Larger goals in representation: Data archiving, interchange, and analysis

MUSIC 253/CS 275A

STANFORD UNIVERSITY

Durable (non-audio) encoding projects

Single-focus

- Folk-music collections (esp. German)
- Music-manuscript finding aids

Multi-focus (vertical integration)

- MuseData (classical/orchestral-chamber)
- KernScores (classical/keyboard)
- Choral Public-domain Library (CPDL)

Characteristics of most

- Representation: Neither *time* nor *space* is a dominant consideration
- Central aim: **Repurposable data**, interoperability
- Examples
  - *Archiving*: canonical format that facilitates interoperability
  - *Interchange*: canonical format that is easily interpreted by sending and receiving systems whose formats may be unknown
  - *Analysis*: flexible format that can be modified to suit a range of needs (can sometimes be distilled from richer format)

Common distinguishing features

Monophonic encodings

- EsAC, P&E (monophonic)

Polyphonic encodings

- MuseData (polyphonic)

Markup and interchange codes

- MusicXML, MEI

Essential feature sets

- Humdrum (Toolkit)

All ASCII
All accessible

Not ASCII
Not accessible

De facto datasets (e.g. SCORE repertories)

(1) Folk music research (network)

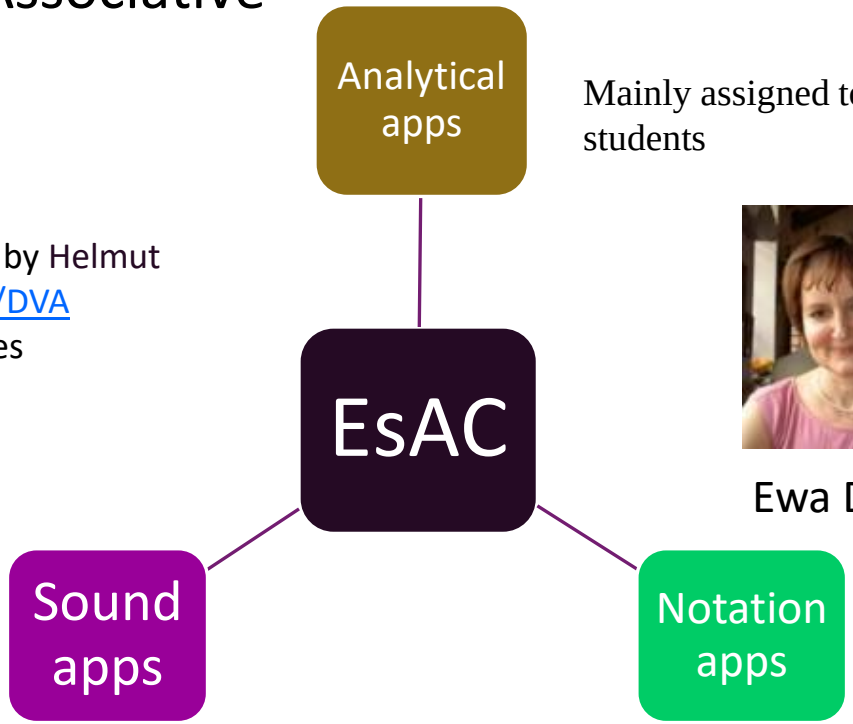
EsAC network model (1982-1994)

EsAC = Essen Associative

PC-era model

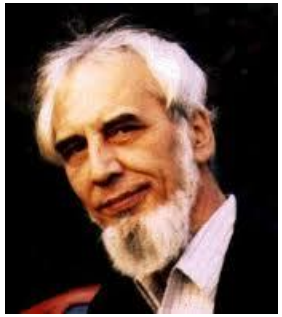
Developed in Essen, DE, by Helmut Schaffrath from the Kiel/DVA archive and other sources

esac-data.org



Mainly assigned to students

Ewa Dahlig



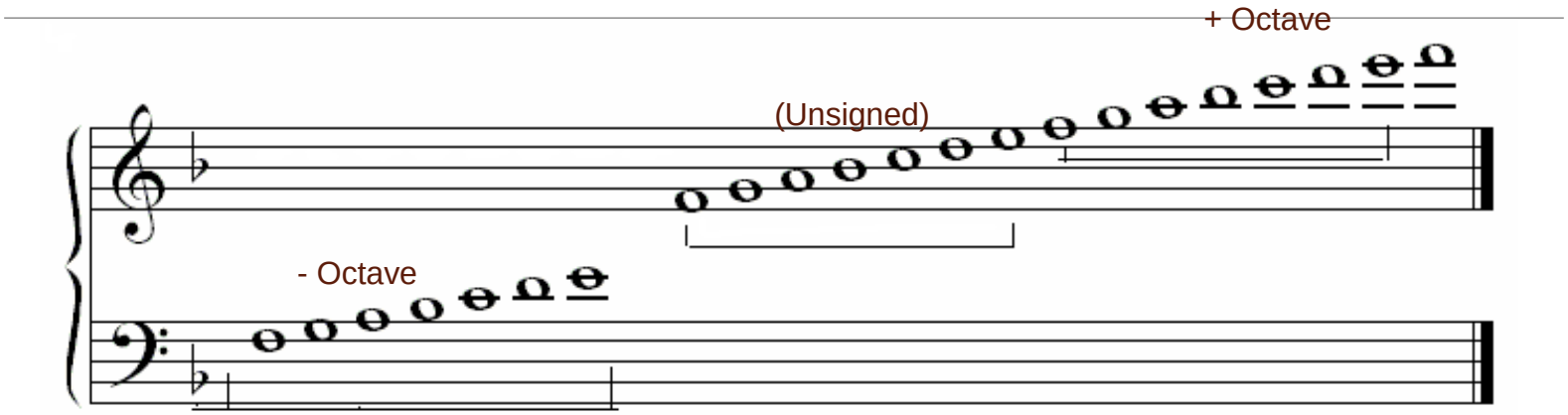
Above: H. Schaffrath, *L*: Ewa Dahlig

Often transcribed by hand

Often simplified, No text underlay

Reflected widely used 19th century typescript encoding foundation

Essen Associative Code (EsAC)



Music rep. in general

- Pitch name
- Pitch inflection
- Octave name or number

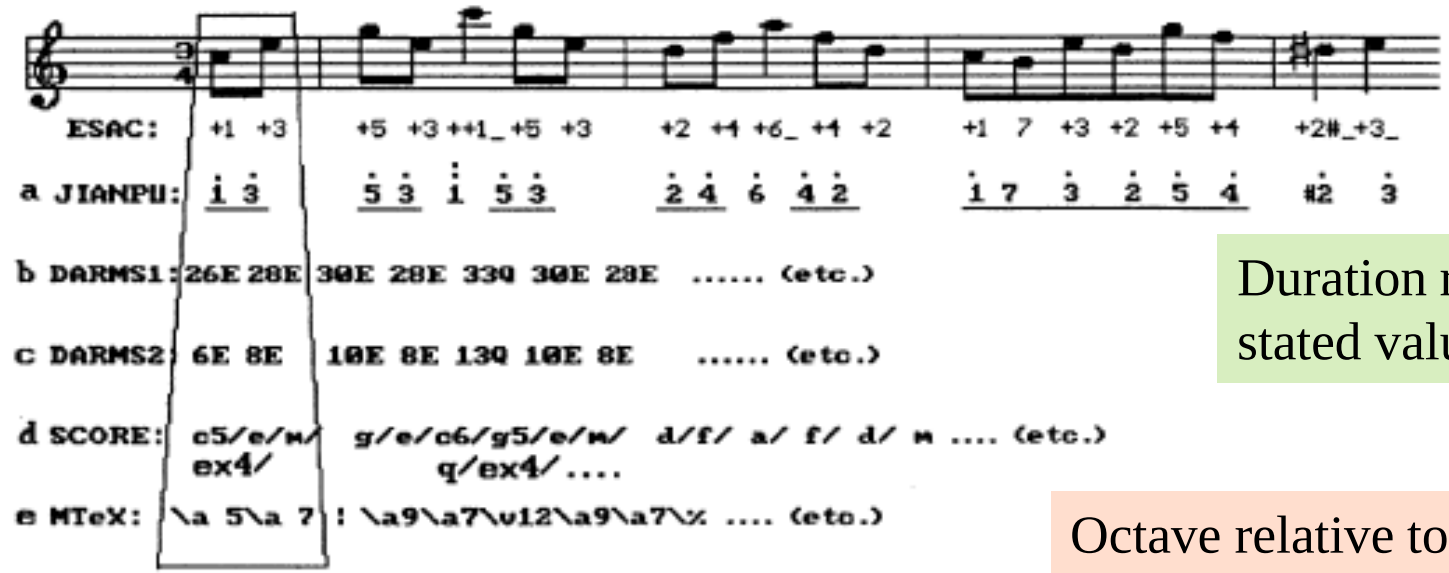
EsAC specifics

- Pitch = number
- Inflection = symbol
- Octave = symbol

See http://www.esac-data.org

EsAC code vs other codes

Pitch relative to a “tonic”



Duration relative to a stated value

Octave relative to central 8ve

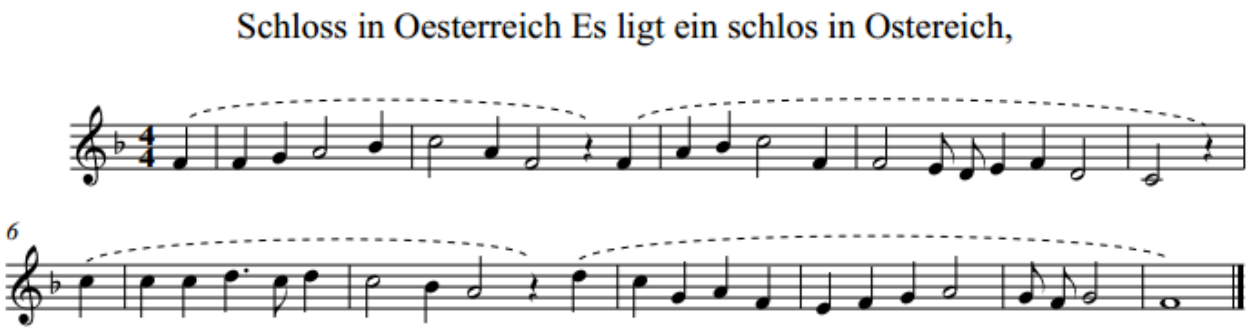
http://esac-data.org/

Mozart trio (EsAC with 5 data translations

http://kern.humdrum.org/search?s=t&keyword=essen&type=Text

Sample EsAC record

F [BALLADE
CUT [Schloss in Oesterreich
Es ligt ein schlos in Ostereich,]
CNR [das ist gar wol erbawet]
REG [Mitteleuropa, Deutschland]
SRC [1, S. 250
1549 gedruckt in Nuernberg]
KEY [Q0024A 08 F FREI]
MEL [1_ 1_2_3__4_ 5__3_1__0_
1_ 3_4_5__1_ 1__-7-6-7_1_-6__ -5__0_
5_ 5_5_6_.56_ 5__4_3__0_
6_ 5_2_3_1_ -7_1_2_3__ 212__ 1___ //] >>
FCT [Ballade, Gefangenschaft, Hinrichtung, Tod, Vergeltung]
CMT [Kleinere Melodievarianten aus anderen Quellen abgedruckt.
Refrainartiges Anhaengsel an der letzten Zeile.]



Music one field in a text database

EsAC: Essen Folksong Collection

Monophonic music (8500 songs)

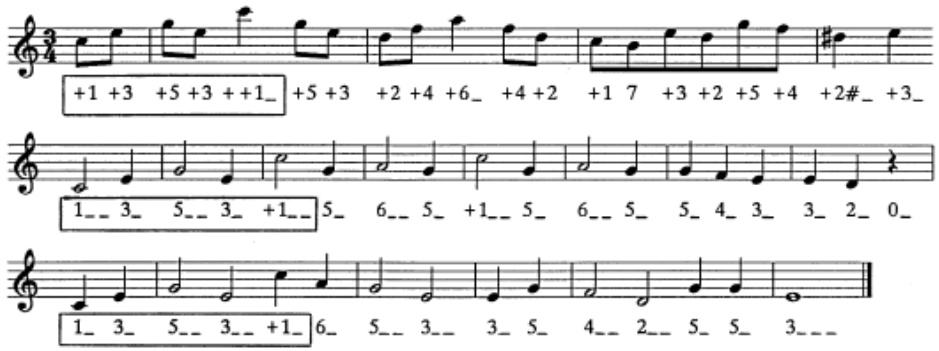
Purposes

- Archiving
- Comparing versions
- Teaching
- Sound output

Contributions

- Earliest model of analysis

  (**Leppig**, 1987)

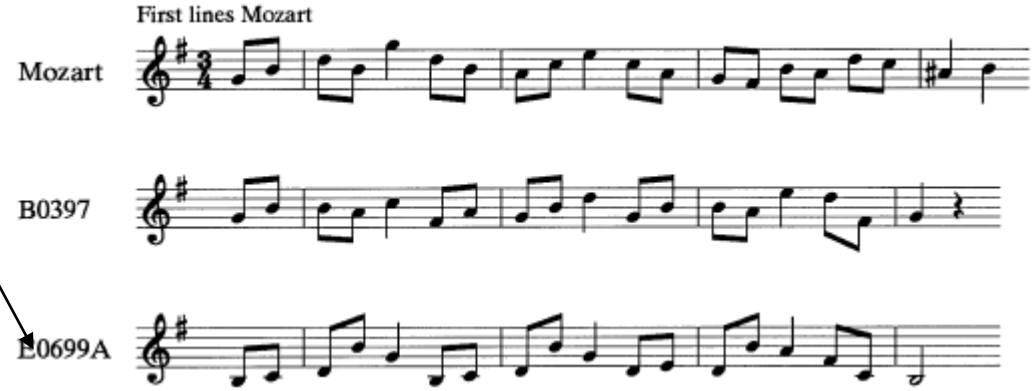


Analytical recoding

Pitch and duration uncoupled

Code-recode comparison

R: nearest matches for Mozart trio



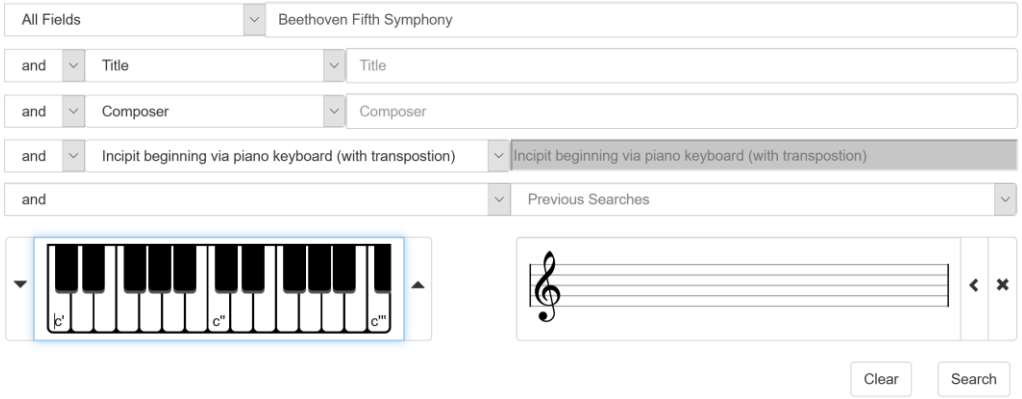
(2) Collaborative music indexing: RISM's Plaine & Easie (P&E) Code

- Designed in 1967 for music-indexing
- Most widely use in the RISM database of music manuscripts (60+ countries)
  - 60+ countries
  - 2.3 million entries (c1.75 million currently online)
  - Most fields (of 112) bibliographical; one music field for encoded incipits
  - Original purpose: to attribute anonymous manuscripts

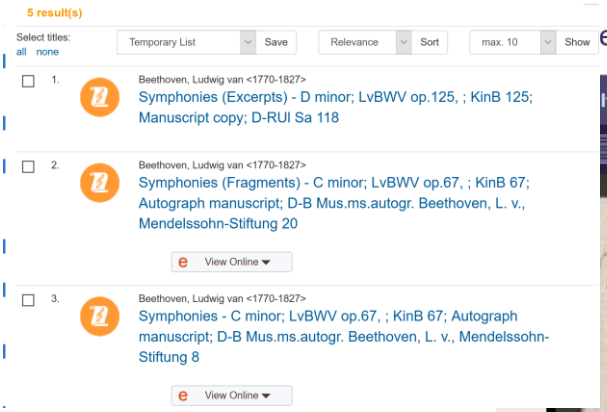
Website: https://rism.info/

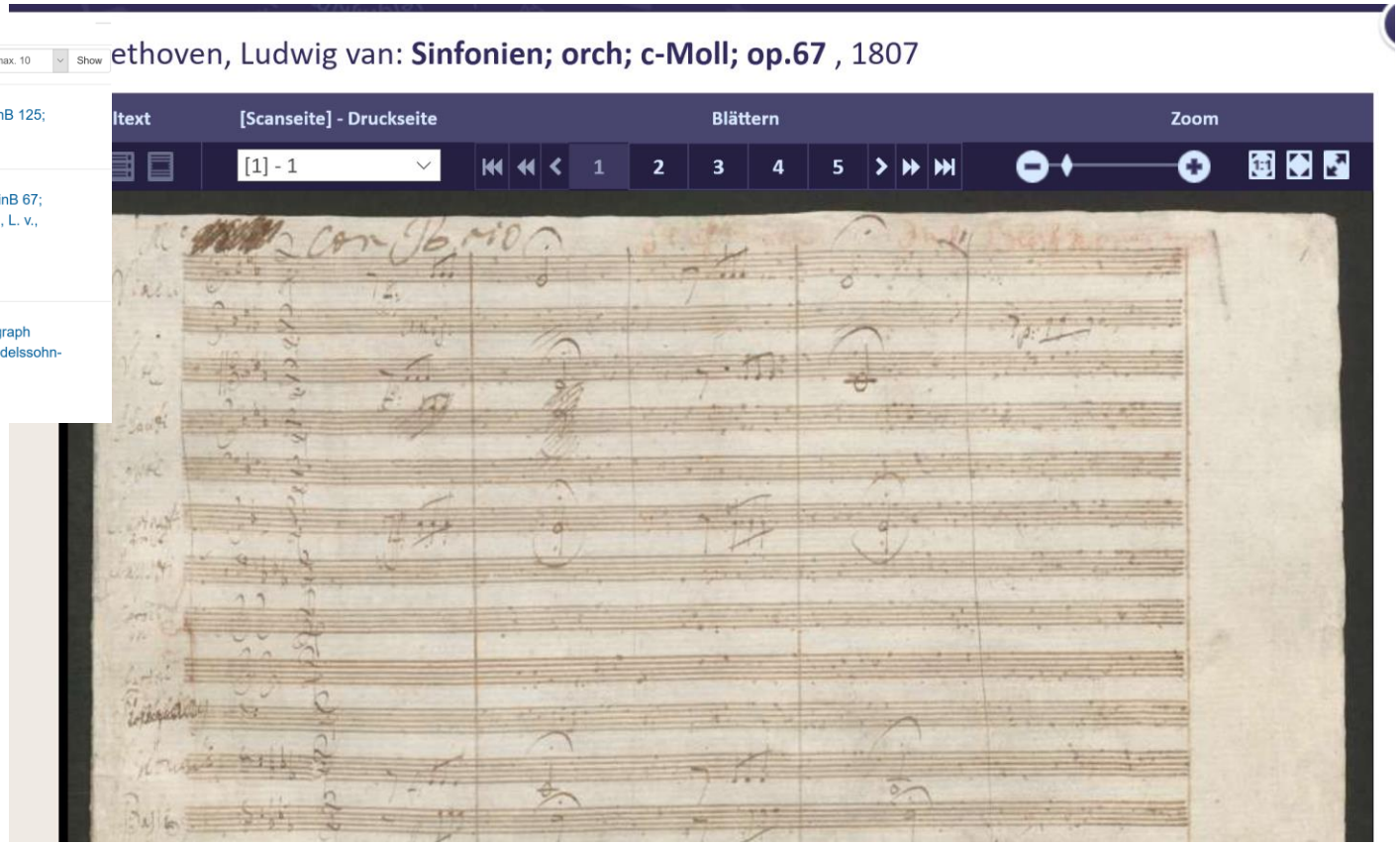
RISM

Advanced search



Simple search

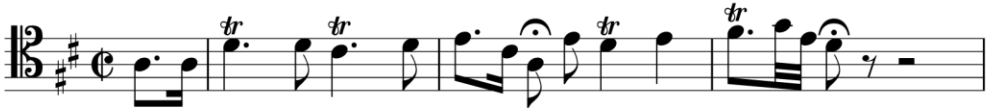




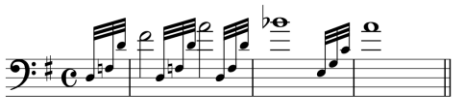
Plaine & Easie Code

Monophonic

Industrial strength (interfaces with MARC et al.)



```
@clef:C-4
@keysig:xFC
@timesig:c/
@data:,{8.A6A}/'4.Dt8D4.Ct8D/{8.E6C},8(A)'E4DtE/{8.Ft3GE}8(D)-2-/
```

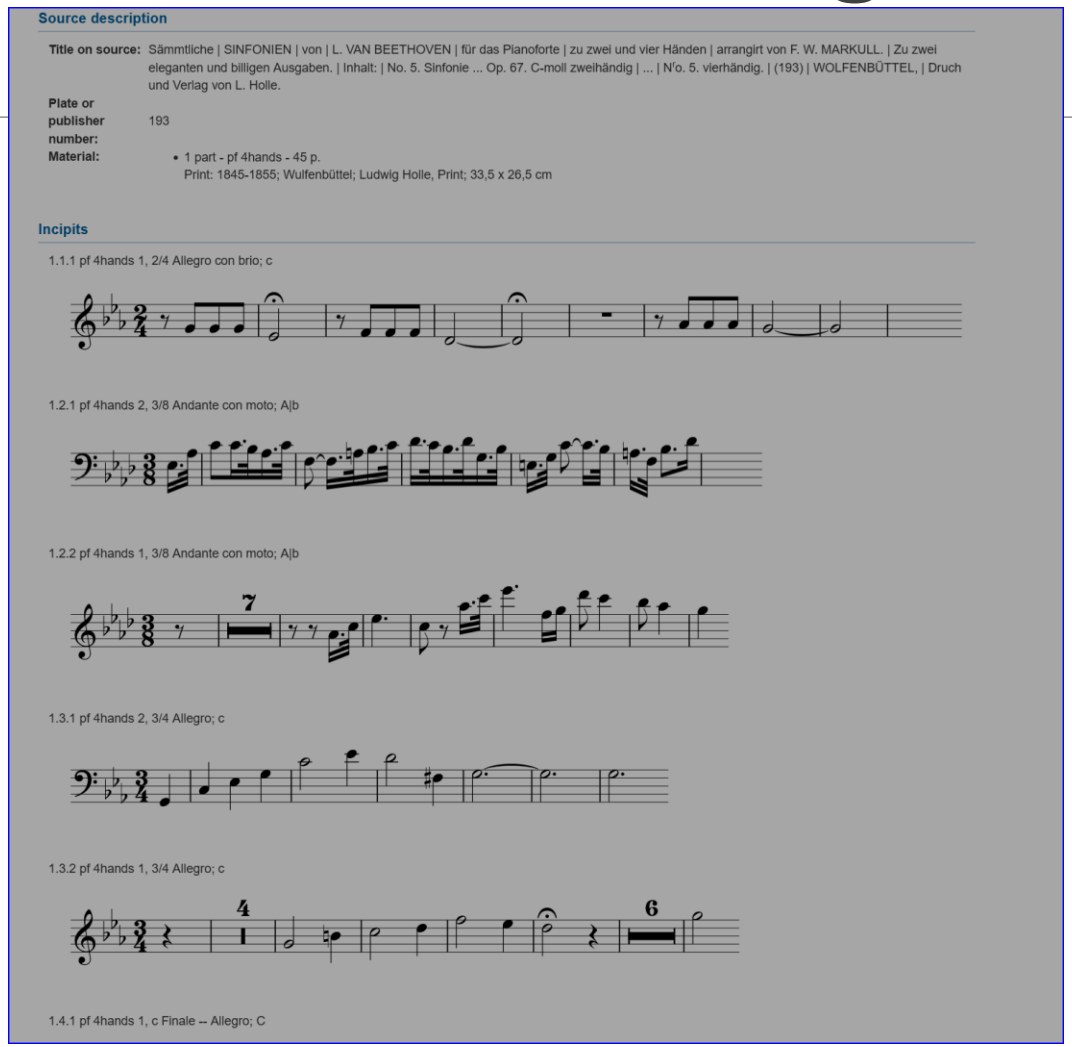


```
@clef:F-4
@keysig:xF
@timesig:c
@data:qq,3{DnF'D}r/2Fqq,3{DnF'D}r2Aqq3,{DF'D}r/b1B,qq3{EG'C}r/1A//
```

Manual: https://www.iaml.info/plaine-easie-code

RISM advanced search engine

Beethoven's
Fifth
Symphony
Listing in RISM



Source description

Title on source: Sämmtliche | SINFONIEN | von | L. VAN BEETHOVEN | für das Pianoforte | zu zwei und vier Händen | arrangirt von F. W. MARKULL. | Zu zwei eleganten und billigen Ausgaben. | Inhalt: | No. 5. Sinfonie ... Op. 67. C-moll zweihändig | ... | N'o. 5. vierhändig. | (193) | WOLFENBÜTTEL, | Druch und Verlag von L. Holle.

Plate or publisher number: 193

Material:
- 1 part - pf 4hands - 45 p.
  Print: 1845-1855; Wulfenbüttel; Ludwig Holle, Print; 33,5 x 26,5 cm

Incipits

1.1.1 pf 4hands 1, 2/4 Allegro con brio; c

1.2.1 pf 4hands 2, 3/8 Andante con moto; A|b

1.2.2 pf 4hands 1, 3/8 Andante con moto; A|b

1.3.1 pf 4hands 2, 3/4 Allegro; c

1.3.2 pf 4hands 1, 3/4 Allegro; c

1.4.1 pf 4hands 1, c Finale -- Allegro; C

(3) Full-score repositories

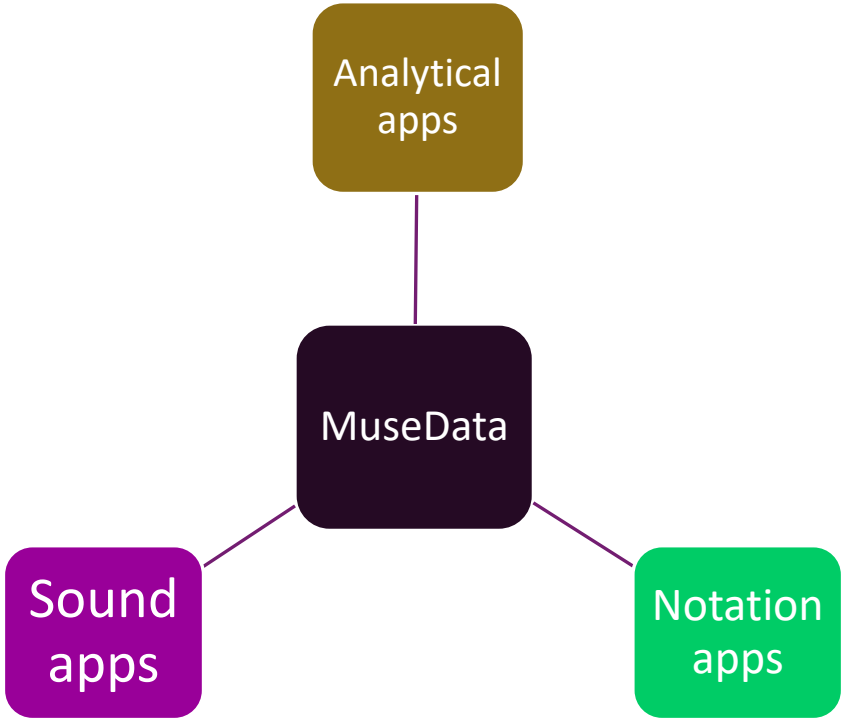
MuseData : overview

http://www.musedata.org

- Developed by Walter Hewlett (from 1982)
- Served by CCARH
- Many implementations, extensions, refinements by Craig Sapp
- Largest verified dataset online

MuseData's "solar" network models

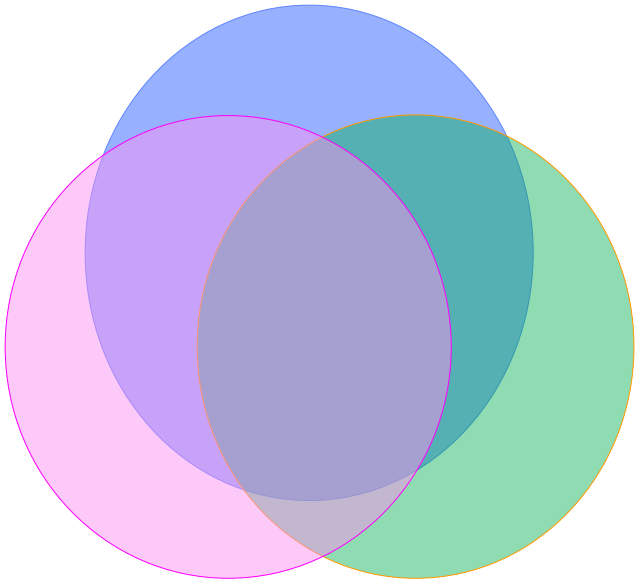
Classical music focus

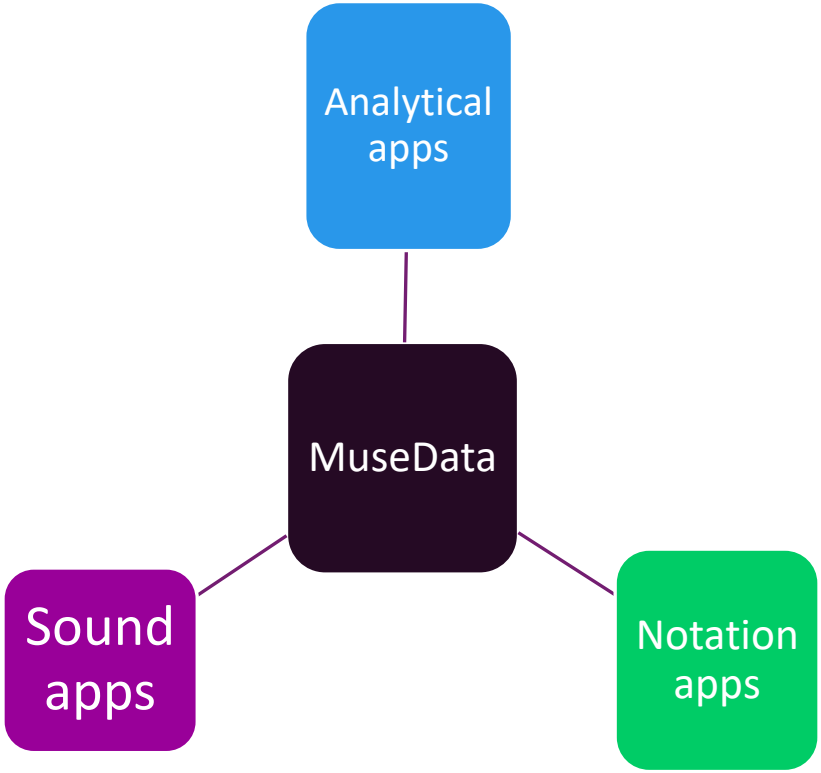


MIDI only

Full encodings

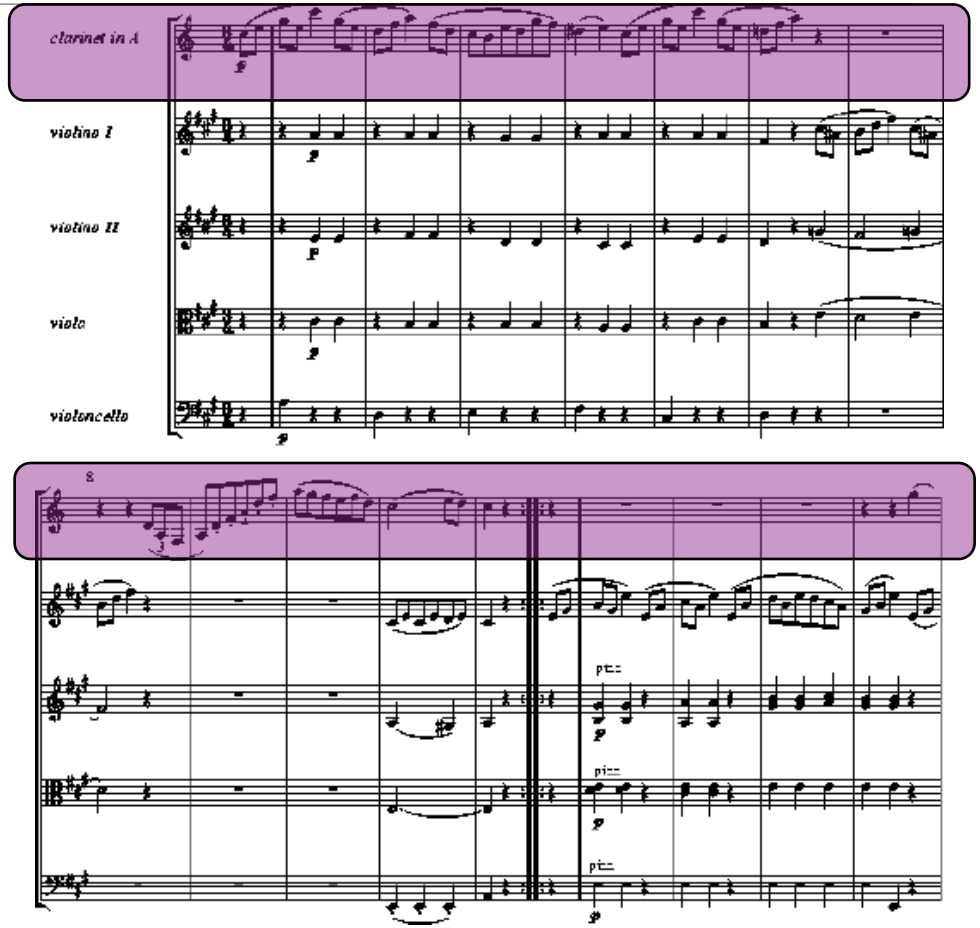
Comparison of models





Part/score orientation in *MuseData*

1. Encode voice by voice for full movement
2. Add lyrics, other refinements
3. Repeat until all movements are encode
4. Assemble score



MuseData: encoding

old.musedata.org

Two-step process
- MIDI-level data
- Non-sounding data

Serial processes

Storage formats
- Stage 1 (pitch, duration)
- Stage 2 (stems, lyrics, etc)
- Internal format (notation)

- About *MuseData*
- Repertoires
- Works and Title Numbers
- Sources
- Data Formats [*MuseData* | Humdrum | MIDI1 | MIDI+]
- Legal Considerations

Search:

[Printable Scores/Parts | MIDI1 files for listening]

composer's name	*number of encoded compositions*	*movements (approx.)*	*PDF files* (by work)	
Johann Sebastian Bach	417	1534	51	(418 pages)
Ludwig van Beethoven	10	58	9	(1339 pages)
Arcangelo Corelli	72	363	0	
Antonín Dvořák	1	0	0	
George Frederick Handel	80	904	0	
Franz Josef Haydn	87	352	12	(693 pages)
Benedetto Marcello	1	3	0	
Wolfgang Amadeus Mozart	47	171	0	
Giovanni Rovetta	1	9	0	
Georg Philipp Telemann	109	553	0	
Antonio Vivaldi	56	168	12	

Encoding in multiple domains: Actualities

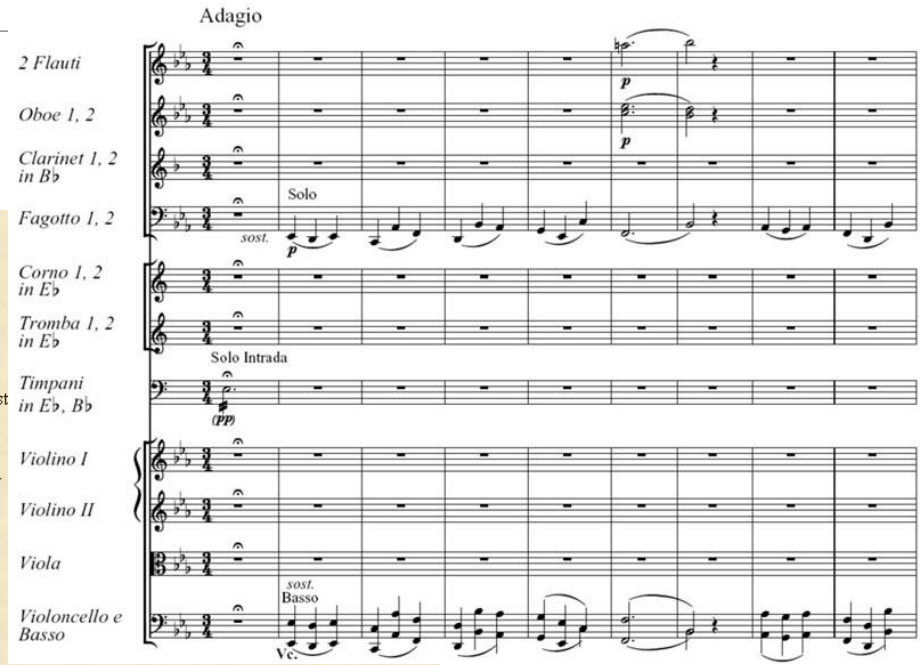
MuseData
An Electronic Library of Classical Music Scores

Work Information

Composer	Haydn, Franz Joseph
Title	Symphony in E-flat Major
Popular Title	Drumroll
Scholarly catalog num.	H I:103
Copyright notice	Copyright (c) 1994, 2000 Center for Computer Assist
Copyright message	Rights to all derivative editions reserved.
Copyright message	Refer to licensing agreement for further details.
Scholarly catalogue	Thematisch-bibliographisches Werkevererzeichnis (A.
Derived from	Dover Edition; reprint of Eulenburg Edition
Encoding state	stage2
Error reports	None [Submit error report]

Musical Data

	kern	*MIDI*	*PDF*	*SCORE*	*stage2*	*parts*
Entire work	all	all	all	all	all	
By movement:						
1. Adagio -- Allegro con spirito	01	01	01	01	01	01 02 03 04 05 06 07 08 09 10 11 12 1313z1414z1516 17 s01 s02 s03 s04 s05 s06 s07 s08 s09 s10 s11 s12
2. Andante	02	02	02	02	02	01 02 03 04 05 06 07 08 09 10 11 12131415 16 17 s01 s02 s03 s04 s05 s06 s07 s08 s09 s10 s11
3. Menuetto and Trio	03	03	03	03	03	01 02 03 04 05 06 07 08 09 10 11 12131415 16 17 s01 s02 s03 s04 s05 s06 s07 s08 s09 s10 s11
4. Finale	04	04	04	04	04	01 02 03 04 05 06 07 08 09 10 11 12131415 16 17 18 s01 s02 s03 s04 s05 s06 s07 s08 s09 s10 s11



musedata.org

Encoding in multiple domains: samples

MuseData
An Electronic Library of Classical Music Scores

From PDF list

Haydn, Franz Joseph	Symphony in E-flat Major, H I:99
	Symphony in G Major ("*Military*"), H I:100
	Symphony in D Major ("*The Clock*"), H I:101
	Symphony in B-flat Major, H I:102
	Symphony in E-flat Major ("*Drumroll*"), H I:103
Vivaldi, Antonio	Concerto in E Major ("*La Primavera*"), Op. 8, No. 1
	Concerto in G Minor ("*L'Estate*"), Op. 8, No. 2
	Concerto in F Major ("*L'Autunno*"), Op. 8, No. 3
	Concerto in F Minor ("*L'Inverno*"), Op. 8, No. 4
	Concerto in E-flat Major ("*La Tempesta di Mare*"), Op. 8, No. 5
	Concerto in C Major ("*Il Piacere*"), Op. 8, No. 6
	Concerto in D Minor, Op. 8, No. 7
	Concerto in G Minor, Op. 8, No. 8
	Concerto in D Minor, Op. 8, No. 9
	Concerto in B-flat Major ("*La Caccia*"), Op. 8, No. 10
	Concerto in D Major, Op. 8, No. 11
	Concerto in C Major, Op. 8, No. 12

From MIDI file list

Beethoven, Ludwig van	Piano Concerto No. 2 in B-flat Major, Op. 19
	Violin Concerto in D Major, Op. 61
	Symphony No. 5 in C Minor, Op. 67
Haydn, Franz Joseph	Symphony in D Major, H I:1
	String Quartet in C Major, H III:57
	Symphony in E-flat Major, H I:99
	Symphony in G Major ("*Military*"), H I:100
	Symphony in D Major ("*The Clock*"), H I:101
	Symphony in B-flat Major, H I:102
	Symphony in E-flat Major ("*Drumroll*"), H I:103
	Symphony in D Major ("*London*"), H I:104

Work Information

Composer	Haydn, Franz Joseph
Title	Symphony in E-flat Major
Popular Title	Drumroll
Scholarly catalog num.	H I:103
Copyright notice	Copyright (c) 1994, 2000 Center for Computer Assisted Research in the Humanities
Copyright message	Rights to all derivative editions reserved.
Copyright message	Refer to licensing agreement for further details
Scholarly catalogue	Thematisch-bibliographisches Werkverzeichnis (A. van Hoboken)
Derived from	Dover Edition; reprint of Eulenburg Edition
Encoding state	stage2
Error reports	None [Submit error report]

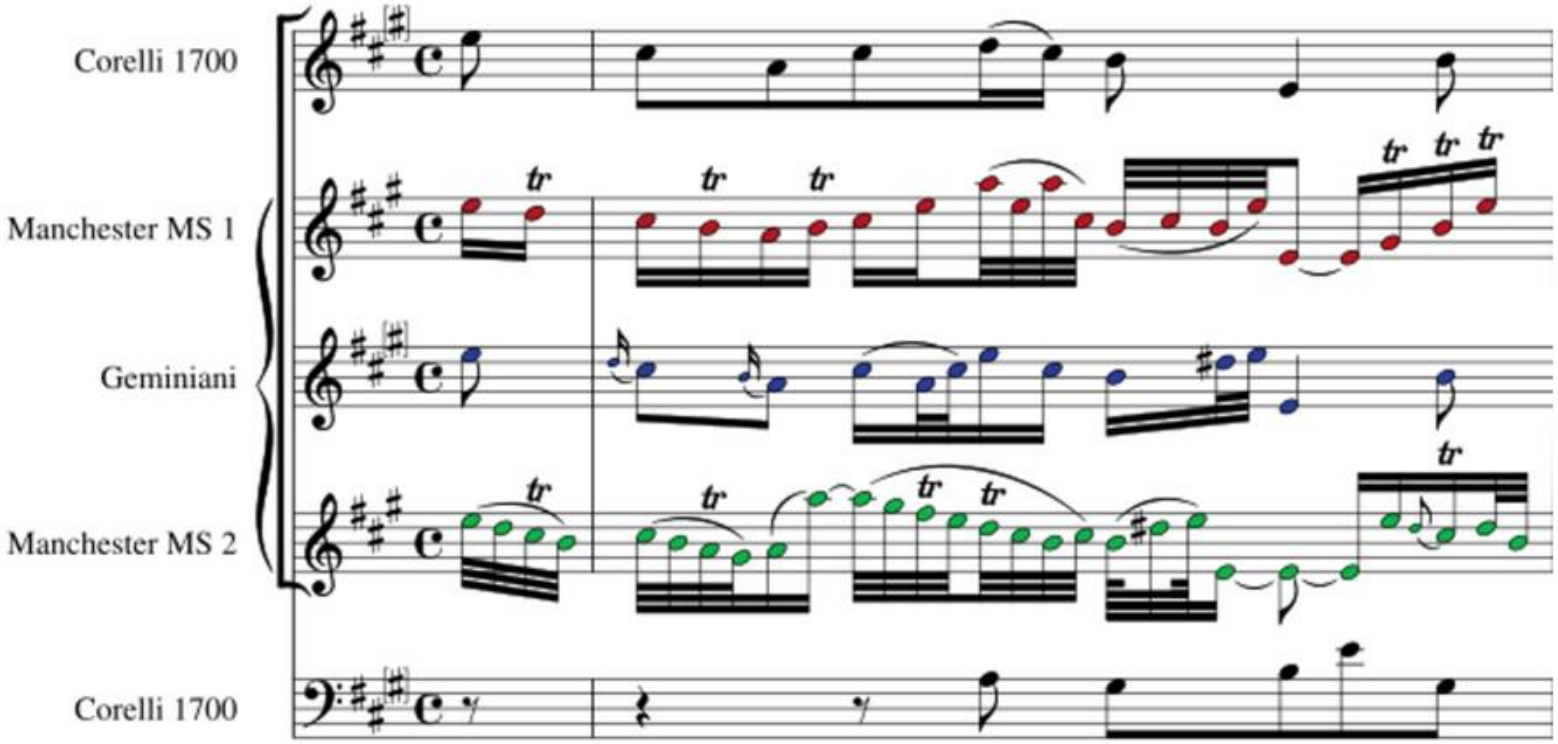
Musical Data

	kern	*MIDI*	*PDF*	*SCORE*	*stage2*	*parts*
Entire work	all	all	all	all	all	
By movement:						
1. Adagio -- Allegro con spirito	01	01	01	01	01	01 02 03 04 05 06 07 08 09 10 11 12 1313z1414z151617 s01 s02 s03 s04 s05 s06 s07 s08 s09 s10 s11 s12
2. Andante	02	02	02	02	02	01 02 03 04 05 06 07 08 09 10 11 121314151617 s01 s02 s03 s04 s05 s06 s07 s08 s09 s10 s11
3. Menuetto and Trio	03	03	03	03	03	01 02 03 04 05 06 07 08 09 10 11 121314151617 s01 s02 s03 s04 s05 s06 s07 s08 s09 s10 s11
4. Finale	04	04	04	04	04	01 02 03 04 05 06 07 08 09 10 11 12131415161718 s01 s02 s03 s04 s05 s06 s07 s08 s09 s10 s11

MuseData uses

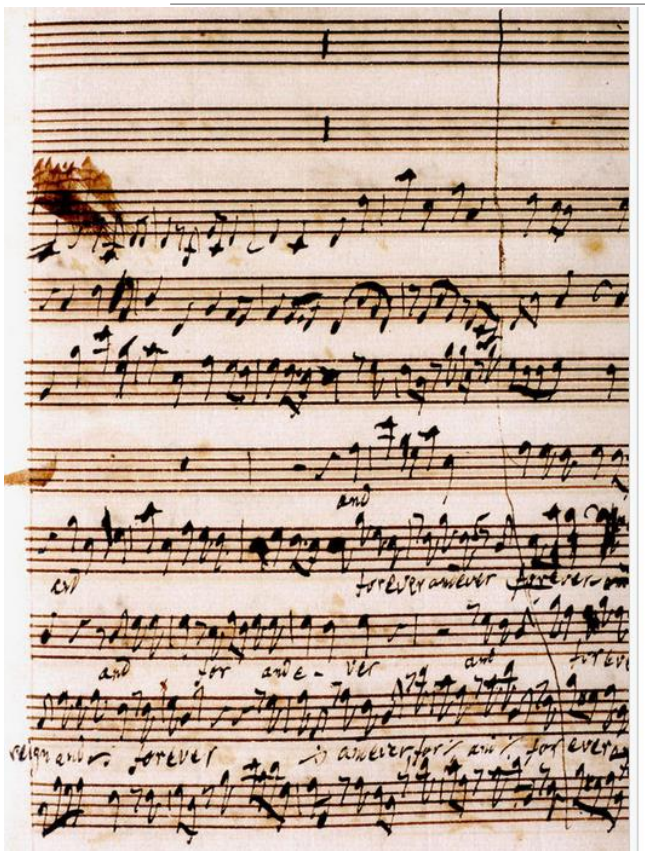
- Performing editions
- Study scores (see Dover Publications)
- Experimental psychology (Krumhansl, Palmer)
- Data modeling (MusicXML)
- Data interchange
- Source comparison (musicology)

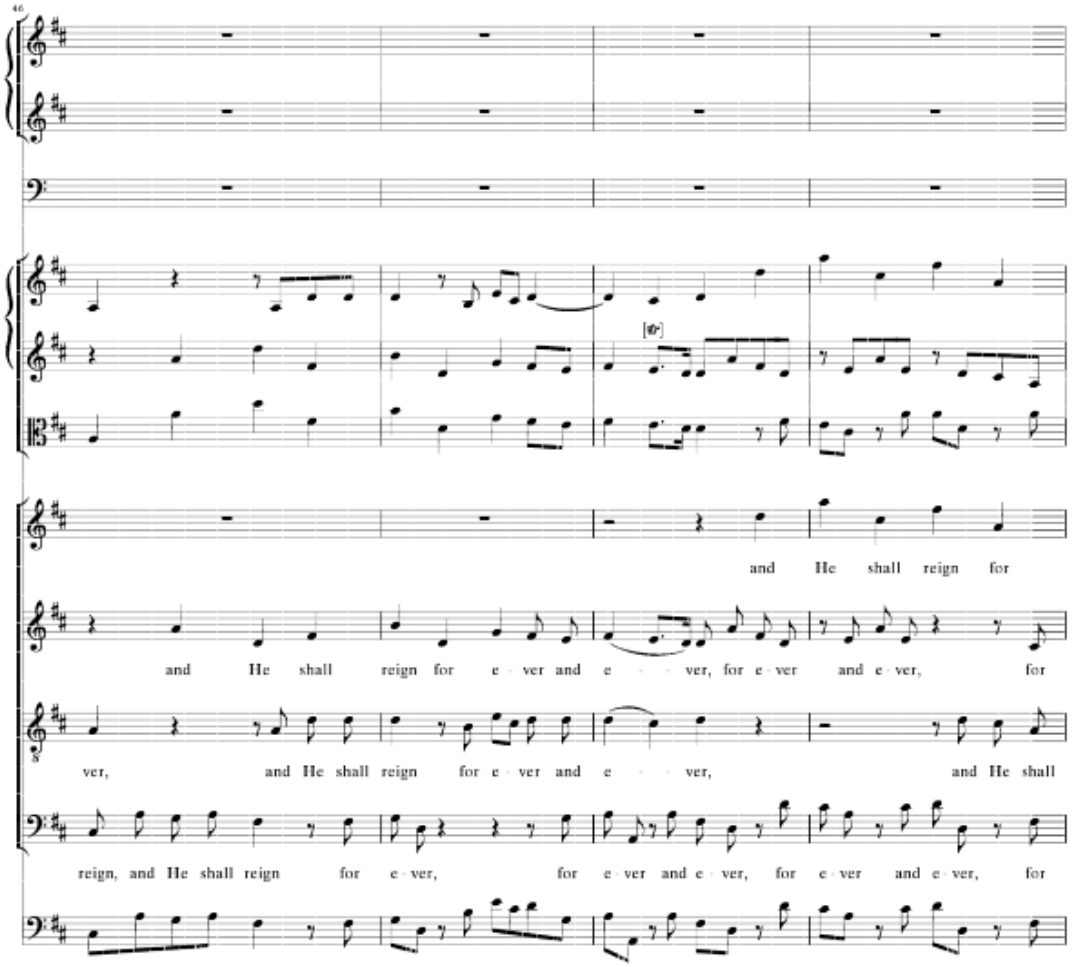
Comparison of sources:
Corelli Sonata Op. 5, No. 1



Handel's *Messiah*

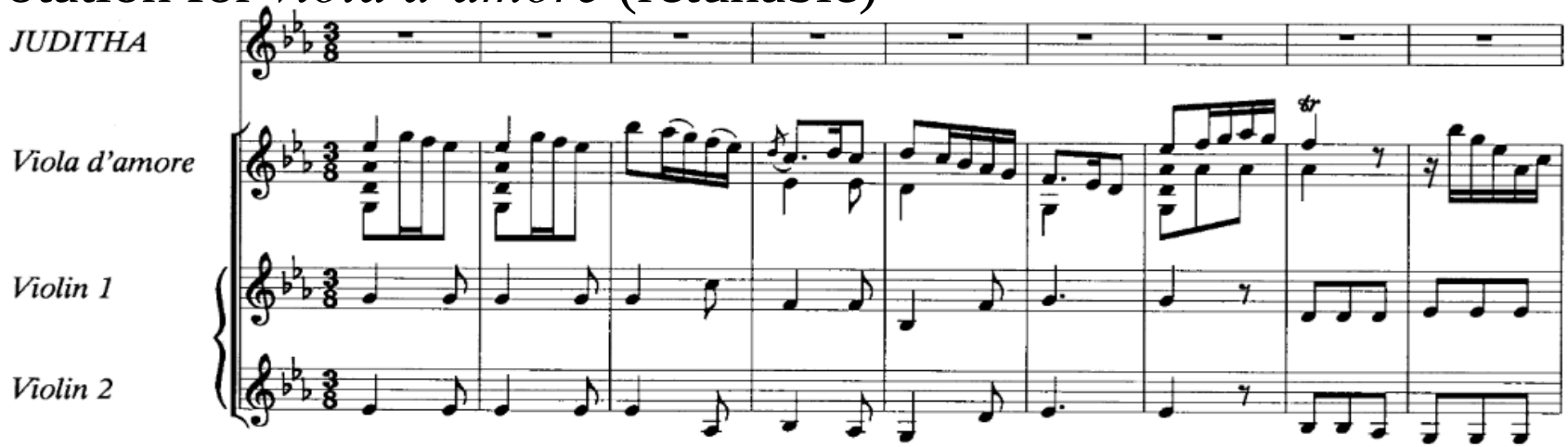
Halleluia chorus

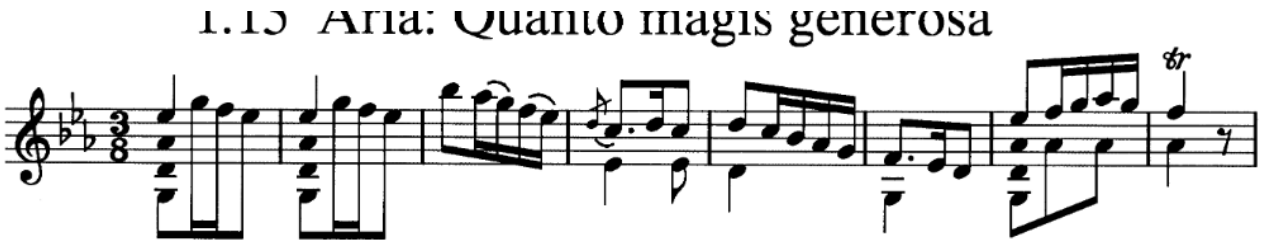




Alternative readings: **Vivaldi—*Juditha triumphans***

Notation for *viola d'amore* (retunable)





Viola d'amore (Vivaldi, *Juditha)*

Brentner: part for *viola d'amore* with tuning key