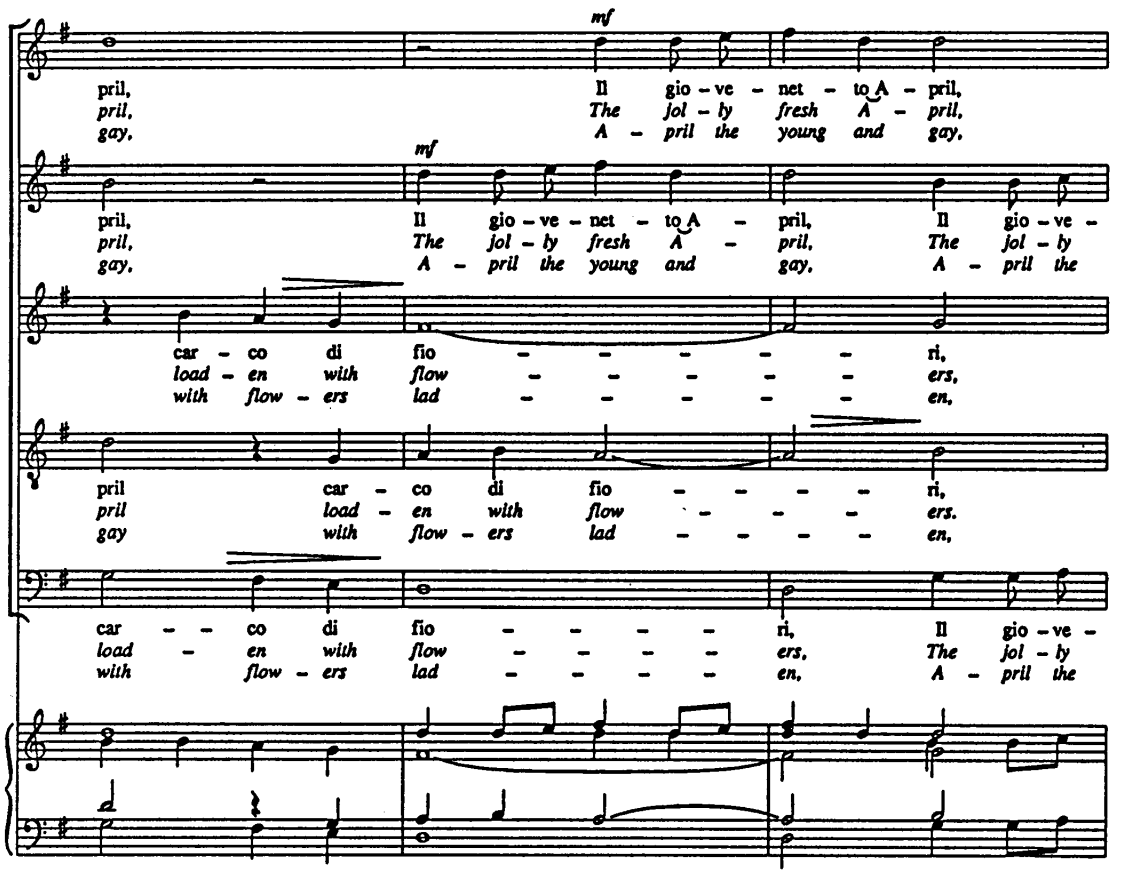


Illustration 37

Commercial Software--IBM PC compatibles
THEME, The Music Editor (THEME Software, Mark Lambert)

Input device: IBM PC compatible
Output device: HP LaserJet Series II
File interchange: MIDI conversion utility
Status: available

Reduced

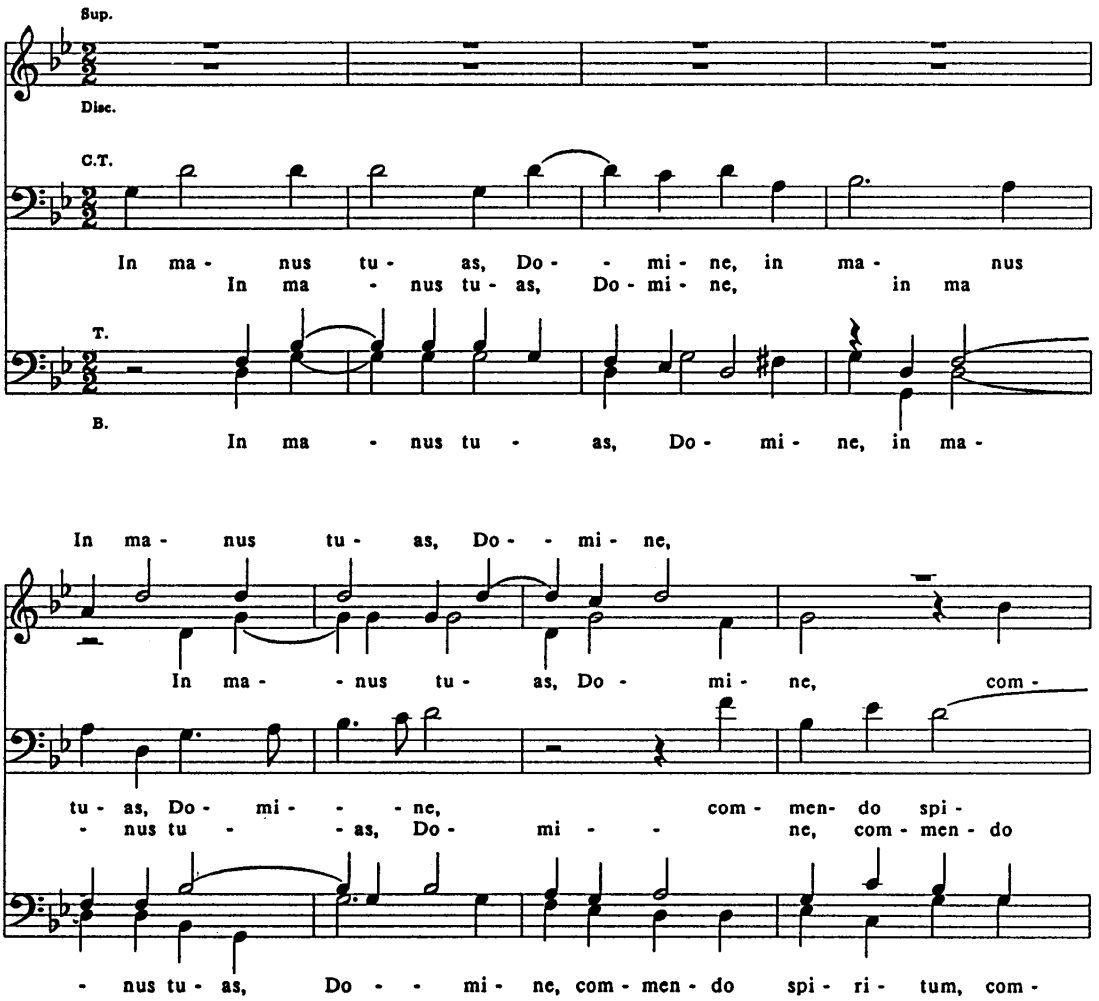


Illustration 38

Commercial Software--IBM PC compatibles
THEME, The Music Editor (THEME Software, Mark Lambert)

Input device: IBM PC compatible
Output device: HP LaserJet Series II
File interchange: MIDI conversion utility
Status: available

Reduced

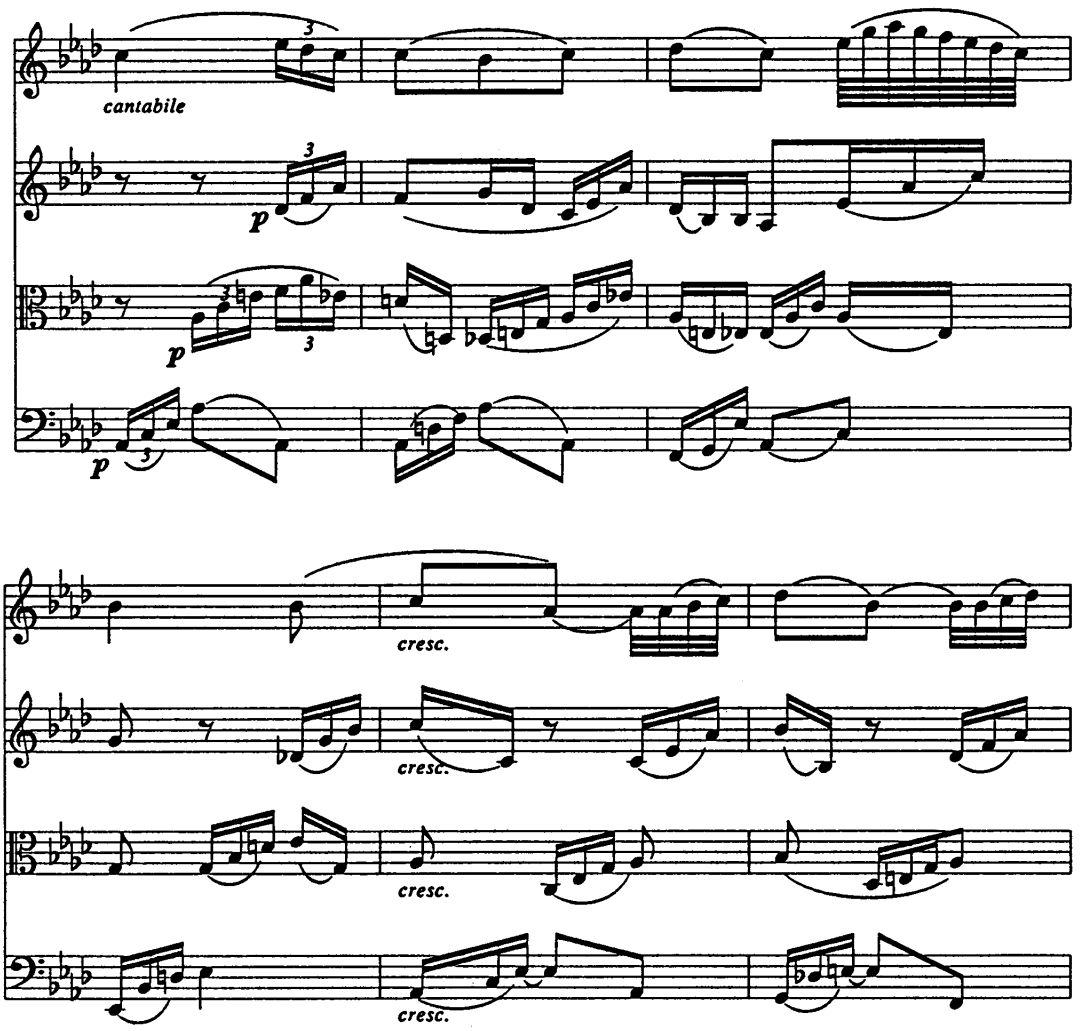


Illustration 39

Commercial Software--IBM PC compatibles
THEME, The Music Editor (THEME Software, Mark Lambert)

Input device: IBM PC compatible
Output device: HP DeskJet
File interchange: MIDI conversion utility
Status: available

Reduced

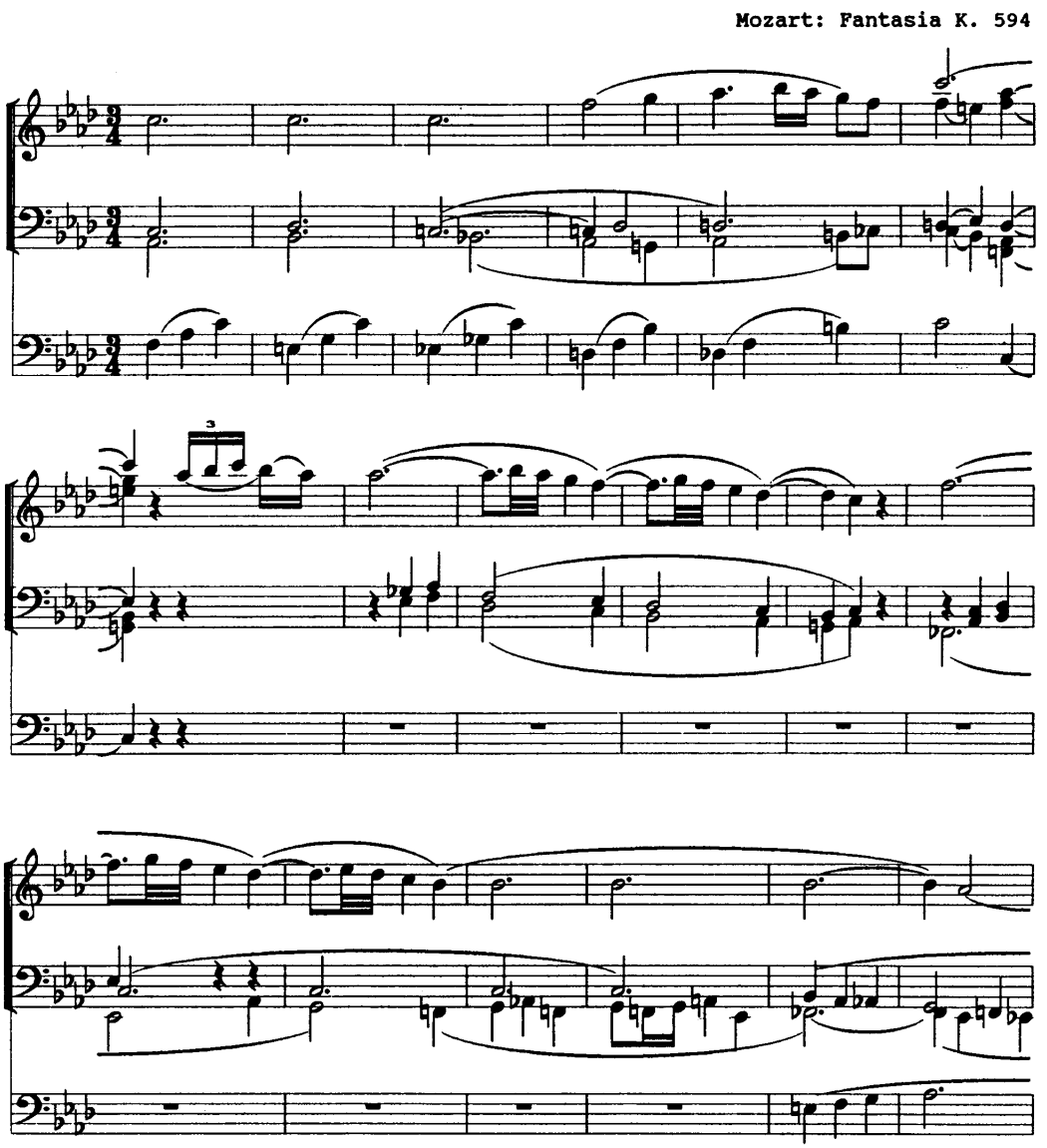


Illustration 40

Commercial Systems
Dai Nippon Music Processor (Dai Nippon Printing Co., Ltd.)

Input device: Dai Nippon Music Processor (16-bit dedicated machine)
Output device: unspecified phototypesetter (dot matrix support also)
File interchange provisions: data can be exchanged with Waseda University's Automatic Score Recognition System and System for Translation of Musical Notation into Braille
Status: available

Reduced

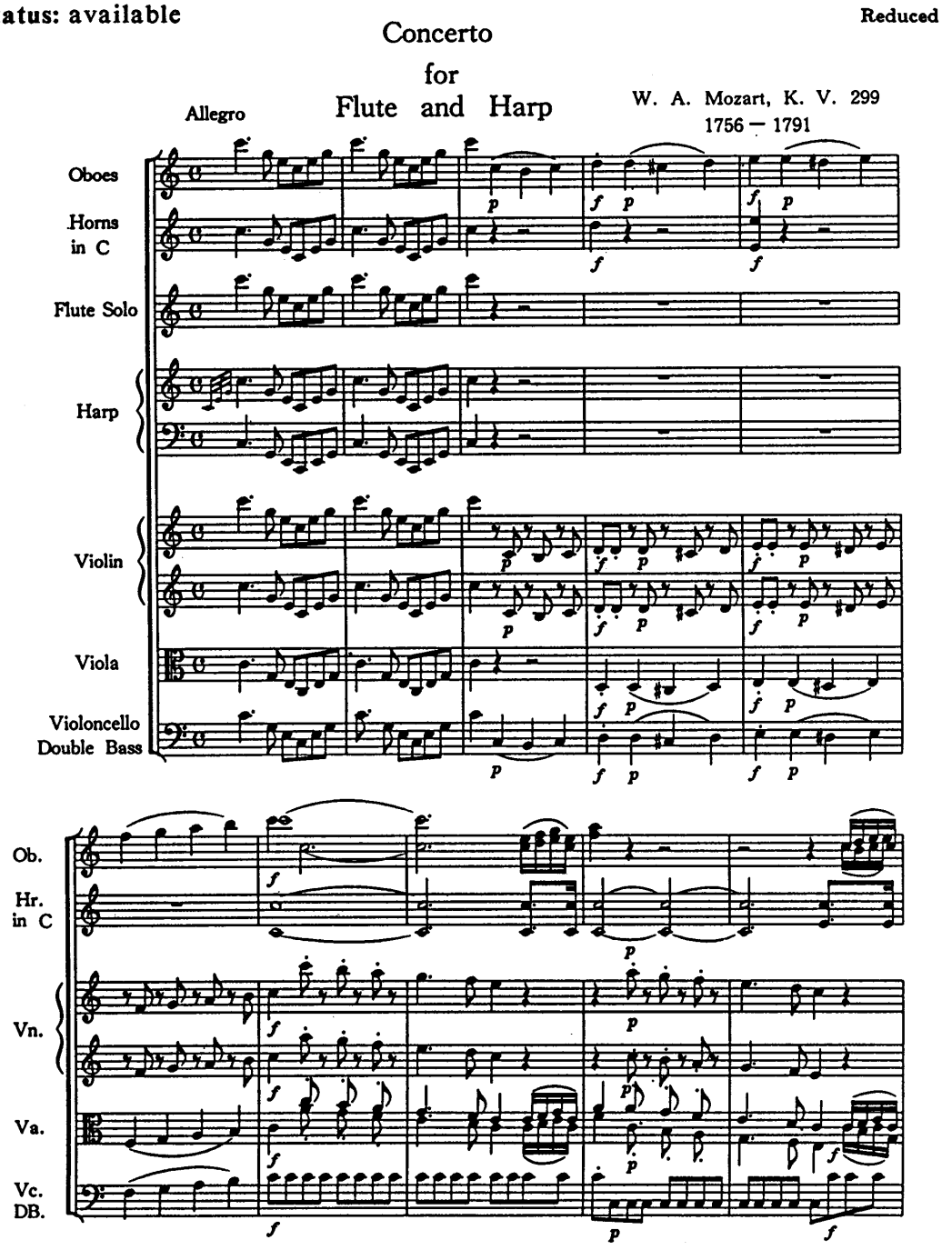


Illustration 41

Commercial Systems
Musicwriter II (Music Print Corp., Cecil Effinger)

Input device: IBM Wheelwriter with proprietary modifications
Output device: same (slurs and ties added by hand)
Status: available

Reduced

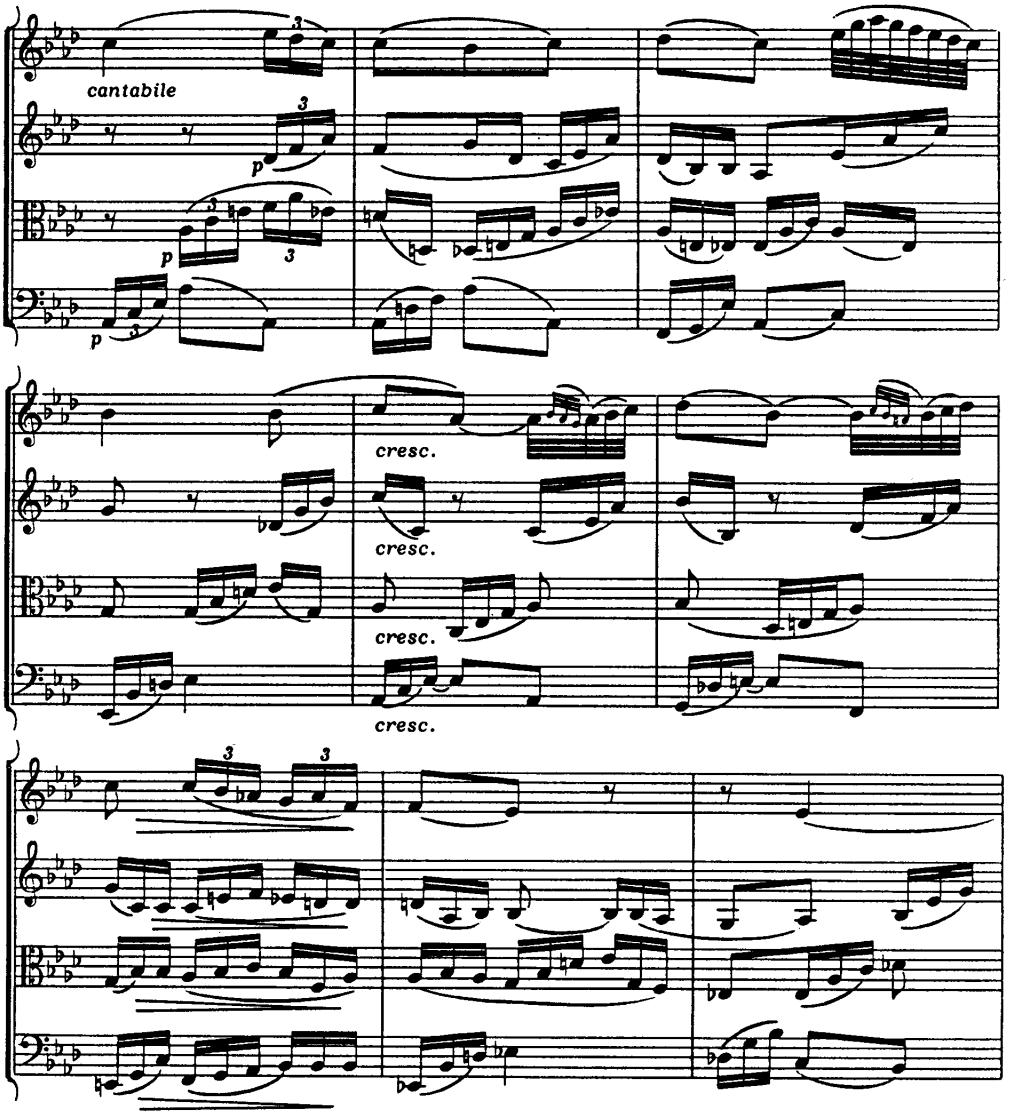


Illustration 42

Commercial Systems
Musicwriter II (Music Print Corp., Cecil Effinger)

Input device: IBM Wheelwriter with proprietary modifications
Output device: same (slurs and ties added by hand)
Status: available

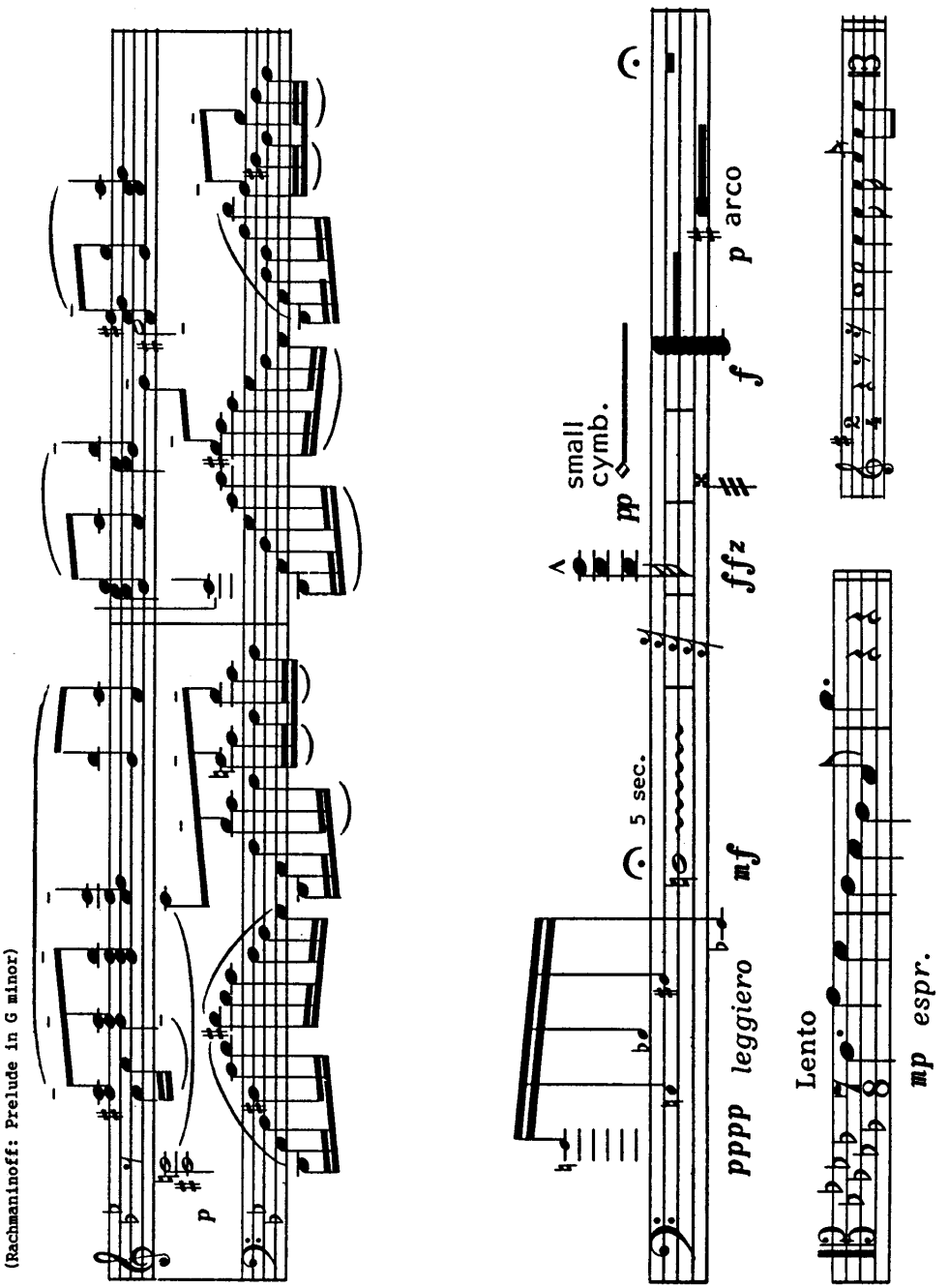


Illustration 43

Commercial Systems
Musicwriter II (Music Print Corp., Cecil Effinger)

Input device: IBM Wheelwriter with proprietary modifications
Output device: same (slurs and ties added by hand)
Status: available

Reduced

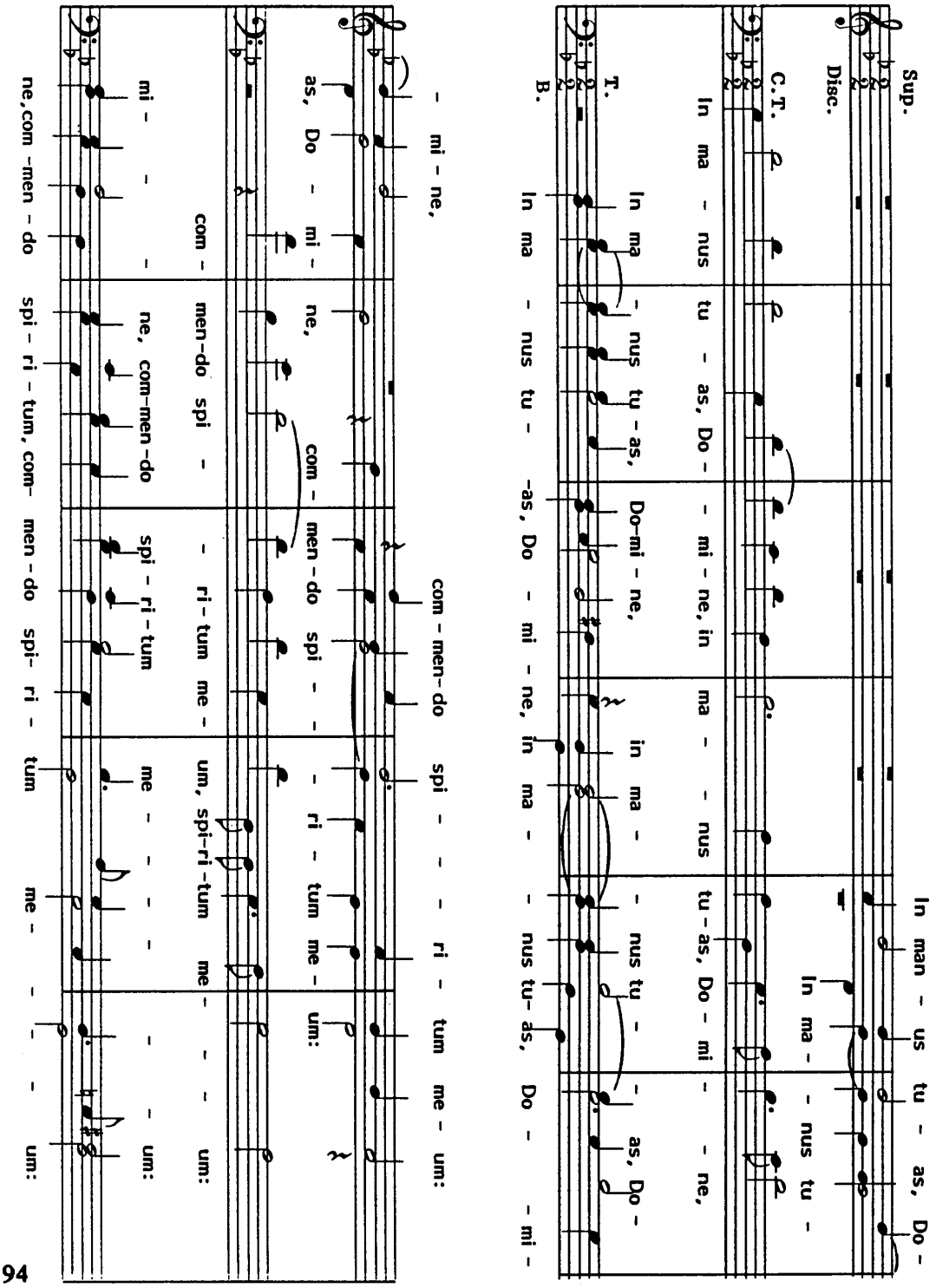


Illustration 44

Special Purpose Software
ExampleKrafter (MusiKrafters, Robert Fruehwald)

Input device: Apple Macintosh (512K)
Output device: Apple LaserWriter (support for Linotronic typesetter)
Purpose: sets musical examples of up to five staves

Reduced

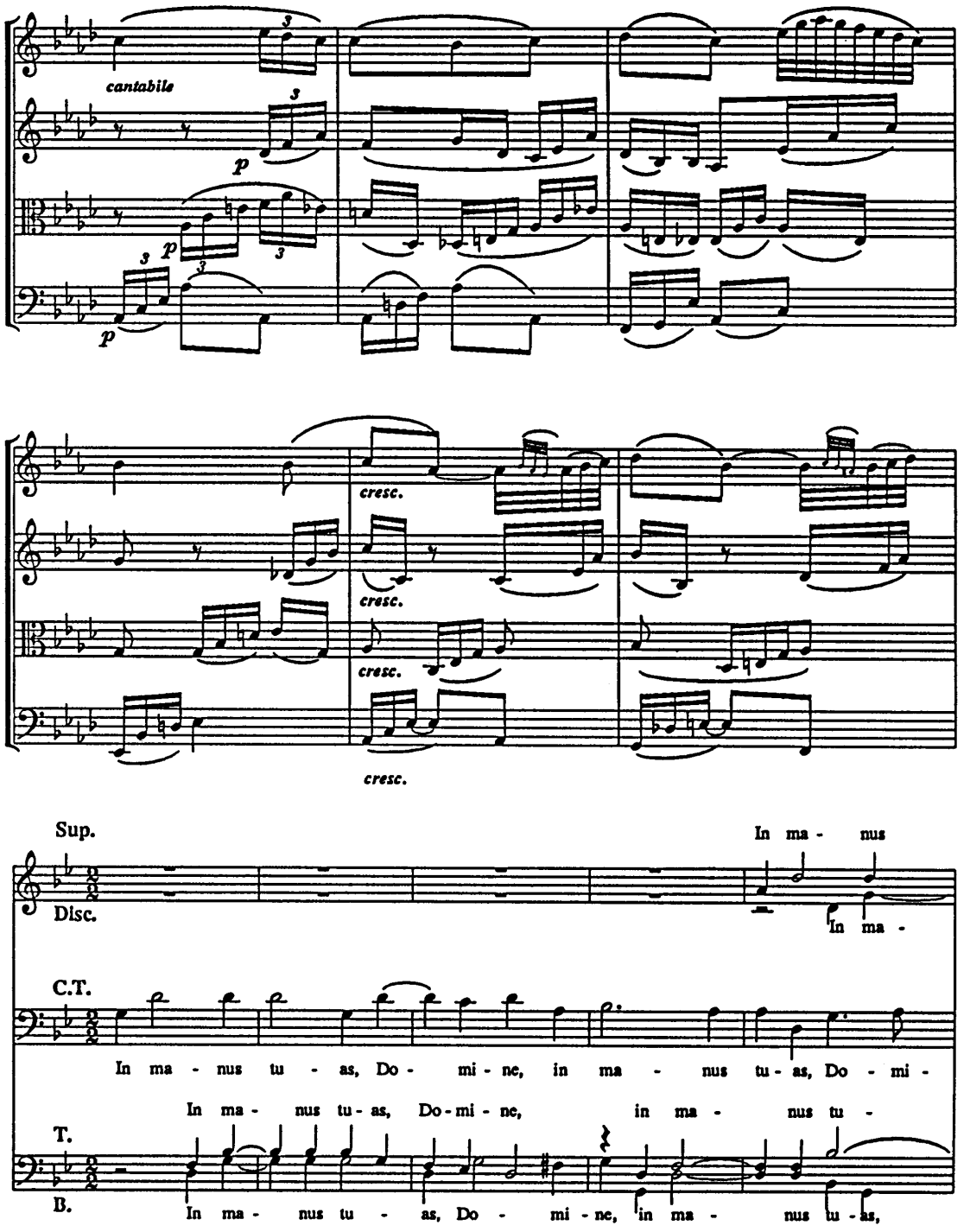


Illustration 45

Special Purpose Software
Shape Notes (MusiKrafters, Robert Fruehwald)

Input device: Apple Macintosh (512K)
Output device: Apple LaserWriter (support for Linotronic typesetter)
Purpose: supports implementation of shape notation (Aiken system)

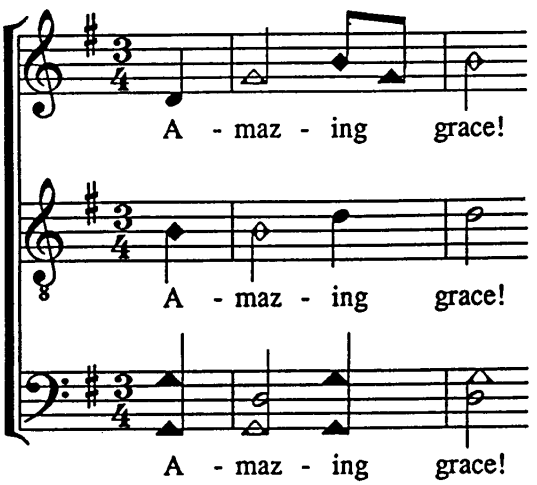


Illustration 46

Special Purpose Software
LuteKrafter (MusiKrafters, Robert Fruehwald)

Input device: Apple Macintosh (512K)
Output device: Apple LaserWriter (support for Linotronic typesetter)
Purpose: typesets French, Italian, English, and Spanish lute tablatures as well as some 4- to 6-course cittern and guitar tablatures

Dowlands adew for Master Oliver Cromwell.

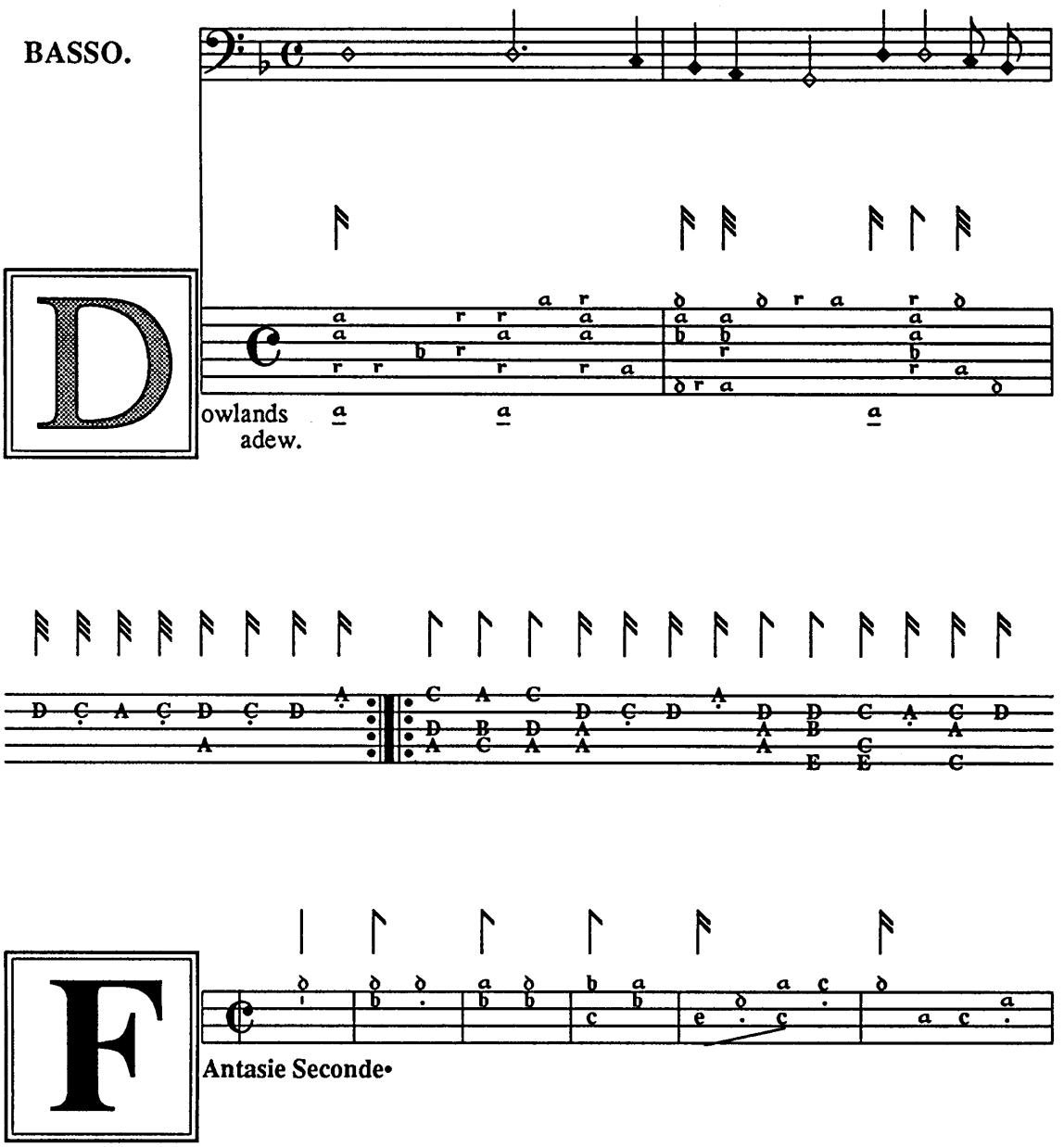


Illustration 47

Academic Systems
ERATTO (Ivry-sur-Seine: Hélène Charnassé; Ottawa: Bernard Stepien)

Input device: IBM PC with SIT code
Output device: Epson dot matrix printer
Focus: German lute tablature, monodic style

Reduced

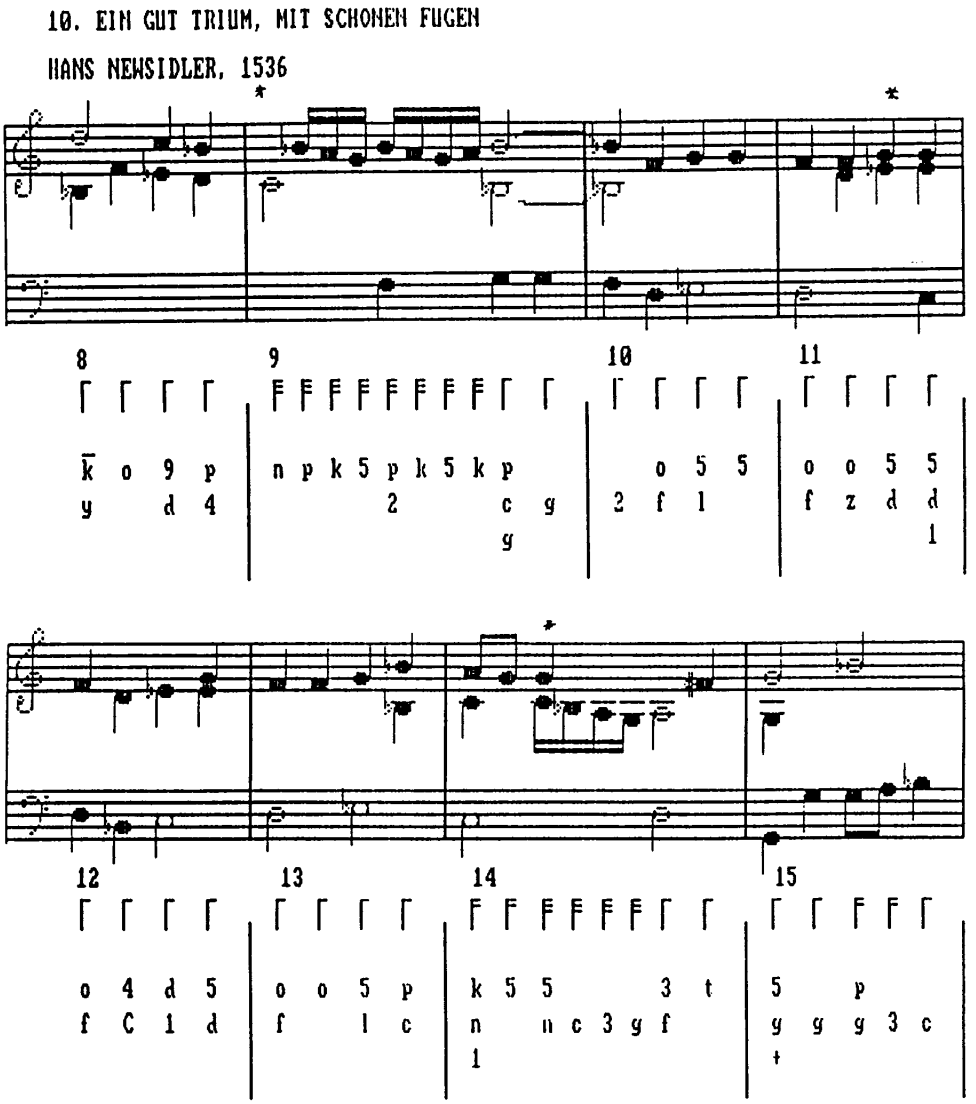


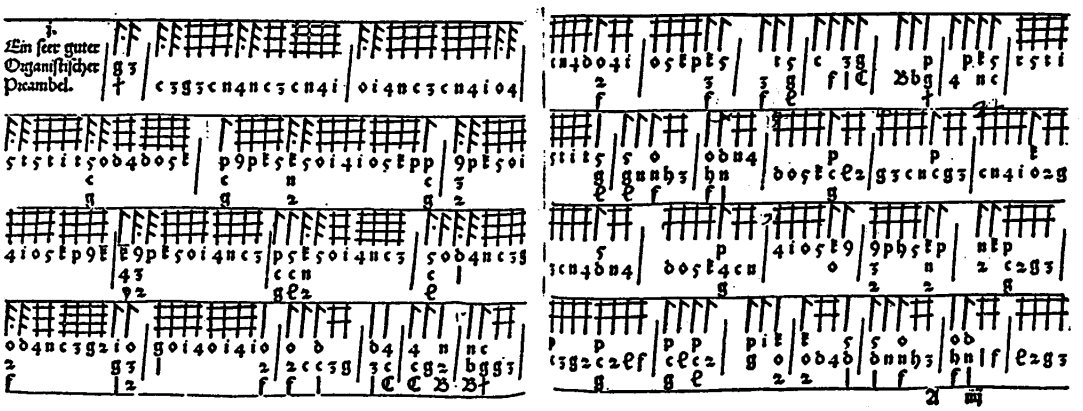
Illustration 48

Academic Systems
ERATTO (Ivry-sur-Seine: Hélène Charnassé; Ottawa: Bernard Stepien)

Input device: IBM PC with SIT code
Output device: Epson dot matrix printer
Focus: German lute tablature, polyphonic style

Reduced

A. Original source



B. Computer printing and analytical reconstruction

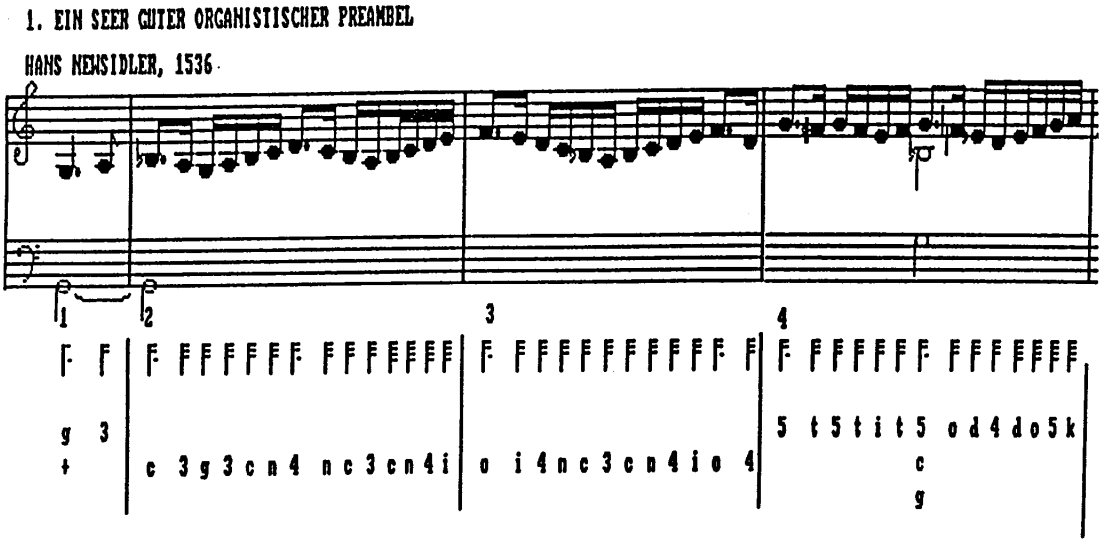
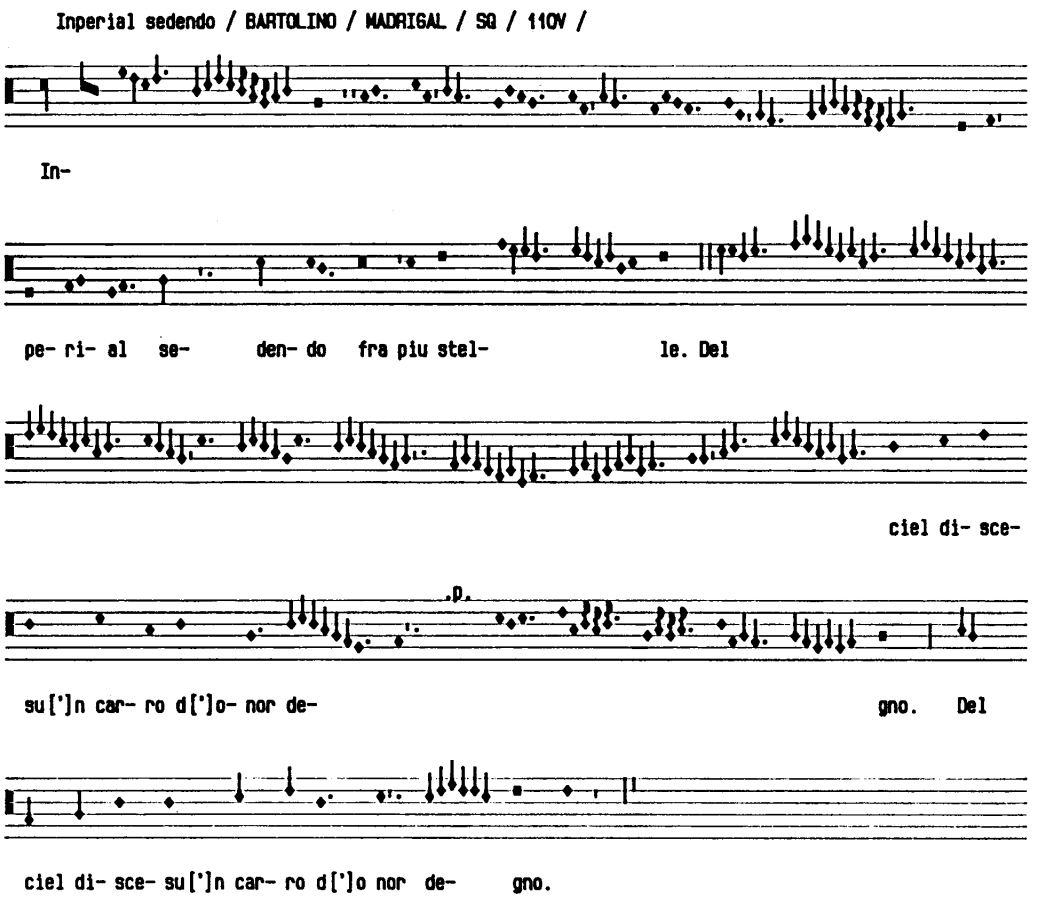


Illustration 49

Academic Systems
La Trobe, Melbourne Universities (SCRIBE, John Griffiths, John Stinson)

Input device: VAX minicomputer, Ericsson PC (IBM PC compatible)
Output device: Houston plotter
Focus: fourteenth-century music
Search parameters: texts, pitch strings, neumes
Status: available June 1988 on single use and site license basis

Black mensural notation



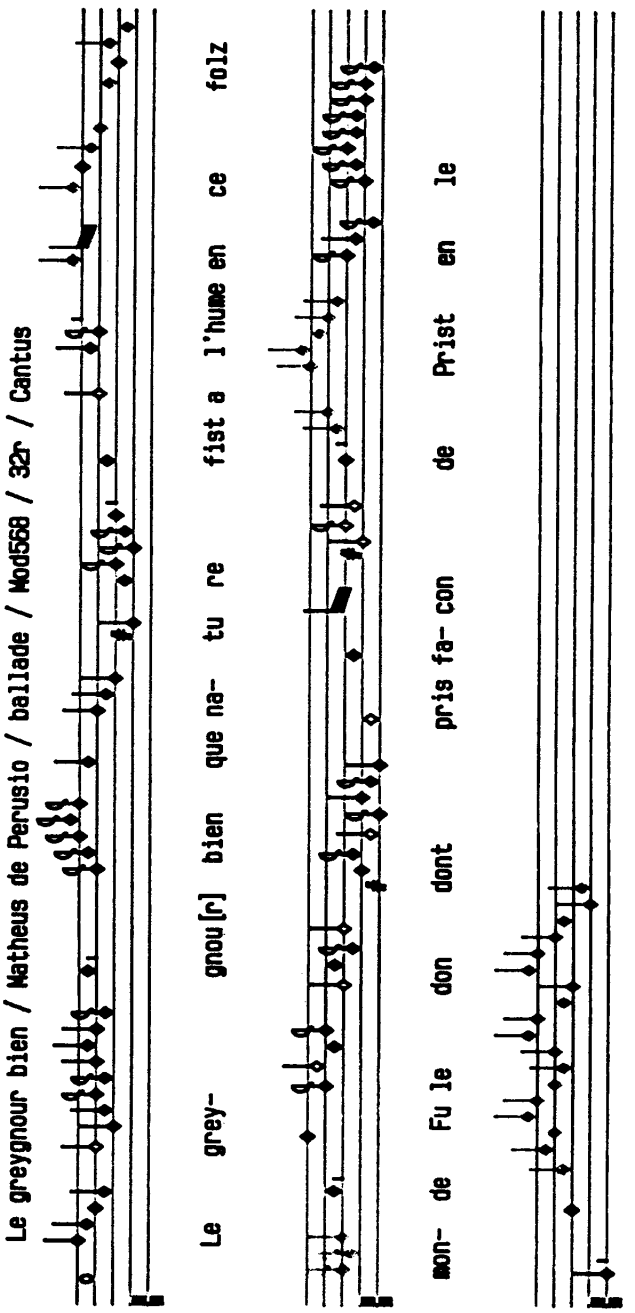
Reduced; reproduced from two-color original (black neumes on red staff)

Illustration 50

Academic Systems
La Trobe, Melbourne Universities (SCRIBE, John Griffiths, John Stinson)

Input device: VAX minicomputer, Ericsson PC (IBM PC compatible)
Output device: Houston plotter
Focus: fourteenth-century music
Search parameters: texts, pitch strings, neumes
Status: available June 1988 on single use and site license basis

Two-color mensural notation



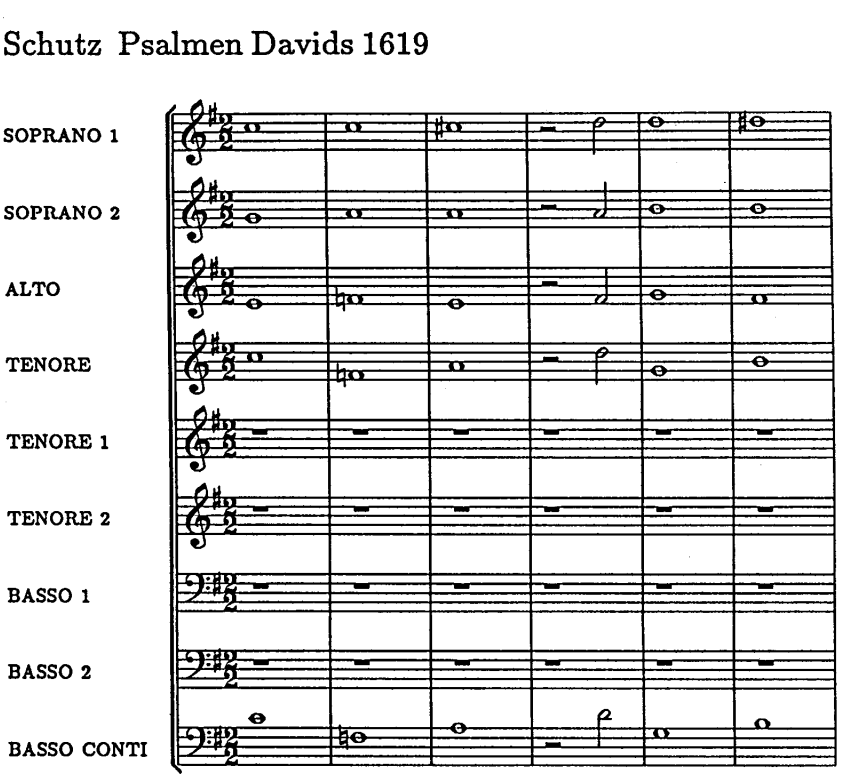
Reproduced from two-color original differentiating black, white, and red neumes on red staff lines (clef signs and text underlay in black)

Illustration 51

Academic Systems
Oslo University (MUSED, Kjell E. Nordli)

Input device: Perqs with MUSIKODE and mouse
Output device: Imagen printer (300 d.p.i.)
Focus: standard repertory, Norwegian folk music; provision for quantitative analysis

Reduced



MUSIKODE for the above example

```
Schutz Psalmen Davids 1619"T2:2; F1'; NG"[22200] 2_ 57$ Alto_
62$ Tenore kor 1_ 57$ Tenore 1 kor 2_ 38$ Tenore 2 kor 2_ 38$
Basso 1 kor 2_ 38$ Basso 2 kor 2_ 38$ Basso continuo_ 57$$ T2:2;
F1'; NG"6C/ "6C/ "6C'/ "P:2 - 6D:2/ "6D/ "6D'/ "6D':4 - 6D':2
- 6D':4/ T2:2;F1';NG"5G/ "5A/ "5A/ "P:2 - 5A:2/ "5H/ "5H/
"5H:4 - 5H:2 - 5H:4/ T2:2;F1';NG"5E/ "5F/ "5E/ "P:2 - 5F':2/
"5G/ "5F'/ "5F':4 - 5F':2 - 5F':4/ T2:2;F1';NG"6C/ "5F/ "5A/
"P:2 - 6D:2/ "5G/ "5H/ "5H:4 - 5H:2 - 5A:4/ T2:2;F1';NG"P/
"+P/ "+P/ "+P/ "+P/ "+P/ "+P/ T2:2;F1';NG"P/ "+P/ "+P/
"+P/ "+P/ "+P/ "+P/ T2:2;F1';NG"P/ "+P/ "+P/ "+P/ "+P/
"+P/ "+P/ T2:2;F1';NG"P/ "+P/ "+P/ "+P/ "+P/ "+P/ "+P/
T2:2;F1';NG"5C/ "4F/ "4A/ "P:2 - 5D:2/ "4G/ "4H/ "4H:4 - 4H:2
- 4A:4/
```

MUSIKODE was developed by Petter Henriksen and Tor Sverre Lande in cooperation with Prof. Ole-Johan Dahl

Illustration 52

Academic Systems
Oslo University (MUSED, Kjell E. Nordli)

Input device: Perqs with MUSIKODE and mouse
Output device: Imagen printer (300 d.p.i.)
Status: in transition to VAXStation II with MIDI input

Reduced

Conclusion of preceding example

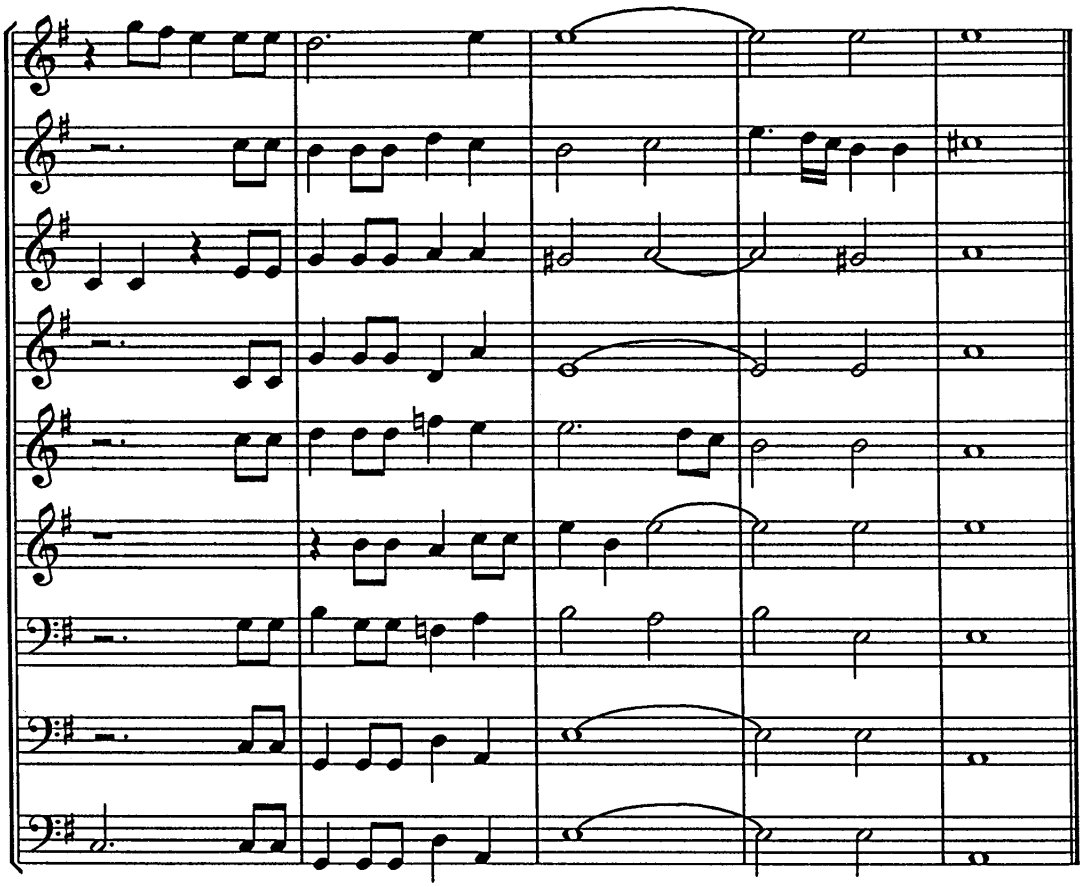


Illustration 53

Academic Systems
Oslo University (MUSED, Kjell E. Nordli)

Input device: Perqs with MUSIKODE and mouse
Output device: Imagen printer (300 d.p.i.)
Focus: standard repertory, Norwegian folk music; provision for quantitative analysis

Reduced

Part extracted from preceding score

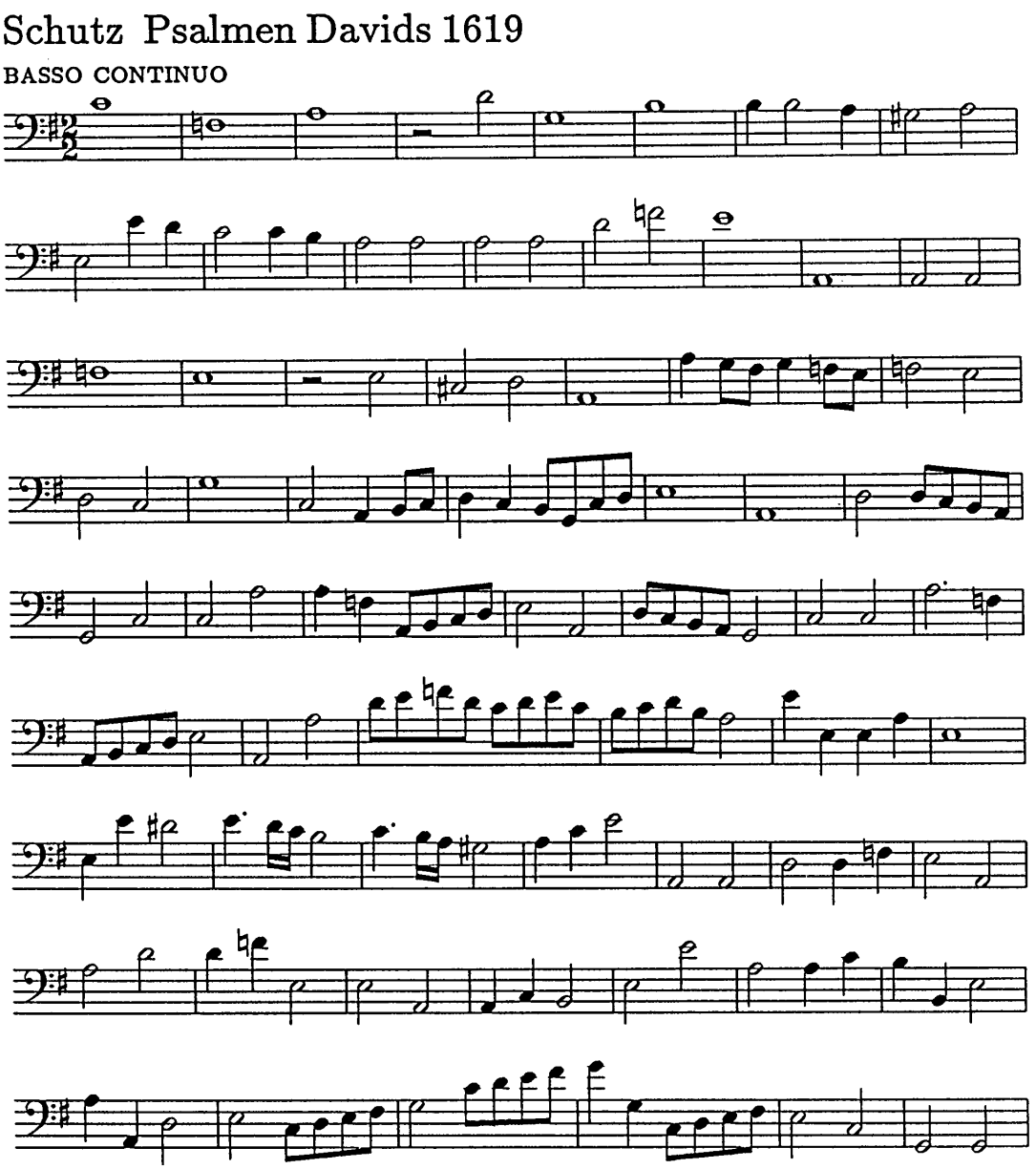


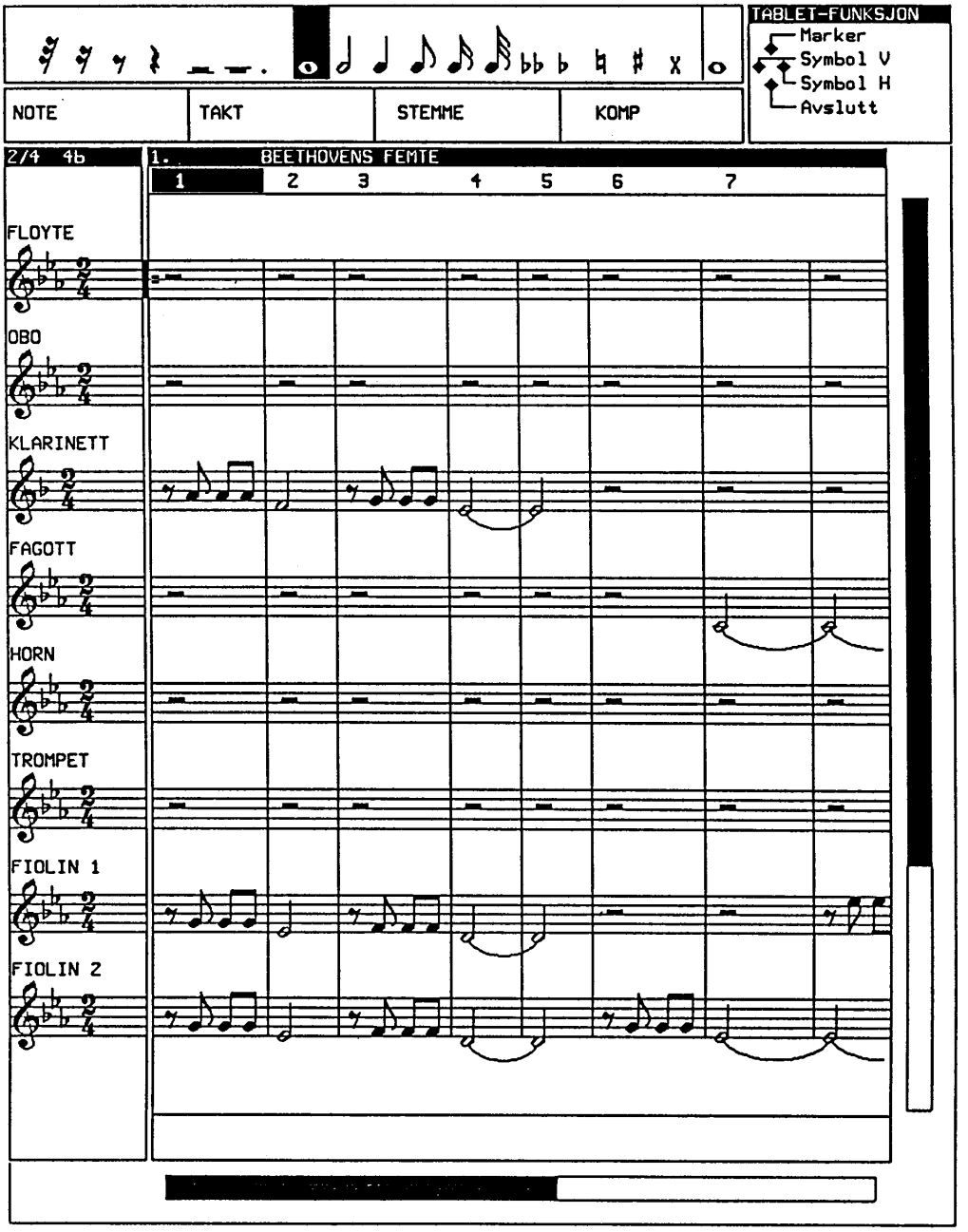
Illustration 54

Academic Systems
Oslo University (MUSED, Kjell E. Nordli)

Input device: Perqs with MUSIKODE and mouse
Output device: Imagen printer (300 d.p.i.)
Status: in transition to VAXStation II with MIDI input

Reduced

Screen display for MUSED system



Log of Current Activities and Applications

The main purpose of this listing is to make available information about work-in-progress prior to its publication. While the Center maintains a cumulative list of work undertaken since 1980, we offer information here only on newly undertaken, recently modified, or previously unreported work. Many projects listed in previous Center directories are still operating. Persons desiring further information about specific projects should contact the individual(s) involved. Those seeking a more complete view of current and recent work in the field should consult the directories published in 1985, 1986, and 1987.

The listing of applications that follows is divided into four sections. The first two sections contain projects which emphasize the gathering and processing of factual information. The first section (I), concerning bibliographies and databases of text, is arranged under several headings--composers, repertories, libretti, contextual indices (in which relations to external information are being explored), instruments, discographies, and iconography. Bibliographies and indices of musical material constitute the second section (II),

Analytical projects are subdivided into two categories--those exploring a particular methodololgy (section III) and those tailored to a specific repertory (section IV). In the latter instance, studies of historical repertories, of non-traditional and non-Western repertories, of text underlay, and of databases designed for analytical use are treated separately. An illustration is provided for listings with an asterisk.

A brief listing of sites at which multiple-purpose systems and programs of study are under development concludes this portion of the Directory.

I. Bibliographies and Databases of Text

A. Composers

Beethoven/Meredith
Title: *Beethoven Bibliography Project*
Scope: a comprehensive bibliography of published and unpublished Beethoven materials, to be made available through RLIN
Investigator: William Meredith
Associate: Patricia Elliott
Place: Ira F. Brilliant Center for Beethoven Studies, San Jose State University
Duration of project: 1987-1991
Online access: RLIN

Janaček/Mraček
Title: *Leos Janaček: A Guide to Research*
Scope: preparation of an extensive bibliography pertaining to the music and writings of Janaček
Investigator: Jaroslav Mraček
Place: San Diego State University
Computer: Apple Macintosh
Other devices: Apple LaserWriter
Software: Apple Hypercard

Scribe/Schweitzer
Title: *The Comédies-vaudevilles of Eugène Scribe*
Aim: investigation of the comedies, especially of the airs and their "timbres"; development of methods for historical research based on semantic data modelling and relational databases
Investigator: Rainer Schweitzer
Place: Musikwissenschaftliches Seminar, University of Heidelberg
Duration of project: 1988-90
Computer: IBM-PC compatible

Telemann/Stewart
Title: *Telemann Works Database (TWD)*
Scope: an on-line catalogue of the works of G.P. Telemann (1681-1767), intended as a continuously updatable supplement to the TWV/TVWV of Martin Ruhnke and Werner Menke
Investigator: Brian D. Stewart
Place: Pennsylvania State University
Computer: NEC APC IV
Software: dBase III+

B. Repertories

Early Keyboard Sources/Silbiger
Scope: development of a database for early keyboard sources, in connection with a proposed archive for such sources to be established at Duke University
Investigator: Alexander Silbiger

Italian Cantatas/Whenham
Title: *A Catalogue of the Sources of Italian Baroque Chamber Cantatas, 1600-1725*
Scope: comprehensive catalogue listing concordances among music manuscripts and printed sources of music and poetry
Investigator: John Whenham
Associate: Colin Timms
Place: Barber Institute of Fine Arts, Birmingham University
Duration of project: 1983-90
Computer: mainframe
Other devices: pen plotter
Software: custom

Orchestral Repertory/OLIS
Title: *Orchestra Library Information Service (OLIS)*
Purpose: to provide a thoroughly researched database of orchestral repertory, currently consisting of more than 4000 titles by more than 500 composers
Investigator: Heather Dinwiddie
Associate: Robyn Guilliams
Place: American Symphony Orchestra League
Computer: IBM PS/2
Software: OLIS (based on Revelation)

Portuguese Music/Castelo-Branco
Title: *Cross-cultural Processes in Music: The Role of Portuguese Music in the World from the Fifteenth Century*
Investigator: Salwa El-Shawan Castelo-Branco
Associates: Maria de São José Feraaz de Olveira, João Filipe S. Soeiro de Carvalho
Place: New University of Lisbon
Duration of project: 1987--
Computer: Amstrad PC 1512
Other devices: Amstrad DMP 3000 Printer
Software: dBase III+

Renaissance Liturgy/Crawford
Title: *Renaissance Liturgical Imprints: A Census*
Scope: creation of a database for books printed between 1450 and 1600 [2700 records to date; 10,000 records anticipated]
Investigator: David Crawford
Associate: James Borders
Place: University of Michigan
Duration of project: *c.*1983--
Computer: IBM 3090
Software: SPIRES, Professional Composer and Performer

C. Libretti

Ospedali Libretti/Berdes
Title: *Index of Libretti for Sacred Vocal Works performed in the Venetian* Ospedali
Investigator: Jane L. Berdes
Place: Bethesda, MD, and Three Lakes, WI
Duration of project: 1983-90
Computer: Epson PC
Software: Personal Composer
Associated Literature: "Musical Life at the Ospedali grandi of Venice, 1525-1855," thesis, Oxford University

RISM Libretti/Walker
Title: *U.S.-RISM Libretto Project*
Purpose: to catalogue the 19th-c. Italian libretti in the Albert Schatz Collection at the Library of Congress, as the initial stage in a many-year, multi-institutional plan to catalogue all historical libretti in the U.S. (RISM related project)
Principal Investigator: Marita P. McClymonds
Director: Diane Parr Walker
Associates: Scott L. Balthazar
Place: University of Virginia
Online access: RLIN

D. Contextual Indices

Arias/Mamy
Title: *Searchable Index of Venetian Opera Arias*
Scope: the repertoire of the Teatro S. Gio. Grisostomo of Venice (17th/18th centuries)
Investigator: Sylvie Mamy
Associate: Michel Monfils
Place: Paris: Laboratoire Informatique des Sciences Humaines, Centre National de la Recherche Scientifique
Duration of project: 1980--
Computer: IBM (SAS.MVS, MS/DOS)
Software: dBase III, SAS
Associated Literature: "La diaspora dei cantanti veneziani nella prima metà del Settecento," *Proceedings of the International Vivaldi Conference, Venice, 1987* [in press]

Motet Text Incipits/Fromson
Title: *Database of Motet Text Incipits, 1560-1605*
Scope: database holds names of composers who set each text, date of and number of voices in their setting, feast to which it was assigned, and references to source and chant-settings of the text; primary emphasis on printed motets, Italian composers
Investigator: Michele Fromson
Place: UC Davis
Computer: IBM
Software: PC-File III

E. Instruments

Early Pianos/Clinkscale
Title: *Early Pianos, 1720-1860*
Scope: comprehensive database with fields for maker, place, date, owners, physical characteristics, bibliographical references
Investigator: Martha Novak Clinkscale
Place: UC Riverside
Duration of project: 1987-1990
Computer: Compaq
Software: R:Base

Fiske Museum/Rogers
Title: *Catalogue of Musical Instruments in the Fiske Museum*
Scope: machine-readable inventory of the museum's collection of musical instruments
Director: Patrick J. Rogers
Place: Fiske Museum of Musical Instruments, Claremont University Center, Claremont, CA
Computer: IBM PC
Software: R:Base 5000

North American Indian Instruments/ Haefer
Title: *North American Indian Music Instruments belonging to the Smithsonian Institution*
Scope: complete descriptive database (including measurements) of North American Indian music/sound instruments housed in the Museum of Natural History (Dept. of Anthropology), Smithsonian Institution
Investigator: J. Richard Haefer
Associates: Jo Van Volkenberg, Tracy Walsh
Place: School of Music, Arizona State Univ.
Duration of project: 1987-88
Computer: Macintosh Plus, Everex EMAC20D (will be placed on Mac II LAN for class use)
Software: Double Helix II Pagemaker
Associated Literature: catalogue in preparation

F. Discographies

American Music/KWilliams
Title: *Computer Index of American Music*
Purpose: to develop an index of sound recordings and printed materials on American music in the holdings of the libraries of the Univ. of North Carolina at Greensboro
Investigators: J. Kent Williams, Eleanor McCrickard, Frank McCarty, Ron Crutcher
Place: UNC Greensboro
Duration of project: 1988-9
Computer: IBM-PC/AT compatible
Software: dBase III or IV

CBMR Database/Floyd
Title: *CBMR Database: A Union Catalog of Black Music Holdings in Chicago-Area Libraries and a Reference System*
Purpose: to provide reference lists of black music books, recordings, printed music, manuscripts, photographs, and vertical-file materials
Head of project: Samuel A. Floyd, Jr.
Associates: Marsha J. Reisser, Marion Gushee, Virginia McLaurin, Dian Raptosh
Place: Center for Black Music Research, Columbia College, Chicago
Time: 1985--
Computer (OS): PC with AM-170 co-processor board (AMOS)
Software: STAR database and information retrieval system

ETNO/Schaffrath
Title: *ETNO: Database to Retrieve and Catalogue Ethnomusicological Sound-material*
Scope: information from covers, booklets, etc. of published records, tapes, videos, etc. (unit is the single musical piece)
Investigator: Helmut Schaffrath
Associate: Barbara Jesser
Place: University of Essen
Duration of project: 1984-permanent
Computer: IBM 3207 (CMS mainframe)
Software: STAIRS/CMS; ESAC

Edelberg/Handel Discography
Title: *Comprehensive Index of Handel Recordings*
Purpose: to create a complete listing of all recorded performances of music by Handel (on cylinders, 33-, 45- and 78-rpm disks, tapes and CD's)
Investigator: David Edelberg
Place: Montréal
Computer: IBM-PC

Jazzbank/Robinson
Title: *Jazzbank*
Purpose: to design a central database for storage/retrieval of comprehensive jazz discographical information, accessible via dial-up from a PC
Investigator: Dave Robinson
Place: Fairfax, VA
Computer: mainframe
Software: Oracle RDBMS

G. Iconography

Iconography/Haefer
Title: *SLIDECAT/MUSICONCAT*
Scope: catalogue/database of ca. 15,000+ slides of music iconography/ethnology; contains descriptive and bibliographic information and digitized visual image for music iconography subjects, music instruments representations, and ethnographic object/ceremonies/etc.
Investigator: J. Richard Haefer
Associate: Kathleen Thompson
Place: Arizona State University
Duration of project: 1986--
Computer: Macintosh Plus/Jasmine DD80

RCMI/Brook
Title: *Music Iconography Database*
Purpose: to make accessible by means of a standardized vocabulary about 20,000 artworks with complete documentation and descriptions of their musical elements; encompasses all artworks (including non-Western ones) up to *c.* 1900
Investigator: Barry S. Brook
Associate: Terence Ford
Place: Research Center for Music Iconography, CUNY Graduate Center
Time: 1987-90
Computer: IBM 3081KX, IBM 3071
Software: SPIRES

II. Bibliographies and Indices of Musical Material

Auber/Schneider
Title: *Catalogue of the Works by Daniel-François-Esprit Auber*
Scope: thematic catalogue including all translations, arrangements, publishers, lithographers, etc.
Investigator: Herbert Schneider
Associate: Th. Betewiese
Place: Musikwissenschaftliches Seminar, University of Heidelberg
Duration of project: 1984-88
Computer: Compaq Portable III
Software: dBase

Chant Examples/Chartier
Title: *"Exempla Theorica"*
Scope: an index of chants quoted by music theorists from ca. 850 to 1600; compilation and statistics derived from them as to genres, modes, frequencies, geographical diffusion, etc.
Investigator: Yves Chartier
Place: University of Ottawa
Duration of project: 1988-90
Computer: IBM PC AT and compatibles
Other devices: Dot-matrix and laser printers
Software: XyWrite III+; ZyIndex; Professional Composer; dBase III+
Associated Literature: unpublished preliminary report

English sacred anonymi/Morehen
Title: *16th- and 17th-century Anonymous English Sacred Music*
Scope: English manuscript sources of liturgical music, 1549-1644
Investigator: John Morehen
Place: University of Nottingham
Duration of project: 1980-
Computer: ICL 2988
Other devices: Benson plotter
Software: FORTRAN77
Encoding: DARMS
Associated Literature: "Thematic Cataloguing by Computer," *Fontes Artes Musicae* **31** (1984), 32-8

Historical Editions/GHill
Title: *A Guide to Music in Collected Editions, Historical Sets, and Monuments*
Aim: to provide an index to the contents and a complete bibliography of the editions previously covered in Heyer's book; musical incipits are encoded if titles are ambiguous
Head of project: George R. Hill
Associate director: Barbara Renton
Place: City University of New York
Time: 1986-8
Musical encoding: custom (Garrett Bowles)

Italian Sonata/Mangsen
Title: *Instrumental Duos and Trios Printed in Italy, 1600-1675*
Scope: thematic catalogue of instrumental duos and trios in prints from 1600 to 1675 (to be extended to 1700 and to manuscript sources at a later date)
Investigator: Sandra Mangsen
Place: Cornell University; Montréal, Quebec
Duration of project: 1986-89
Computer: Macintosh 512E
Software: Helix, Data Desk
Encoding: MUSSCRIPT

Lute Tablature/Hultberg
Aims: to implement the tablature-to-standard-notation transcription processes for Spanish, Italian, English, French, and German styles of tablature, as well as tablature-to-tablature conversion; thematic indices of Spanish sources are in preparation
Head of project: Warren Hultberg
Associate: Mary Lou Hultberg
Place: SUNY Potsdam
Computer: Macintosh 512, SE
Other devices: DX7II FD Synthesizer
Software: BASIC, PASCAL; PFS--File and Report; Professional Composer/Performe
Encoding: modified DARMS; direct input from synthesizer or computer
Music printing: Professional Composer, Imagewriter

Madrigal/Lincoln
Title: *The Italian Madrigal and Related Repertories: Indexes to Printed Collections, 1500-1600* [Yale University Press, 1988]
Scope: incipits of all voices of 9500 pieces (total 38,000 incipits) printed in music staff notation; index to first lines; thematic locator index; index to RISM numbers for printed sources
Head of project: Harry B. Lincoln
Place: SUNY Binghamton
Hardware: IBM 3090 (data); Nicolet Zeta plotter (music printing)
Encoding: DARMS
Software: custom, in PL/1 and PASCAL
Associated Literature: "A Description of the Database in Italian Secular Polyphony held at SUNY Binghamton, N.Y.," *Fontes Artis Musicae* **XXXI/3** (1984); sample of music printing in 1986

Marcello/Selfridge-Field
Title: *The Music of the Marcellos--Benedetto and Alessandro: A Catalogue of Works* [Oxford University Press, 1989]
Scope: listing of textual and musical incipits of 800 works, based on a survey of 3000 sources, with multiple indices and source filiation
Investigator: Eleanor Selfridge-Field
Place: CCARH, Menlo Park, CA
Time: 1984-88
Hardware: HP-1000 (IBYCUS); HP LaserJet II
Software: custom designed by Walter B. Hewlett

Medieval Rhymed Office/Hughes
Title: *Late Medieval Rhymed Offices*
Scope: manuscript sources/inventories; complete textual and chant concordances; general information, catalogues, and inventories
Investigator: Andrew Hughes
Place: University of Toronto
Computer: various, mostly IBM and clones
Software: custom designed encoding system; FYI; Brigham Young Concordance Program
Associated literature: *Dictionary of the Middle Ages*: "Rhymed Office"; "Research Report," in *Journal of the Plainsong and Medieval Music Society* **8** (1985)

NTI: Wind Band Music/Camus
Title: *National Tune Index: Early American Wind and Ceremonial Music, 1636-1836*
Scope: a listing and concordance of eighteenth-century wind music in American, British, French, Hessian, and other sources
Head of project: Raoul Camus
Place: CUNY--Queensborough (supported by NEH)
Time: 1987-90
Publication: microfiche binder with printed contents guide (University Music 1987)

Swedish Hymn Tunes/Görannson
Title: *Index of Swedish Hymn Tunes*
Scope: 15,000 hymn tunes in use between 1500 and 1820
Investigator: Harald Görannson
Place: Royal Academy of Music, Stockholm

Symphonies/LaRue
Title: *A Catalogue of Eighteenth-Century Symphonies*: Vol I. *IDENTIFIER* Indiana University Press, 1988
Scope: identification and source files for all known symphonies from *c.* 1720 to *c.* 1810
Head of project: Jan LaRue
Assistants: Kathryn Shanks, David Cannata
Place: New York University
Time: 1982--
Computer: Cyber 180 (NOS)
Encoding: MUSTRAN

Walther Manuscripts/Schnell *et al.*
Title: *Sources for the Music of J. G. Walther*
Purpose: to assemble tables of contents, thematic concordances, and stemmata for the sources of the music of Johann Gottfried Walther
Investigator: Christoph Schnell *et al.*
Place: St. Gall, Switzerland
Software: Alpha/TIMES system

III. Analytical Methods, Tools, and Procedures

Cluster Analysis/Stepien and Logrippo
Title: "Cluster Analysis for the Computer-Assisted Statistical Analysis of Melodies," *Computers and the Humanities* **20** (1986)
Purpose: to explore the uses of cluster analysis [a method of classifying a set of entities] in the classification of melodies by pattern types
Repertory: monophonic songs
Measures: tonal density, interval density, melodic similarity
Investigators: Bernard Stepien, Luigi Logrippo
Place: University of Ottawa Dept. of Computer Science

Declarative Representations/Roeder
Title: *Declarative Music Representations*
Purpose: to use computers in the logical representation of analysis and composition
Investigator: John Roeder
Place: University of British Columbia
Computer: Apple Macintosh
Associated Literature: "A Declarative Model of Atonal Analysis", *Music Perception* [in press]

Fourier Index Sorting/Ferkova
Title: *Some Possibilities in Computer Assisted Analysis of Melody and Tonal Harmony*
Purpose: to explore translation of existing music-analytical procedures into algorithms for data processing, with special emphasis on Fourier index sorting for melodic analysis
Repertory: 554 melodies from Haydn symphonies
Procedures: differentiation of ascending and descending segments and numerous other measures
Investigator: Eva Ferkova
Associates: Andrej Ferko, Marian Dudek
Place: Slovak Academy of Science (Science of Art Institute), Bratislava
Duration of project: 1986-89
Computer: PDP-11/34 (RSX)
Software: custom
Encoding: modified ALMA
Associated Literature: doctoral thesis, Slovak Academy, Bratislava, 1986

Interactive Melodic Analysis/Schaffrath
Title: *Interactive Melodic Analysis*
Purpose: to input, analyze, catalogue, classify and play one-part melodies and variants
Repertory: 4200 German songs, 1000 Chinese songs, and 500 ballads
Approach: to provide a summary set of descriptive attributes that can be searched in isolation or combination and used as a tool for studies from diverse points of view
Measures: interval frequencies, scale degree frequencies, ambitus, succession of cadence tones and stressed tones, comparisons of pitch successions
Investigator: Helmut Schaffrath
Associate: Barbara Jesser
Place: Essen University
Duration of project: 1985-90
Computers: IBM 3207; IBM PC
Analysis Software: MAMMUT (PL/1)
Encoding: ESAC (MIDI input)
Associated Literature: Articles by Schaffrath in *Musikpädagogische Forschung* **5** (1985), *Musica* **2** (1987), proceedings of the ICTN World Conference (1987) and the Lancaster Conference (1988); articles by Jesser in ICTM proceedings (1987) and *Musikpädagogische Forschung* **8** (1988)

Layer Analysis/Wang Sen et al.*
Title: *Analysis of Tone Structure in Chinese Folk Melody*
Purpose: classification of regional differences in relation to patterns of differentiation between melodic foundation, framework, and ornament tones
Investigators: Wang Sen, Zhou Haihong
Associates: Wong Wei, Feng Yankun
Place: Central Conservatory of Music, Beijing
Duration of project: 1988-89
Computer: IBM PC
Analysis Software: LSA [=Layer and Structure Analysis]
Encoding: extended numeric
Associated Literature: "The Structure and Layer of Tones: The Possibilities of Stylistic Analysis Aided by the Computer" [in progress]

Melodic Analysis/Bevil*
Title: *MelAnaly: A Software Package and Query System for Comparative Analysis of British-American Folktunes*
Purpose: to extend the study of the centonate process and to establish a means of enquiry and a central database for other researchers
Investigator: J. Marshall Bevil
Place: Houston, TX
Duration of project: 1988
Computer: Apple IIgs (Apple II+ for field)
Other devices: ImageWriter II printer
Analysis Software: custom, for array scanning
Printing Software: Tunegraph (prints video images and hard copy of color-coded line graphs)
Encoding: numeric (pitch, duration, stress)
Associated Literature: "A Genre-Specific... Method of Comparative Melodic Analysis for the Assessment of Relationships between British-American Folksongs" (talk given to the Sonneck Society, April 1988)

Melodic Scaling/ISTAR*
Title: *Raga Classification*
Purpose: Two- and three-dimensional scaling of ragas on the basis of computer analysis of recorded music
Investigators: Bernard Bel, Wim van der Meer
Place: Amsterdam and Marseilles
Duration of project: 1988
Computer: Apple IIe, Macintosh+
Software: Meloscribe (automatic notation)
Encoding: MMA (Melodic Movement Analyser)

Melodic Similarity/Leppig
Title: *Melodic Similarity*
Scope: series of projects devoted to measuring melodic similarity between works
Repertory: German 18th-century classical and folk music
Measures: comparison of pitch profiles (absolute, with horizontal offset, with vertical offset, with suppression of repeated notes, with accented notes only)
Investigator: Manfred Leppig
Place: University of Duisburg, Faculty of Mathematics
Encoding: numeric
Associated Literature: "Musikuntersuchungen im Rechenautomaten," *Musica* **2** (1987), 140-150; "Tonfolgenverarbeitung in Rechenautomaten: Muster und Formen," *Zeitschrift für Musikpädagogik* **42** (1987), 59-65; "Die Untersuchung musikinterpretierbarer Eigenschaften in Zahl- und Zeichenfolgen, Eine Sachmotivation zum Programmierunterricht," *Beiträge zum Mathematikunterricht* **1** (1987); "Programmieraufgaben für Zahl- und Punktfolgen mit Deutungen in der Musiktheorie (II)," *BzMU* **2** (1988) [in press]

Melodic Variation/Boroda
Title: *A Methodology for Quantitative Investigation of Melodic Variation in Song Segments*
Purpose: to establish a methodology for quantifying variations between melodic segments both within one work and between works; uses R. K. Zaripov's concept of intervallic-metrical structure
Repertories: 500 melodies from works by Schubert, Dunayevsky, and Russian folksongs
Investigator: Moisei Boroda
Place: Conservatory of Music, Tbilisi
Duration of project: 1988
Associated Literature: "A Methodology of Quantitative Investigation of Methods of Variation of Segments in Song Melodies" in *Quantitative Aspects of the Systemic Organization of Text* (in Russian, Tbilisi, 1987); "Construction of Frequency Lexicons of Musical Segments for Analysis and Modelling of Melodies" [by R. K. Zaripov; in Russian] in *Science* **41** (Moscow, 1984), 207-252

Musical Language/Boroda
Title: *MUSLAN--A Systemic-Quantitative Approach to Musical Language*
Purpose: to study general regularities (especially rhythmic ones) of musical thinking, metastylistic principles of the organization of repetitions in musical composition, general principles of the paradigmatic organization of melody, and interrelations between music and language
Investigator: Moisei Boroda
Place: Tbilisi Conservatory
Duration of project: 1988-93
Computer: Soviet
Associated Literature: "The Frequency Organization of the Musical Work and the Problem of Universals of Musical Language" in *Applied Linguistics and Automatic Text Analysis* [in Russian; Tartu, 1988]; "Rhythmical Models in Folk Melodies: Towards the Quantitative Approach" [in Russian; forthcoming in *Quantitative Methods in Ethnomusicology and Music Theory* (Moscow, 1988)]

Petri Nets/Camurri et al.
Title: *Petri Nets as a Means of Describing Styles of Orchestration in the Seventeeth and Eighteenth Centuries*
Purpose: one of a series of projects designed to show how Petri nets (which can describe asynchrony, non-determinism, concurrency, causality, and hierarchy) can be used to describe musical processes
Investigators: A. Camurri, G. Haus, R. Zaccaria
Place: Milan (Laboratorio di Inf. Mus.)
Duration of project: 1986-90
Operating System: UNIX
Software: MAP system (Musical Actors by Petri Nets; produces sound sample files)
Associated Literature: "Describing and Performing Musical Processes" in *Human Movement Understanding*, ed. P. Morasso and V. Tagliasco (*Advances in Psychology* 33), Amsterdam: North Holland, 1986, 335-357

Phrase Identification and Analysis/ Camilleri*
Title: *Computer Generation and Description of Simple Tonal Melodies*
Purpose: to employ the concept of perfect and imperfect phrases by Lidov and some rules of prolongation and reduction by Lerdahl and Jackendoff to describe and generate melodies
Investigator: Lelio Camilleri
Place: CNUCE (Pisa) and Florence Conservatory
Duration of project: 1987--
Computer: IBM 8081, VM 370
Software: custom
Encoding: TELETAU
Associated Literature: "Theory of a Rule-Based System for Music Analysis" [forthcoming]

Polyphonic Analysis/Böker-Heil*
Title: *MUSAN: A Program for Elementary Analysis of Harmonic Intervals in Late Medieval Polyphony*
Scope: creates relational graphs and frequency tables differentiating specific intervals and kinds of motion
Investigator: Norbert Böker-Heil
Place: Staatliches Institut für Musikforschung, Berlin (West)
Duration of project: 1985--
Hardware: DEC mainframe, Benson 1233 plotter

Rhythmic Models/Boroda*
Title: *Rhythmic Models of Musical Language*
Purpose: use of Zipf-Mandelbrot law to show significant isomorphisms in rhythmic organization between literary and musical texts
Repertory: folksongs of Georgia and Armenia
Measures: motivic frequency and repetition
Investigators: Moisei Boroda, A. A. Polikarpov
Associate: V. Detlov
Place: Tbilisi Conservatory
Completion of project: 1984
Associated Literature: "The Zipf-Mandelbrot Law and Units of Different Text Levels" in *Quantitative Linguistics in Automatic Text Analysis* [in Russian and Estonian; Tartu, 1984]

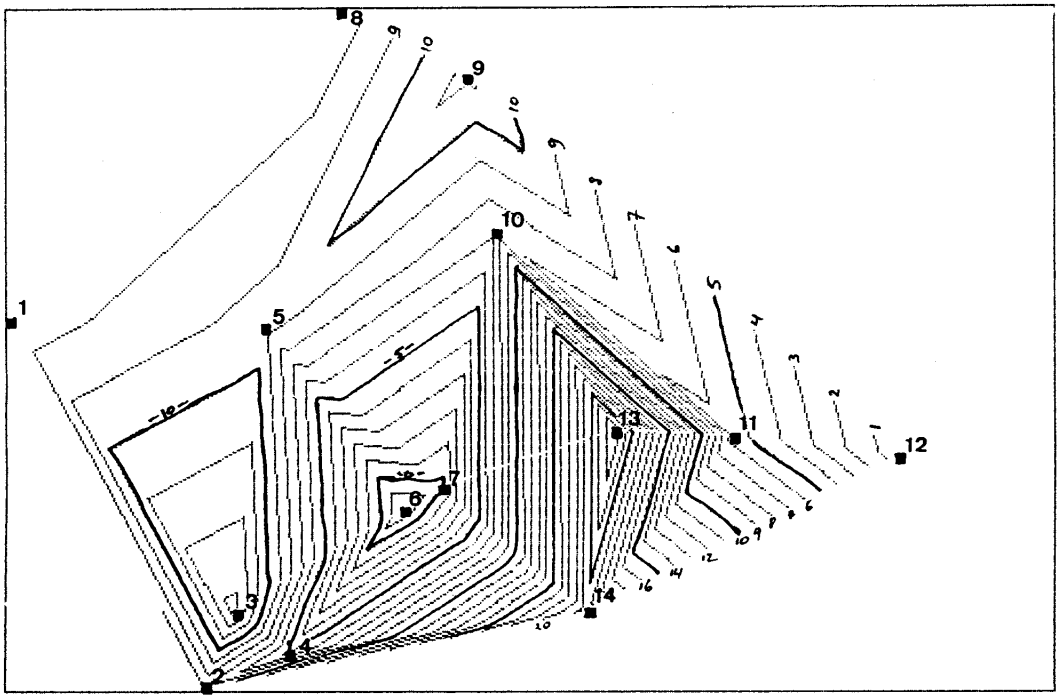
Segmentation Rule System/Camilleri
Title: *An Expert System for Musical Segmentation and the Harmonic Analysis of Tonal Music*
Purpose: to create a tool for music analysis based on a rule system and to verify the theoretical value of the rules
Investigator: Lelio Camilleri
Associates: Chiara Duranti, Francesco Carreras
Place: CNUCE (Pisa) and Florence Conservatory
Duration of project: 1987-89
Computer: IBM 8081, VM 370
Software: custom, using ESDE (Expert System Development Environment)
Encoding: TELETAU (enhanced)
Associated Literature: "Psychological and Theoretical Issues of Musical Segmentation" [Camilleri, forthcoming]; Analysis of Grouping Structure [thesis by Duranti, forthcoming]

Set Theory/Solomon
Title: *Set Theoretic Analysis Software*
Purpose: to create software for the analysis of chords and melodies based on set theory
Investigator: Larry J. Solomon
Place: Tucson, Arizona
Computers: Apple II, IBM PC, DEC
Associated Literature: "The List of Chords, Their Properties and Use in Analysis," *Interface* 11 (1982), 67-107

Structural Notations/Pope
Title: "Music Notations and the Representation of Musical Structure and Knowledge", *Perspectives on New Music* (1986), 156-189
Purpose: investigates the use of tree structures, state machines, control flow models, Petri nets, predicate transition nets and other data structures that can be supported by the Doubletalk music programming system under development by the author
Investigator: Stephen Pope
Place: ParcPlace Systems, Palo Alto, CA

Tonal Melody/KWilliams
Title: *Analysis Package for Tonal Melody*
Functions: isolates pitch strings, scale-degree strings, interval strings; identifies metrically equivalent rhythmic patterns; performs melodic reduction; finds latent melodic similarities
Investigator: J. Kent Williams
Place: Univ. of North Carolina, Greensboro
Duration of project: 1982-88
Computer: VAX/VMS, MS-DOS machines
Software: in SPITBOL
Encoding: MUSTRAN
Associated Literature: "Themes Composed by Jazz Musicians of the Bebop Era: A Study of Harmony, Rhythm, and Melody," Ph.D. dissertation, Indiana University, 1982 (UMI dissertation #8308888)

Three-dimensional map of 14 recordings of Indian music (Bernard Bel and associates)



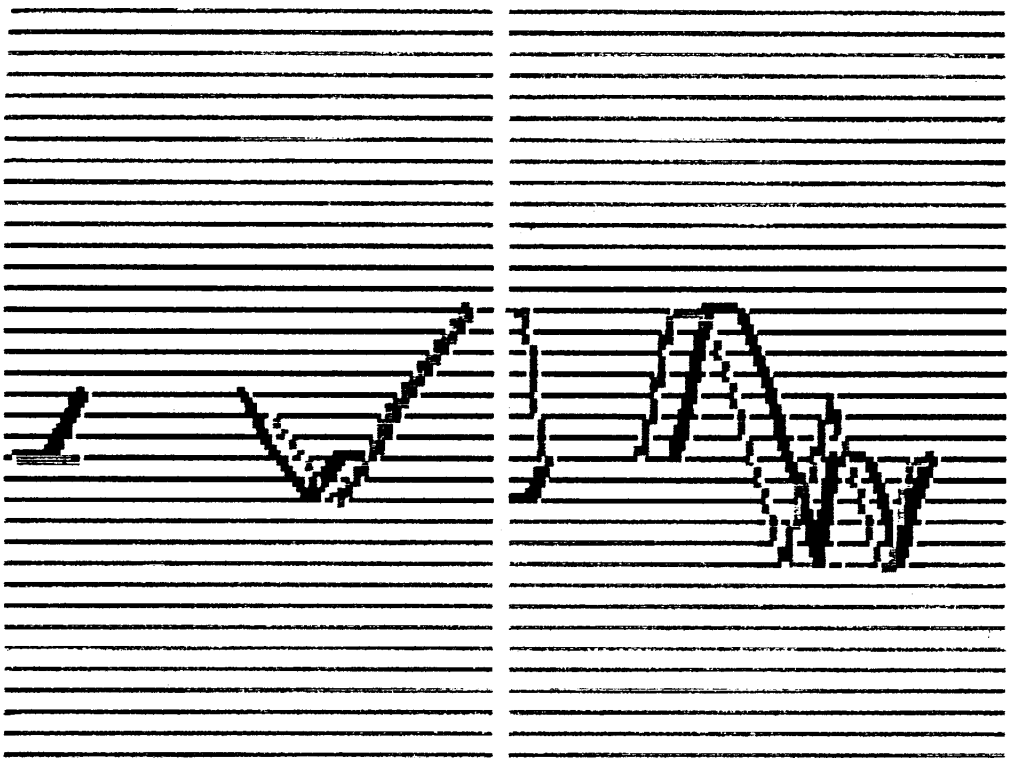
1. Multani by Bhimsen Joshi
2. Multani by Hirabai Barodekar
3. Multani by Wahid Khan
4. Multani by Nupur Roy Chaudhuri
5. Todi by Z. M. Dagar
6. Todi by Nupur Roy Chaudhuri (1st recording)
7. Todi by Nupur Roy Chaudhuri (2nd recording)
8. Todi by Kesar Bai Kerkar
9. Todi by Faiyaz Khan
10. Todi by Omkarnath Thakur
11. Todi by Mallikarjun Mansur
12. Todi by Kishori Amonkar
13. Vibhas by Kishori Amonkar
14. Vibhas by Malikarjun Mansur

Todi and Multani both use the scale C Db Eb F# G Ab B, though in different melodic sequences. Vibhas uses the scale C Db E G A. Multani is located distinctly in the "South-West", while Vibhas is situated in the "mountains". The position of the recordings 11-14 (both artists belong to the Jaipur school) indicates that the distance between the pieces of music is not exclusively a factor o different ragas but that there exists a consistency of individual and school interpretation.

Comparative Melodic Analysis

Superimposition of related melodic profiles on a graph (J. Marshall Bevil)

Reproduced from a two-color original



```
COMPARISON #1       CONTROL: MTHGV/CHANDL   ***   TEST: SHGR/BRNH2

PRIMARY CELL DETAILS

INCIPIT  MEDCLOS  FINEOPN  FINAL

 1 2 3    1 2 3    1 2 3   1 2 3

 X X      X X X      X     X  X  X  DIRECT, PITCH
                                    1-2 CROSS
                                    2-1 CROSS
                                    DOUBLE-CROSS
                                    3-1 RESEQUENCING
                                    3-2 RESEQUENCING

    X     X X X    X X X           DURATION

 X  X     X X X    X X X      X    STRESS


STATISTICAL SUMMARY AND CONCLUSIONS, SHGR/BRNH2 TO MTHGV/CHANDL

< PC >  P: 67   D: 58   S: 75   PD: 33   PS: 50   DS: 58   PDS: 33
< CT >  EE: 82   (BE): 9   (SE): 18   BB: 50   (BS): 8   (SB): 8   SS: 39   AV: 57

C L O S E    R E L A T I O N S H I P
```

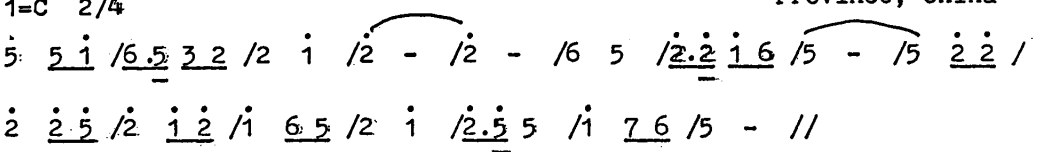
Results, comparative array scan for two melodies.

Layer Analysis

Differentiation of melodic foundation, framework, and embellishment in Chinese folk music (excerpt from a recent paper by Wang Sen *et al.*)

Example I. Driving Livestock North of Shanxi Province, China

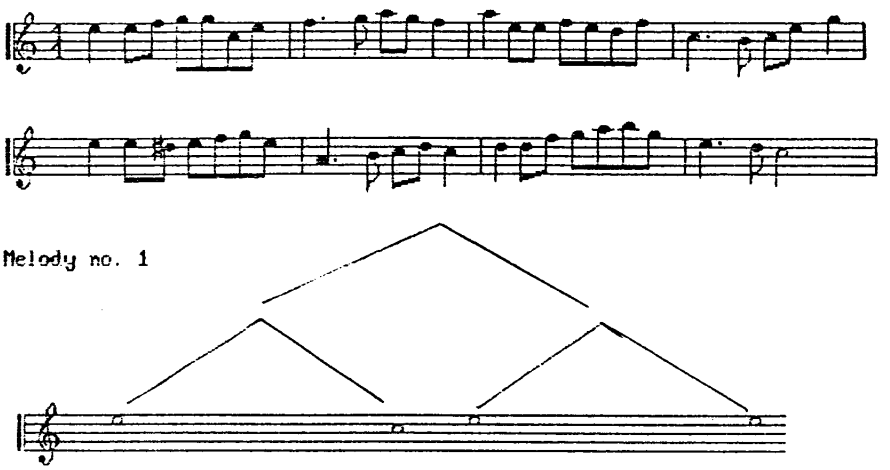
1=C 2/4



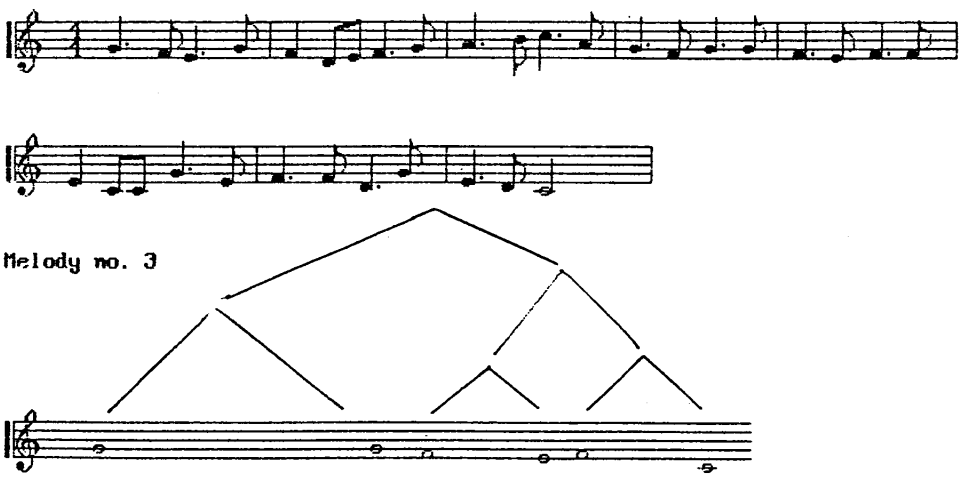
In this graph, "2" and "5" constitute the first basic layer because they assume a central status in the formation of the music. They are designated "framework tones". They second layer consists of "framework supporting tones" (1, 3, 6). A distinction is drawn between "principal supporting tones" and "subordinate supporting tones". "7", which has no structural function, is an "embellishing tone".

Phrase Identification and Analysis

Computer implementation of Lidov's distinction between perfect and imperfect phrases (Lelio Camilleri)



Perfect phrase structure

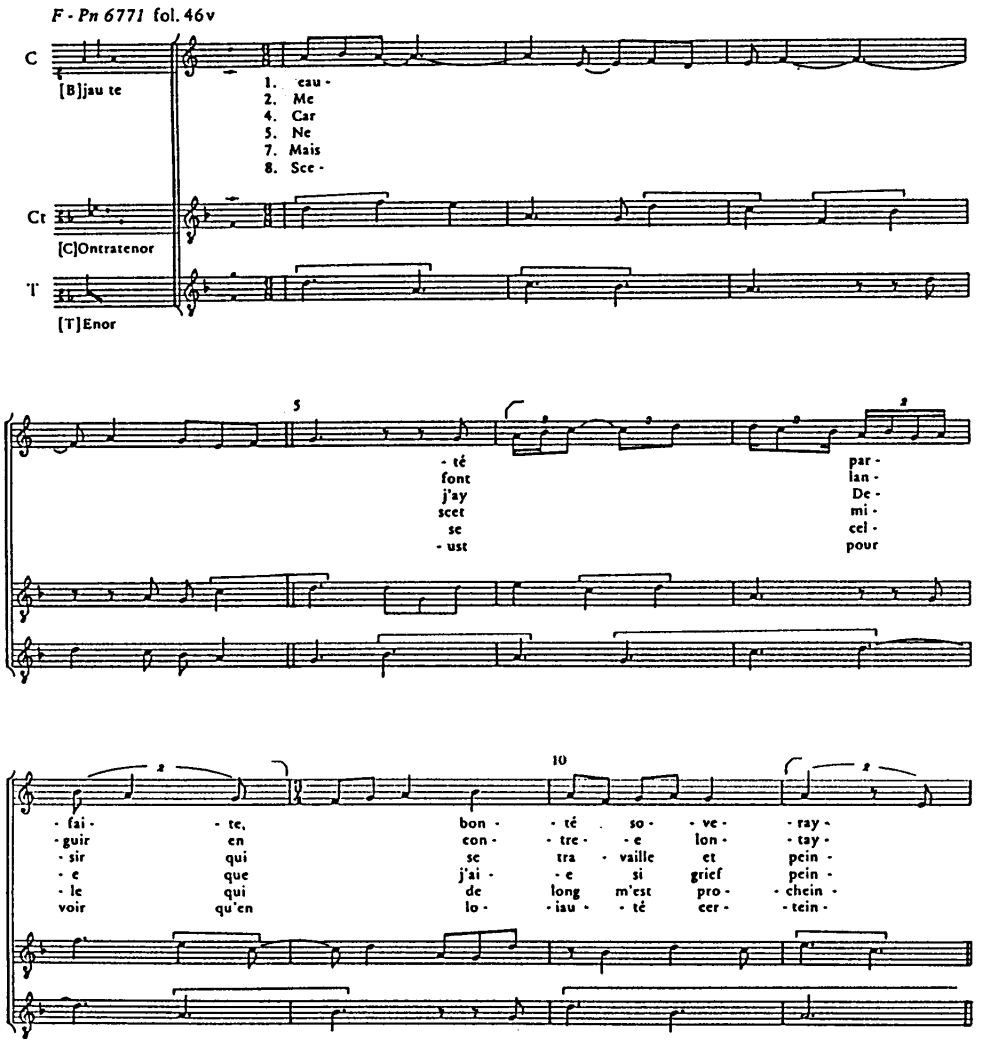


Imperfect phrase structure

Musical score of Anthonello de Caserta's "Beauté parfaite"

BEAUTÉ PARFAITE

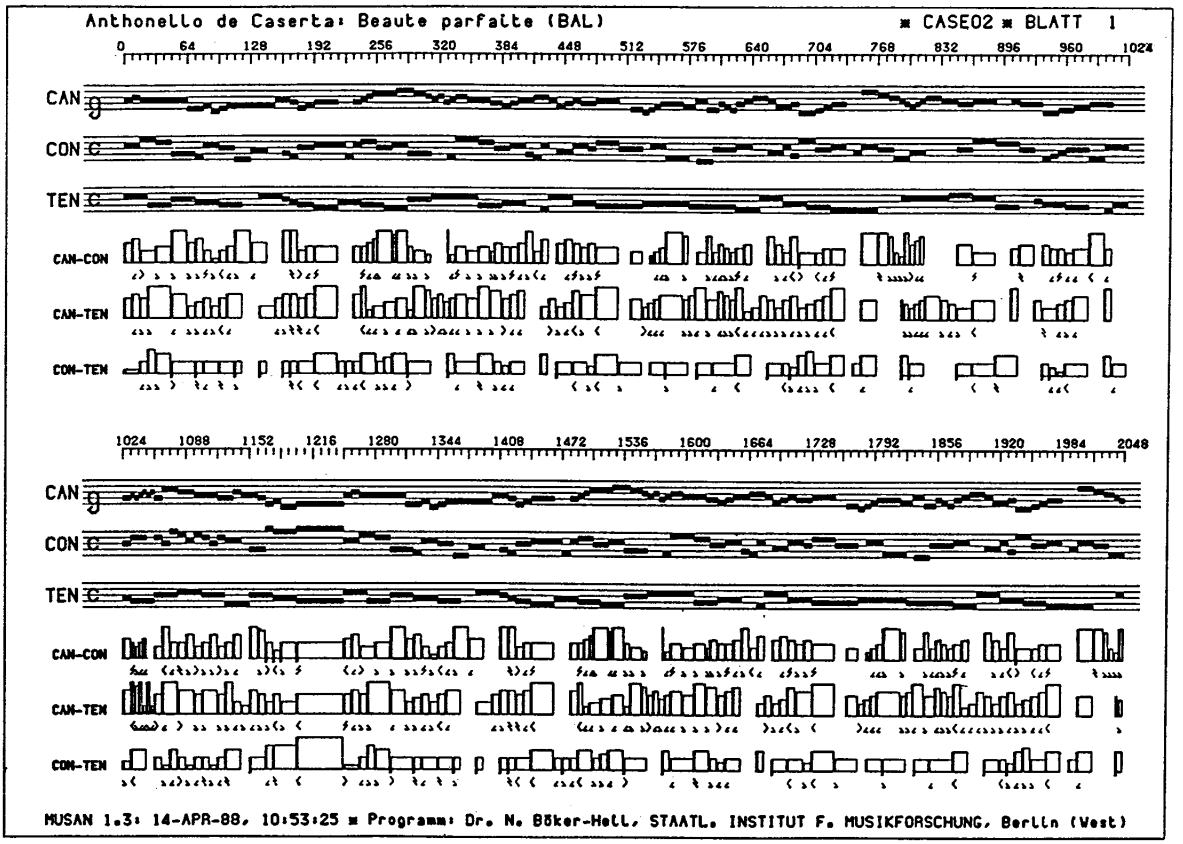
Anthonello de Caserta



Polyphonic Analysis/2
(Norbert Böker-Heil)

A. Horizontal bar graph of the score ["CAN" = Cantus, "CON" = Contratenor, "TEN" = Tenor].

B. Vertical bar graph, showing intervals between voice parts. The symbols beneath this bar graph distinguish parallel, contrary, and oblique motion and also indicate direction (rising or falling).



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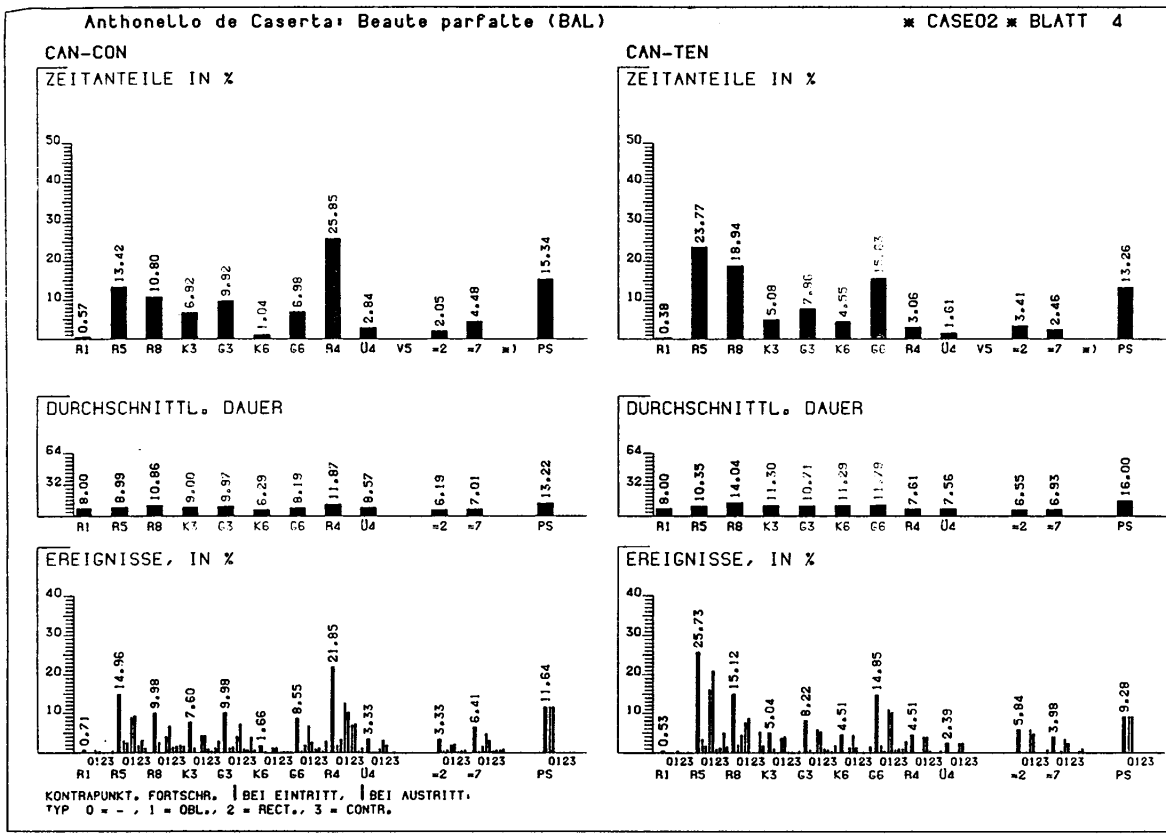
Polyphonic Analysis/3
(Norbert Böker-Heil)

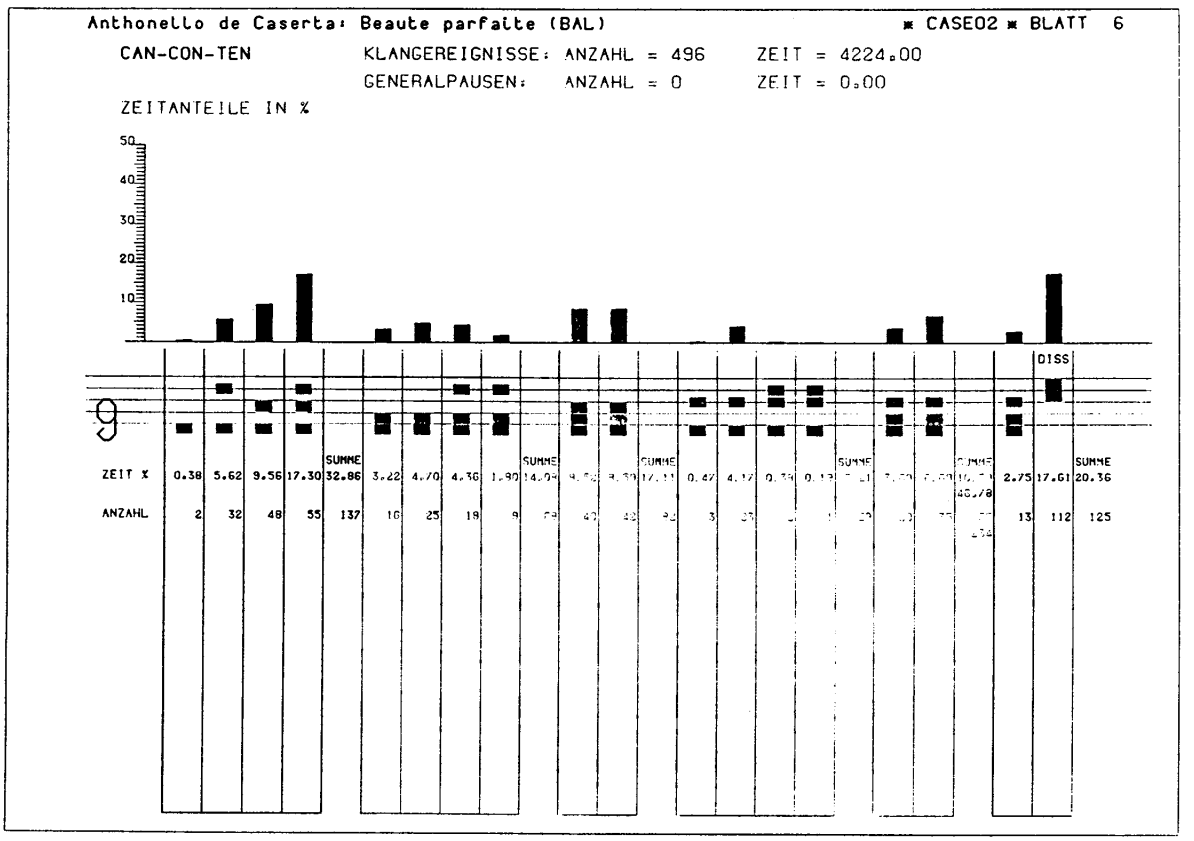
Frequency counts of intervals [R = reine (perfect), K = kleine (minor), G = grosse (major)]



Reproduced from a three-color original

Polyphonic Analysis/4
(Norbert Böker-Heil)

Subtotals and totals for the work: the columns to the left of the first summary column represent perfect intervals, the next four sections represent imperfect intervals, and the rightmost section represents dissonant intervals. These types are coded green, red, and black throughout the output.



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Stress Pattern Identification

Representation of short, intermediate, and long syllables used to differentiate rhythmic patterns in text setting (Katherine Rohrer)

Relative syllable lengths: o = short
o. = intermediate
o: = long

USES OF FORMULA I (♪♪♪ | ♩) IN LANIER'S "HERO AND LEANDER"

1. Lines beginning with three unstressed (and therefore short) syllables, for which Formula I is uniquely appropriate:

that have been oft
o o o o: TOTAL: 1

2. Lines with a stress on positions 2 and 4 and no word boundary between positions 2 and 3, for which Formula I is appropriate, though alternatives exist (e.g., ♪ | ♩ ♩ ♩.):

nor com'st thou yet (enclitic between 2 and 3)
o o. o. o:

who holds thee, cru[el?] (enclitic between 2 and 3)
o o. o. o.[o.]

the rosy-fin[ger'd]
o o.o. o. [o.]

[And similarly:]
my impreca[tions]
with faithless lines
thy chiefest calm
Leander's thine
the wary eyes
and even now
and tempests black
through cloudy night TOTAL: 11

3. Lines which have a stress on positions 2 and 4 and a word boundary between positions 2 and 3, and which therefore would be better set as ♪ | ♩. ♪ ♩ :

in these my lan[guishing]
o o: o o.

if far from hence
o o: o o:

[And similarly:]
upon thy na[tive]
invades the hor[ror]
ye Gods, 'tis so!
and seas my woe
forgets that e'er
retire your fu[ry]
and here beneath
in spite of fate TOTAL: 10

Vivaldi aria text contrafacta

Two examples in order of declining degrees of similarity (John Hill; Savvy PC relational database software)

Example 1. Two obviously similar texts:

Siroe rè di Persia	Orlando furioso
(Ferrara, Carnevale, 1739), 1/16/1	(Vicenza, 1738), 1/01/1
Laodice sung by Anna Cosimi	Angelica sung by Anna Cosimi
Configuration of lines:	Configuration of lines:
7 7t 7t 5 7 7 7 5	7 7t 7t 5 7 7 7 5
Parto confusa anch'io	Ardo ferita, oh Dio,
Ne sò quel che sarà;	Nè so quel, che farà
Non ho più libertà,	Non ò più libertà,
Non ho più pace.	Non ò più pace.
Vorrei del fato mio	Fa, si, che l'idol mio
Scoprir quall'è il tenore,	Al sen mi torni amante,
Ma timido il mio core	Ma quant'io son costante
E pena, e tace.	Alla sua face.

Example 2. Elaborate parody:

Il Tamerlano	Armida al campo d'Egitto
(Verona, Carnevale, 1735), 2/10/1	(Venezia, Carnevale, 1738), 2/14/1
I:Tn, Giordano 36	[No score survives]
Quartet	Quartet
Configuration of lines:	Configuration of lines:
8 8 4 8t 8t 8 8 4 4 4 5	8 8 8t 8t 8 8 4 4 4 5
8t 8t 8t 8t 8t 3 5 3 4	8t 8t 8t 8 8 4t 5 5 8t 8t 8t
Si crudel! questo è l'amore	Morte a me Fiero rigore
D'un tiranno, inique core.	Mi condonna traditore.
Mostro indegno	
Dispietato senza fè.	Non sei degno di mercè.
Morte al padre, oh Dio! perchè	Numi, cieli, oh Dio! Perchè
Cosl barbara sentenza?	Cosl barbara violenza?
Non è degno di clemenza	Donna rea la mia innocenza
Tanto fasto	Tanto fasto?
Tanto orgoglio	Tanto orgoglio?
Morte attendi	Morte attendi
E morte voglio	E morte voglio
Numi, aita oh Dio! pietà.	Morte, oh Dio! Ah nò pietà.
Nò non sà, che sia pietà.	Non è tempo di pietà.
Io non voglio sua pietà.	Questa è troppa crudeltà.
Nò non merita pietà.	La costanza, o la fortezza.
Questa è troppo crudeltà.	Il rigore, la fierezza.
Pur al fin	Del tuo cor.
La mia morte	Della mia sorte
Pur al fin	Dell'alma ingrata
Nostra morte.	La tua morte abbatterà.

In this database environment spelling, orthography, and punctuation are ignored in seeking matches. A coefficient of similarity calls the user's attention to those cases in which the extent of matching text in ostensibly independent arias exceeds the limits of chance.

In Example 1, it can be deduceds that Anna Cosimi sang the aria "Parto confusa anch'io" in Vivaldi's Siroe (1739) to the same music with which she sang "Ardo ferita, oh Dio" in Vivaldi's Orlando furioso (1738). [One general finding is that first lines are more commonly changed than subsequent lines.]

Motivic Frequency
(M. G. Boroda)

A. Numerical measures of motivic frequency (n) and repetition (n1, n2, n3) in eighteenth- and nineteenth-century instrumental music as shown in "Die melodische Elementareinheit" (*Quantitative Linguistics* 15, Bochum, 1982)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
lfd. Nr.	Materialquelle	N_o	P_{max}	n	n^*	δ	n_1	n_1^*	δ_1	n_2	n_2^*	δ_2	n_3	n_3^*	δ_3	$\frac{n_1}{n}$
1.	J.S. Bach (1685-1750). Präludium und Fuge Nr. 13 BWV 858; aus dem Wohltemperierten Klavier, 1.Teil (abgek.: WTK 1).	615	0.0910	186	153.0	21.6	105	93.0	12.9	31	31.0	0.0	12	15.5	-22.6	0.565
2.	ders. Präludium und Fuge Nr. 20 BWV 865; WTK 1.	1422	0.1958	296	252.0	17.45	192	126.0	58.4	39	42.0	-7.2	16	21.0	-23.8	0.648
3.	ders. Präludium und Fuge Nr. 2 BWV 871; WTK 2.	671	0.1430	168	145.0	15.8	96	72.5	32.4	26	24.2	8.3	9	12.1	-25.8	0.572
4.	ders. Präludium und Fuge Nr. 22 BWV 891; WTK 2.	1430	0.1350	310	272.0	13.6	191	136.0	41.3	26	45.0	-42.0	21	22.7	-7.5	0.616
5.	G.F. Händel (1685-1756). Fuge für Orgel Nr. 2 G-Dur.	765	0.1070	201	173.0	16.2	120	86.5	38.8	29	28.8	-2.8	8	14.0	-42.9	0.598
6.	D. Scarlatti (1685-1757). Sonate Nr. 1 (Zählung der Edition Peters).	250	0.1190	72	72.0	0.0	37	36.0	2.8	9	12.0	-25.0	3	6.0	-50.0	0.515
7.	ders. Sonate Nr. 5.	182	0.0659	60	67.0	-10.5	28	33.5	-16.2	16	11.2	42.9	1	5.6	-46.6	0.467
8.	ders. Sonate Nr. 9. (Ausgabe von B. Holdenweiser).	156	0.1090	53	52.0	1.9	20	26.0	-23.1	11	8.7	27.0	8	4.3	84.5	0.378
9.	ders. Sonate Nr. 13. (Ausgabe von L. Nikolaev).	568	0.0986	190	139.0	36.8	100	69.5	43.9	39	23.2	68.2	17	11.6	46.6	0.526
10.	ders. Sonate Nr. 25 (Edition Peters).	107	0.0655	51	47.2	8.1	25	23.6	5.9	15	7.9	90.7	3	3.4	-12.5	0.490
11.	G. Tartini (1692-1770). Sonate g-moll für Violine und Klavier.	828	0.0652	218	204.0	6.9	60	102.0	-41.2	85	34.0	150.0	11	17.0	-35.3	0.276
12.	J. Haydn (1732-1809). Symphonie Nr. 45 fis-moll "Abschieds-Symphonie".	1304	0.0437	340	317.0	7.3	164	158.5	3.5	65	52.8	23.1	25	28.5	-6.0	0.483
13.	W.A. Mozart (1756-1791). "Eine kleine Nachtmusik" KV 525.	1260	0.1143	205	252.0	-18.7	60	126.0	-52.4	61	42.2	44.6	13	21.1	-38.4	0.293
14.	ders. Fuge g-moll für Klavier.	731	0.1370	199	157.0	26.7	119	78.5	51.6	33	25.8	16.3	10	12.9	-14.7	0.548
15.	ders. Sonate für Klavier Nr. 10.	1249	0.0509	296	297.0	0.0	95	149.0	-36.2	98	49.5	98.0	14	24.8	-43.6	0.321
16.	J.G. Albrechtsberger (1736-1809). Fuge c-moll.	693	0.2160	168	138.0	20.9	111	69.8	70.0	17	23.0	-21.8	8	11.5	-30.8	0.661
17.	L. van Beethoven (1770-1827). Sonate für Klavier Nr. 19.	584	0.0565	151	163.0	-7.4	60	81.5	-26.4	36	27.2	32.4	13	13.6	-4.4	0.400

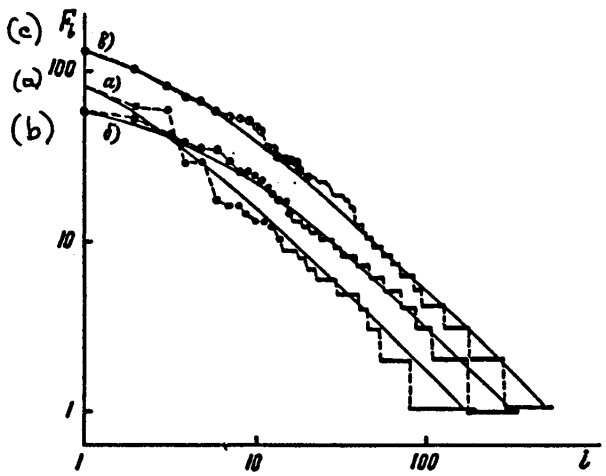

Рис. 3. Описание частотной структуры музыкальных текстов законом Ципфа-Мандельброта (1): а) Г.Ф.Гендель. Фуга № 2 для органа; б) Й. Гайдн. Симфония № 45 ("Прощальная"); в) Ф. Шопен. Соната № 3. Обозначения те же, что на Рис. 1. Шкала логарифмическая.

B. Graphic descriptions of motivic frequency in (a) Handel's Fugue No. 2 for Organ (No. 5 above), (b) Haydn's Symphony No. 45 (No. 12 above), and (c) Chopin's Sonata No. 3 as shown in "The Zipf-Mandelbrot Law . . ." in *Quantitative Linguistics in Automatic Text Analysis* (Tartu, 1984)

IV. Analysis of Specific Repertories

A. Historical Repertories

Ambrosian Chant/Halperin
Title: *Analysis of Ambrosian Chant*
Purpose: comparison of stylistic traits of different elements of the repertory with special emphasis on the melodic segment (by analogy to the linguistic morpheme)
Repertory: antiphonary of *c.* 1200 A.D.
Procedures: note and interval counts, phrase lengths, melodic features (leaps, pentatonicism, initial and final interval schemes, rates of melismatics), forward and reverse segment profiles
Results: statistical tests show correlations between stylistic traits and liturgical function, also between melodic behavior and modal ambience
Investigator: David Halperin
Place: Tel-Aviv University
Computer: mainframe
Software: custom, reproduced in thesis
Encoding: numeric representation of relative pitch
Associated Literature: "Contributions to a Morphology of Ambrosian Chant: A Computer-Aided Analysis of the *pars hiemalis* according to British Museum Add MS 34209 with a Package of Computer Programs for the Analysis of Monophonic Music," Ph.D. thesis, Tel-Aviv University, 1986

Bartok's Harmony/Li
Title: *Harmonic Organization of Bartok's String Quartets*
Purpose: to use an investigation of the harmonic features of Bartok's string quartets as the basis for developing a system for harmonic analysis of string and wind ensemble music
Investigator: Betty Li
Place: Hong Kong Baptist College
Duration of project: 1987-89
Computer: VAX mini 11/750
Software: in SPITBOL
Encoding: custom (alphanumeric)

Byrd and Tallis/Morehen
Title: *Sixteenth-Century English Polyphony: The* Cantiones Sacrae *(1575) of Thomas Tallis and William Byrd*
Investigator: John Morehen
Place: University of Nottingham
Duration of project: 1983--
Computer: ICL 2988
Associated Literature: "Computer-Assisted Musical Analysis: A Question of Validity," *Proceedings of the International Computer Music Conference 1986*

German Lute Tablature/Charnassé
Title: *Automatic Transcription of German Lute Tablature*
Aims: translation of tablature into staff notation; polyphonic analysis
Investigator: Hélène Charnassé
Associate: Bernard Stepien
Place: ERATTO (Paris); Ottawa
Duration of project: 1986-91
Other devices: Epson printer
Support software: TURBO-PROLOG
Analysis software: Luth (custom)
Encoding: SIT (custom)
Associated Literature: "Une Tentative d'introduction de l'informatique en musicologie" in *Aspects de la recherche musicologique au C.N.R.S.* (Paris, 1984), 179-195; "Automatic Transcription of Sixteenth-Century Notation" in *CHUM* **90/3** (1986), 179-190; "Le Point des travaux de l'Équipe ERATTO" in *Informatique et Musique* (Ivry: ELMERATTO, 1988), 129-145

Goudimel's Harmonic Grammar/Halperin
Title: *The Harmonic Grammar of Homophonic Psalm Settings*
Investigator: David Halperin
Place: Tel-Aviv University
Duration of project: 1988--
Computer: IBM PC/XT

Late Medieval Polyphony/Böker-Heil
Title: *Towards the "ars subtilior": Investigation of the Practice and Development of Counterpoint between 1340 and 1430*
Investigator: Norbert Böker-Heil (Berlin/West)
Associates: Ursula Günther (Göttingen)
Duration of project: 1984-90
Computers(OS): PDP 11/34 (RSX11-M), Macintosh II
Other devices: Benson 1233 plotter, Yamaha FB-01 synthesizer, Synclavier (proof-hearing)
Associated Literature: "Klingende Dokumentation aus dem Synthesizer," *Jahrbuch des Staatlichen Institut für Musikforschung (Preussischer Kulturbesitz) 1983/84* (1987), 27-33

Schubert/Nettheim
Title: *Analysis of the Works of Schubert*
Purpose: to provide basis for comparison with works of other composers
Investigator: Nigel Nettheim
Place: Sydney Conservatorium
Computers: IBM PC, Toshiba 1340

Troubadour Music/Halperin
Title: *A Structural Analysis of Troubadour Music*
Procedures: evaluation of interval frequencies, standard phrases, chord patterns, initial and final formulas, melodic segmentation
Results: stylistic traits examined in relation to internal behavior, modal ambience, and characteristics of other monophonic repertories
Investigator: David Halperin
Place: Tel-Aviv University
Software: custom, reproduced in thesis
Encoding: numeric representation of relative pitch
Associated Literature: "A Structural Analysis of Troubadour Music," M. A. thesis, 1978

Troubadour Music/Steel
Title: *Stylistic Analysis of Troubadour Music*
Scope: to assess relationship of this repertory to chant, cantigas de Santa Maria, *trouvere* and *Minnesinger* repertory
Investigator: Matthew Steel
Place: University of Michigan
Computer: IBM PC/XT, mainframe
Software: SPIRES
Encoding: custom

B. Non-traditional and non-Western Repertories

Jazz--Chord Sequences/Steedman and Cooper
Title: *Jazz Chord Sequences*
Scope: development of a generative grammar in the context of formal rule systems for computational analysis
Investigator: Mark J. Steedman
Associate: Robin Cooper
Place: University of Edinburgh
Associated Literature: "A Generative Grammar of Jazz Chord Sequences," *Music Perception* **2/1** (1984), 53-78

Jazz--Melodic Analysis/KWilliams
Title: *Analysis of Jazz Melody*
Scope: discusses a series of programs that perform rhythmic and melodic tests on a jazz repertory and discusses relation to other literature
Investigator: J. Kent Williams
Place: University of North Carolina, Greensboro
Computer: mainframe
Software: custom
Encoding: MUSTRAN
Associated Literature: "A Method for the Computer-Aided Analysis of Jazz Melody in the Small Dimensions," *Annual Review of Jazz Studies* 3 (1985), 41-70

Jazz--Rule Systems/Giomi and Ligabue
Title: *A Software Tool for Generation and Study of Jazz*
Purpose: to define a system of rules capable of providing models of jazz improvisation to support systematic study of the jazz idiom
Investigators: Francesco Giomi, Marco Ligabue
Place: CNUCE (Pisa), Florence Conservatory
Duration of project: 1985-88
Computer: IBM 3081 - VM SP/REL4
Encoding: TELETAU
Associated Literature: "Software for Studio Generation of Jazz" [in Italian], CNUCE internal report #C88-06

Tabla Music/Kippen
Title: *A Computer-Aided Social Anthropological Analysis of a Music System*
Purpose: to identify the structure of human thought specific to the creation, performance, and appreciation of the music of the North Indian tabla
Investigator: James Kippen
Place: Belfast, NI, and Lucknow, India
Duration of project: 1986-88
Software: Bol Processor (developed by B. Bel and author)

C. Analysis of Text Setting

Dutch Strophic Songs/Grijp
Title: *Voetenbank* [Footbank]
Purpose: to create a database and catalogue of strophic forms of 6000 Dutch songs from the early seventeenth century
Investigator: Louis Peter Grijp
Associates: Clara Strÿbosch, Johan Koisteeg, Rudolf Rasch
Place: Utrecht University
Duration of project: 1986-1990
Computer: Olivetti M28 (MS-DOS)0
Database Software: RBase
Associated Literature: " 'Voetenbank': Een methode om melodieën te zoehen," *Tijdschrift van de Vereriging voor Nederlandse Muziekgeschiedenis* 34/1 (1984), 26-48

English Declamation/Rohrer*
Title: *Stress Pattern Identification in English Declamation*
Purpose: comparative study of stress in declamatory settings of English text
Investigator: Katherine T. Rohrer
Place: Columbia University
Computer: IBM PC
Associated Literature: "The Myth of English Declamatory Style," [AMS, New Orleans, 1987]

Text Parody/JHill
Title: *Theatrical Music and Text Parody in Early Monodic Sources*
Purpose: to match monody texts with word books from theatrical productions
Investigator: John Hill
Place: University of Illinois
Computer: IBM PC/AT
Database Software: Savvy PC

Vivaldi Arias/JHill*
Title: *Self-Borrowing in Vivaldi's Operas*
Scope: index of 3700 complete aria texts from 128 opera productions with which Vivaldi was associated
Purpose: to identify all instances of text as evidence of musical borrowing
Procedure: after entry of full texts, probable matches are displayed; after user decisions, accepted matches are recorded in a separate file
Investigator: John Hill
Place: University of Illinois
Computer: IBM PC/AT
Database Software: Savvy PC

D. Analytically Oriented Databases

Bach/CCARH
Title: *Bach Database*
Purpose: to create a machine-readable version of all the musical works of J. S. Bach
Current contents: 48 keyboard works, 15 orchestral works, B-Minor Mass, passions, 69 cantatas
Data entry: Edmund Correia, Steven Rasmussen
Place: CCARH
Duration of project: 1985--
Computer(OS): HP 1000 (IBYCUS)
Other devices: Epson dot matrix printer, HP LaserJet
Software: custom (by Walter B. Hewlett)
Encoding: custom
Associated Literature: "Databases and the Practice of Musicology," *Proceedings of the Fourteenth Congress of the International Musicological Scoiety, Bologna, 1987* (1988)

Chinese Folksong/Beijing Conservatory
Title: *Database of Chinese Folksong*
Investigator: Zhang Bo Yu
Associates: Wang Xin Hua, Xu Bin, Wang Qing
Place: Conservatory of Music, Beijing
Duration of project: 1985-88
Computer: IBM PC
Encoding: ESAC (Essen Associative Code)

Corelli/CCARH
Title: *Corelli Database*
Purpose: to create a machine-readable version of all the works of Arcangelo Corelli
Current contents: 72 instrumental works (Opp. 1-6)
Data entry: Frances Bennion
Place: CCARH
Duration of project: 1986-87
Computer(OS): HP 1000 (IBYCUS)
Other devices: Epson dot matrix printer, HP LaserJet
Software: custom (by Walter B. Hewlett)
Encoding: custom

Handel/CCARH
Title: *Handel Database*
Purpose: to create a machine-readable version of all the works of G. F. Handel
Current contents: 42 instrumental works (Opp. 2, 3, 5, 6 *et al.*), one opera (*Radamisto*)
Data entry: Frances Bennion
Duration of project: 1987--
Computer(OS): HP 1000 (IBYCUS)
Other devices: Epson dot matrix printer, HP LaserJet
Software: custom (by Walter B. Hewlett)
Encoding: custom

LIAO/Essen
Title: *LIAO: a Database of Chinese Folksongs*
Purpose: to create a database of 1000 Chinese folksongs
Investigator: Helmut Schaffrath
Place: Hochschule, Univ. of Essen
Duration of project: 1986--
Computer: IBM 3207; IBM PC
Software: custom
Encoding: ESAC (Essen Associative Code)

LIED/Essen
Title: *LIED: a Database of German Folksongs*
Current contents: 4200 German folksongs of the nineteenth century; ballads edited by the German Volksliedarchiv will be used to verify the methodology
Investigator: Helmut Schaffrath
Associate: Barbara Jesser
Place: Hochschule, Univ. of Essen
Duration of project: 1984--
Computer: IBM 3207; IBM PC
Encoding: ESAC

Telemann/CCARH and Pennsylvania State University
Title: *Telemann Database*
Purpose: to create a machine-readable database of all the works of G. P. Telemann
Current contents: 18 suites (*Tafel=Musik*), 24 cantatas (RISM T 394, 403)
Editorial coordinator: Brian Stewart, Penn. State
Data entry: CCARH staff
Duration of project: 1987--
Computers(OS): HP 1000 (IBYCUS), IBM PC
Other devices: Epson dot matrix printer, HP LaserJet
Software design: Walter B. Hewlett

TELETAU/Florence Conservatory
Title: TELETAU Music Library
Purpose: to provide machine-readable versions of representative works of Western music from 1600 to the present
Current contents: 1000 works from Frescobaldi to Joplin and jazz
Investigators: Lelio Camilleri, Giovanni Nencini, Pietro Grossi
Place: Florence and Pisa
Duration of project: 1980--
Computer: mainframe
Software: analysis and other support software for using the data can be accessed online
Encoding: TAUMUS
Online access: MUSIC3@ICNUCEVM.bitnet
Associated Literature: *Studi Musicali: Modalità operative del TELETAU Software Sperimentale per le TELEMATICA MUSICALE, Release 1.0 (Pisa: CNUCE Division of Musicology, 1986)*

Musical Information Systems

The Center receives a significant volume of information from persons developing extensive systems for musical information processing. Some systems are design-oriented, while others are use-oriented. Some are intended primarily to support instructional programs, some to support acoustical research, and some to support basic research. We provide brief reports here on some of these efforts.

BEER SHEVA

Mira Balaban heads a team at Ben Gurion University in Beer Sheva, Israel, that is designing a music workstation based on multiple hierarchical views of music. The intention is that the workstation should serve as a kernel for music processing. The kernel can be extended easily for both theoretical and practical purposes.

The main piece of hardware is a Sun 3/50 workstation operating under UNIX control. LISP and a unique music code are used. Further information can be found in three internal reports from the State University of New York at Albany: TR-87-18, TR-87-27, and TR-87-28. The first, "The TTS Language for Music Description," will appear in the *International Journal of Man-Machine Studies*. Broader circulation of the other two--"Music Structures: A Temporal-Hierarchical Representation for Music" and "A Music Workstation Based on Multiple Hierarchical Views of Music"--is anticipated.

GHENT

At the Institute for Psychoacoustics and Electronic Music at the University of Ghent, Marc Leman is investigating the possibilities of parallel distributed networks for music processing. His work is based on an IBM PC and transputer system. An account is given in "Neural Networks in Music Research," which is report No. 11 from the Institute's seminar in musicology.

HELSINKI

The Helsinki University Music Analysis and Composition (HUMAC) system is concerned with the development of software tools for composition, analysis, and teaching. One practical result of their effort is the draft porposal for a "Time-Stamped Music File Format" [see description under **News: Standards**].

LANCASTER

The development of tools to facilitate the writing of computer assisted learning programs in music is one of the goals of the Centre for Research into the Applications of Computers to Music at Lancaster University. Another goal is to work towards a computer model of music that reflects fluidity and flexibility of musical cognition. Alan Marsden, Anthony Pople, and Roger Bray are involved in the Centre's works. Articles by Marsden and Pople are forthcoming in *Interface* and *Contemporary Music Review*.

MILAN

The team headed by Goffredo Haus and Luigi Finarelli at the Laboratorio di Informatica Musicale (University of Milan) continues work on the design and implementation of a workstation for musical analysis and music printing. The system is based on a Macintosh II microcomputer with custom encoding and software for analysis. Printing is implemented on Apple Laser Writer and ImageWriter printers and uses the Adobe "Sonata" font.

Current interests include the development of two-user environments, provisions for the use of external musical databases, quick encoding with multiple devices (music keyboard, pedals, computer keyboard, and mouse), and typographical refinements of the score. Details are provided in the talk "A Musicological/Publishing Workstation for the Processing of Musical Texts", which will appear in the proceedings of the 1988 International Computer Music Conference (to be held in Cologne in September 1988).

OSLO

A multifaceted program in music representation, printing, and analysis is being pursued in the MUSIKUS project at Oslo University. Analytical routines can investigate the harmony of chorales, explore melodic and rhythmic procedures jointly, and perform procedures suited to atonal and Norwegian folk music. The booklet "Music Encoding and Analysis in the MUSIKUS System" by Arvid Vollsnes and Tor Sverre Lande is available from the University (Blindern, N-0316 Oslo 3).

PADUA

The Centro di Sonologia Computazionale at the University of Padua, founded in 1972, has been closely associated with the biannual festival of contemporary music (the Biennale) in Venice. In 1980 a Laboratorio per l'Informatica Musicale (LIMB) was opened. A language called MUSICA has been used for the encoding of traditional scores, which have been used in synthesis projects. A series of one-week courses of study are in progress from July through November 1988. The Center also conserves a significant number of programs written to generate electronic works and hopes to preserve this collection for the purpose of facilitating the study of the compositional process in electronic music. The Center is on Via S. Francesco 11, 35121 Padua, Italy.

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