

A Methodology for Encoding Mensural Music:

Introducing the Mensural MEI Translator

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Solentem

Voce

clarson

Triste

clarson

Voce

clarson

Bass

Voce

clarson

Triste

clarson

Voce

clarson

*Alterum caput. Secundum tenorem
 redimisson et sic y totam missam*

clarson






Voce

clarson

Triste

clarson

Voce

clarson

Voce

clarson

Voce

clarson

Voce

clarson

Voce

clarson

Voce

clarson

Voce

clarson








What is the best way to get
musicologists to enter a large amount of
musical documents into the computer?

And how can we get them encoded into
Mensural MEI files?

The Mensural MEI Translator

A straightforward method to encode
music repertories from the later Middle
Ages and the Renaissance
as they were originally notated.

Mensural Notation 101

Mensural Notation

System of notation used from the 1250s to 1600s

Looks similar to our common Western music notation (CMN):

- Already uses staff-lines and clefs to indicate pitch
- Mensural note-shapes are similar to CMN note-shapes

Modern Notes



(White) mensural notes



Mensural Notation

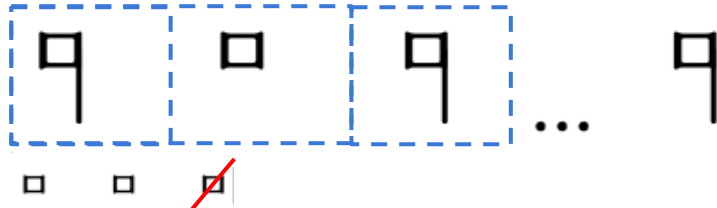
- The note-shapes are similar and there is a clear hierarchy in the note duration
- But, the actual value of these notes is ambiguous
- It can either be triple (i.e., “perfect”) or duple (i.e., “imperfect”)
- The value is determined by two factors:
 - Mensuration
 - Context

longest
↓
shortest

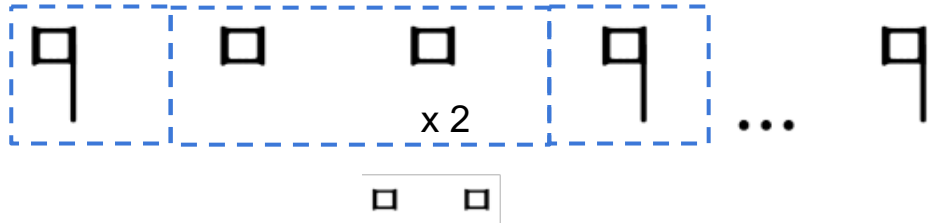
Notes		Values			
Name	Shape	Perfect		Imperfect	
Maxima	☐	☐	☐	☐	☐
Long	☐	☐	☐	☐	☐
Breve	☐	◇	◇	◇	◇
Semibreve	◇	↓	↓	↓	↓

Examples of Context Changing the Note's Value

Mensuration: $\text{modus (longs)} = 3 \rightarrow$ Longs are perfect by default



Perfect \rightarrow Imperfect



Alteration

Methodology for Encoding Mensural Music

Methodology



F-Pa f. fr. 146, 44r

tripulum
motetus
tenor

Neuma

```
<staff n="1">
  <layer n="1">
    <note dur="longa" oct="4" pname="c" xsl:id="piccd4n40v1b1s1">
      <verse n="1">
        <syl con="d" wordpos="i">Gar</syl>
      </verse>
    </note>
    <tuplet num="4" num.format="ratio" numbase="2">
      <note dur="semibrevis" oct="4" pname="c"
xsl:id="piccd4n409v1b1s1">
        <verse n="1">
          <syl wordpos="t">rit</syl>
        </verse>
      </note>
      <note dur="semibrevis" oct="4" pname="c"
xsl:id="piccd4n408v1b1s1">
        <verse n="1">
          <syl con="d" wordpos="i">gal</syl>
        </verse>
      </note>
      <note dur="semibrevis" oct="3" pname="b"
xsl:id="piccd3n512v1b1s1">
        <verse n="1">
          <syl wordpos="t">lus</syl>
        </verse>
      </note>
      <note dur="semibrevis" oct="4" pname="c"
xsl:id="piccd4n563v1b1s1"/>
      <dot />
    </tuplet>
  </layer>
</staff>
```

Gar - rit gal-lus flen - do do - lo
In - no - va - fen
Neuma
3
quip-pe gal-lor-um con - ci - o que sa-tra-pe tra - di-tur
-ni-mus mu - ta - tas di-ce - re for - mas

Opening of the motet *Garrit gallus / In nova* from the manuscript Paris, Bibliothèque nationale, f. fr. 146.

Methodology

A digital musical score for the motet "Garrus gal-lus flen-do do-lo" and "In no-va fen-tas". The score is for three voices: triplum, motetus, and tenor. It includes rhythmic markings such as "4:2" and "2:1". A red arrow points from the manuscript image to this score. To the right of the score is a snippet of XML code representing the musical data.

```
<staff n="1">
  <layer n="1">
    <note dur="longa" oct="4" pname="c" xel:id="piccd4n40v1b1s1">
      <verse n="1">
        <syl con="d" wordpos="i">Gar</syl>
      </verse>
    </note>
    <tuplet num="4" num.format="ratio" numbase="2">
      <note dur="semibrevis" oct="4" pname="c"
        xel:id="piccd4n409v1b1s1">
        <verse n="1">
          <syl wordpos="t">rit</syl>
        </verse>
      </note>
      <note dur="semibrevis" oct="4" pname="c"
        xel:id="piccd4n408v1b1s1">
        <verse n="1">
          <syl con="d" wordpos="i">gal</syl>
        </verse>
      </note>
      <note dur="semibrevis" oct="3" pname="b"
        xel:id="picbd3n5120v1b1s1">
        <verse n="1">
          <syl wordpos="t">lus</syl>
        </verse>
      </note>
      <note dur="semibrevis" oct="4" pname="c"
        xel:id="piccd4n5632v1b1s1"/>
      <dot />
    </tuplet>
  </layer>
</staff>
```

Opening of the motet Garrus gal-lus / In nova from the manuscript Paris, Bibliothèque nationale, f. fr. 146.

Methodology

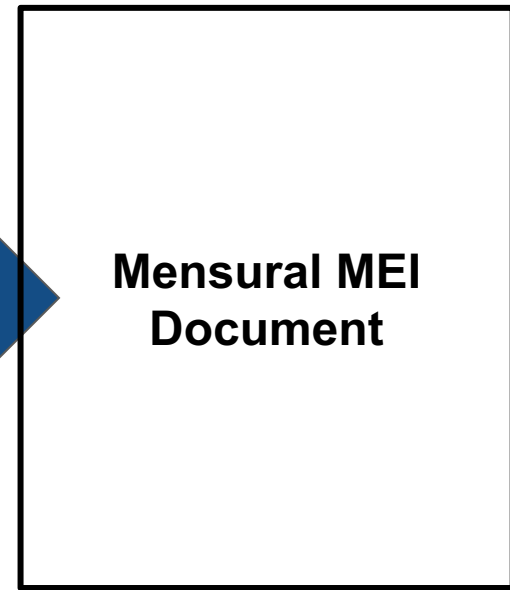


Modern musical score for 'Garrit gallus' with Common Music Notation MEI code overlaid. The score includes parts for triplum, motetus, and tenor. The MEI code is as follows:

```
F-Pa f. fr. 146, 44r
triplum
Gar - rit gal-lus flen - do do - lo
motetus
In - no - va - fen
tenor
Neuma
quip-pe gal-lor-um con - ci - o que sa-tra-pe tra - di-tur
-ni-mus mu - ta - tas di - ce - re for - mas
```

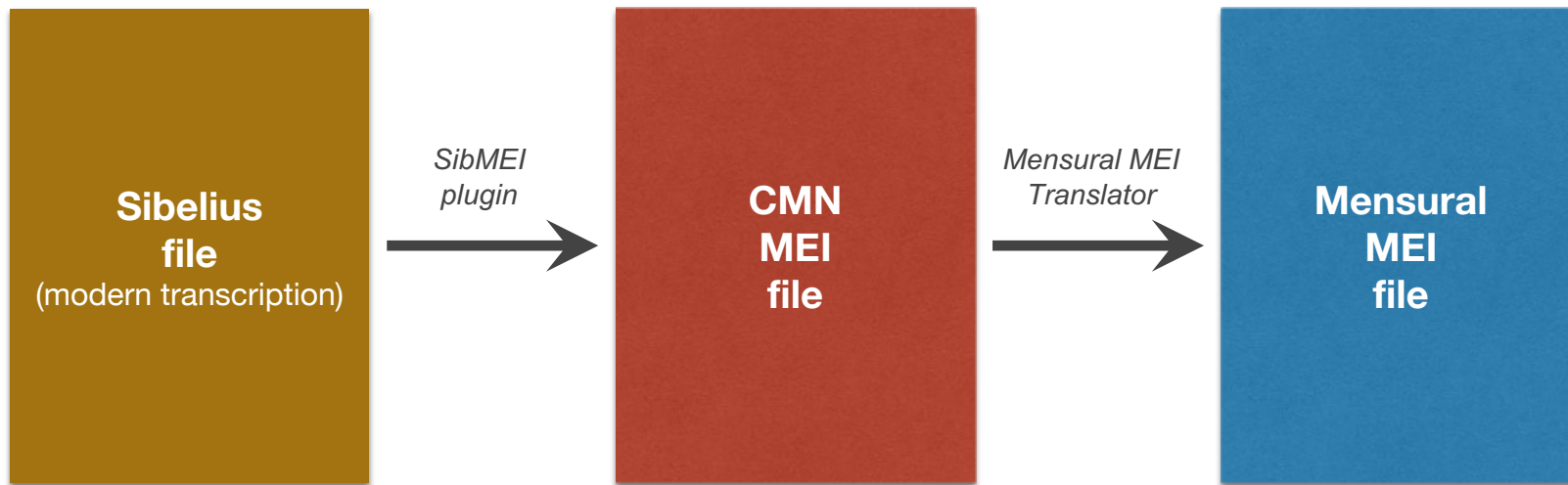
Common Music Notation MEI code:

```
<staff n="1">
  <layer n="1">
    <note dur="longa" oct="4" pname="c" xel:id="piccd4n409v1b1s1">
      <verse n="1">
        <syl con="d" wordpos="i">Gar</syl>
      </verse>
    </note>
    <tuplet num="4" num.format="ratio" numbase="2">
      <note dur="semibrevis" oct="4" pname="c"
        xel:id="piccd4n409v1b1s1">
        <verse n="1">
          <syl wordpos="t">rit</syl>
        </verse>
      </note>
      <note dur="semibrevis" oct="4" pname="c"
        xel:id="piccd4n409v1b1s1">
        <verse n="1">
          <syl con="d" wordpos="i">gal</syl>
        </verse>
      </note>
      <note dur="semibrevis" oct="3" pname="b"
        xel:id="piccd3n5120v1b1s1">
        <verse n="1">
          <syl con="d" wordpos="i">lor</syl>
        </verse>
      </note>
      <note dur="semibrevis" oct="3" pname="b"
        xel:id="piccd3n5120v1b1s1">
        <verse n="1">
          <syl con="d" wordpos="i">um</syl>
        </verse>
      </note>
      <dot />
    </tuplet>
  </layer>
</staff>
```



Opening of the motet Garrit gallus / In nova from the manuscript Paris, Bibliothèque nationale, f. fr. 146.

Methodology



Step 1: Transcribe

**Sibelius
file**
(modern transcription)

- Modern transcriptions usually do not record all the features contained in the mensural sources
- We developed a system of articulation marks to represent specific mensural notation features in the Sibelius transcriptions



Opening of the motet *Garrit gallus* / *In noua* from the manuscript Paris, Bibliothèque nationale, f. fr. 146.

triplum

Gar - - rit gal-lus flo - do do - lo - ro - se lu - ge

motetus

In - - no - - ua - - fert a -

3

quip-pe gal-lor-um con-ci-o que sa-ra-pe tra-di-tur do-lo-se

-ni-mus mu - ta - tas di-ce - re for-mas

Repertoire for first phase of ‘Measuring Polyphony’ project

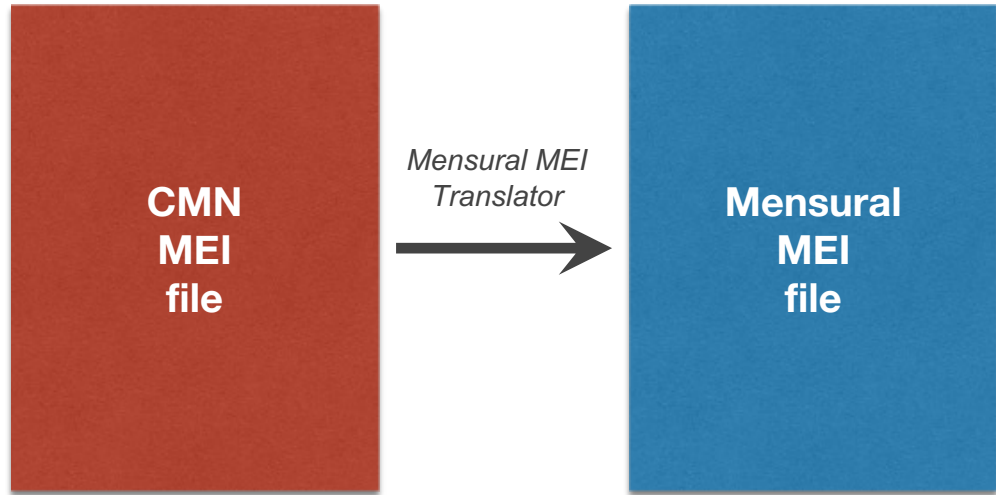
64 polyphonic pieces representing:

- *Ars antiqua* (c. 1280–1320):
 - **Montpellier Codex** (Montpellier, Bibliotheque interuniversitaire, Section de medecine, H. 196)
 - ***Roman de Fauvel* manuscript** (Paris, Bibliotheque nationale, f. fr. 146)
 - **Brussels rotulus** (Brussels, Bibliotheque royale, Ms. 19606)
- *Ars nova* (c. 1320–1350):
 - Ivrea Codex (Ivrea, Biblioteca capitulare, Ms. 115)

Step 2: Convert into MEI






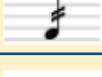
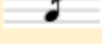
Step 3: The Mensural MEI Translator

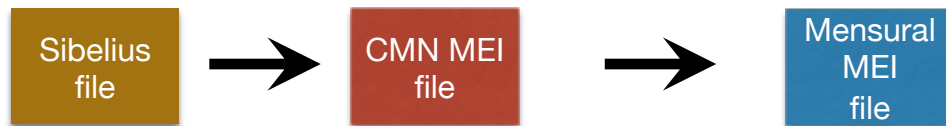


Three actions











1. Decodes the articulation marks we introduced in Sibelius
2. Changes the **CMN note names** to the corresponding **mensural note names**
3. Determines and encodes the quality (perfect / imperfect) of the note within the `<note>` element

1. Decode the Sibelius marks

Mensural feature	Sibelius	CMN MEI	Mensural MEI
Alteration		@artic = "stop"	@num = "1" @numbase = "2"
Dots		@artic = "stacc"	<dot>
Downward stem (major semibreves)		@artic = "ten"	@stem.dir = "down"
Plica upward		@stem.mod = "2slash"	@plica = "asc"
Plica downward		@stem.mod = "1slash"	@plica = "desc"



2. Changes the *CMN note names* to the corresponding *mensural note names*

CMN MEI @dur value	Mensural MEI @dur value
 "long"	 "longa"
 "breve"	 "brevis"
 "1"	 "semibrevis"
 "2"	 "minima"
 "4"	 "semiminima"

3. Determines and encodes the quality of the note within the `<note>` element

The quality values (relates to the **realized durations**) are:

- Perfect
- Imperfect
- Altered
- Minor and major semibreves (*Ars antiqua*)
- Partial imperfection (*Ars nova*)

3. Determines and encodes the quality of the note within the `<note>` element

- Use the **performed duration** (encoded in the `@dur.ges` attribute) of the note to determine its perfect / imperfect quality

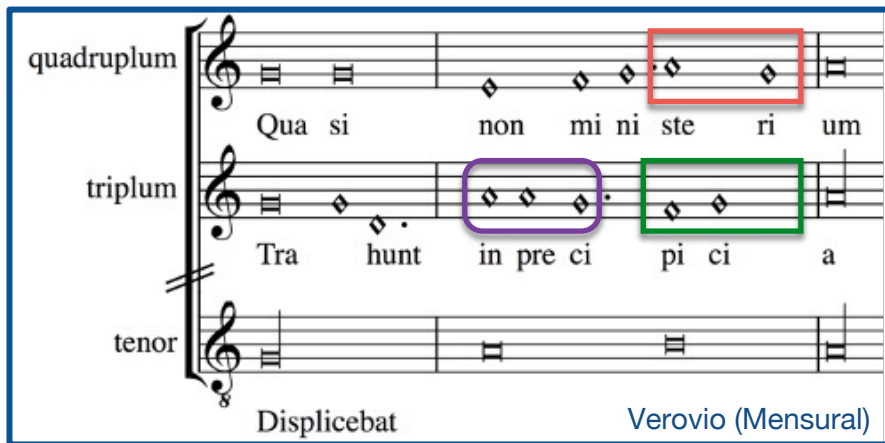
Examples: Perfect, Imperfect, Altered

The image displays a musical score for Hugo (Ivrea) in mensural notation. It features three staves: triplum, motetus, and tenor. The lyrics are: Cum sta tu a Na bu co do na sor me. The tenor part has three notes highlighted: a green circle around the first note, a red circle around the second note, and a purple rounded rectangle around the third note.

Verovio (Mensural)

Piece: Hugo
(Ivrea)

Examples: Minor and Major Semibreves



quadruplum
Qua si non mi ni ste ri um

triplum
Tra hunt in pre ci pi ci a

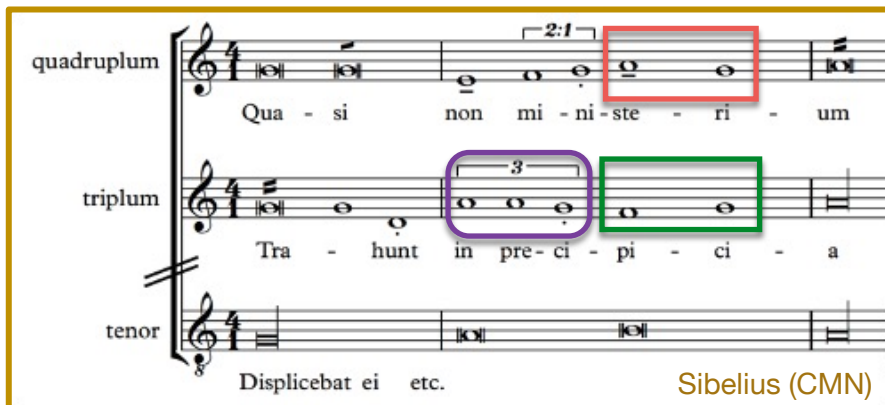
tenor
Displcebat

Verovio (Mensural)

Detailed description: This image shows a snippet of mensural notation for the piece 'Displcebat' by Verovio. It features three staves: quadruplum (top), triplum (middle), and tenor (bottom). The quadruplum staff has a red box around the notes for 'ste' and 'ri'. The triplum staff has a purple box around the notes for 'in' and 'pre', and a green box around the notes for 'ci' and 'pi'. The tenor staff shows the corresponding notes for 'Displcebat'. The text 'Displcebat' is written below the tenor staff, and 'Verovio (Mensural)' is written at the bottom right.

In *ars antiqua* pieces

Piece: Ve qui gregi
(*Fauvel*)



quadruplum
Qua - si non mi - ni - ste - ri - um

triplum
Tra - hunt in pre - ci - pi - ci - a

tenor
Displcebat ei etc.

Sibelius (CMN)

Detailed description: This image shows a snippet of Common Music Notation (CMN) for the piece 'Displcebat ei etc.' by Sibelius. It features three staves: quadruplum (top), triplum (middle), and tenor (bottom). The quadruplum staff has a red box around the notes for 'ste' and 'ri'. The triplum staff has a purple box around the notes for 'in' and 'pre', and a green box around the notes for 'ci' and 'pi'. The tenor staff shows the corresponding notes for 'Displcebat ei etc.'. The text 'Displcebat ei etc.' is written below the tenor staff, and 'Sibelius (CMN)' is written at the bottom right.

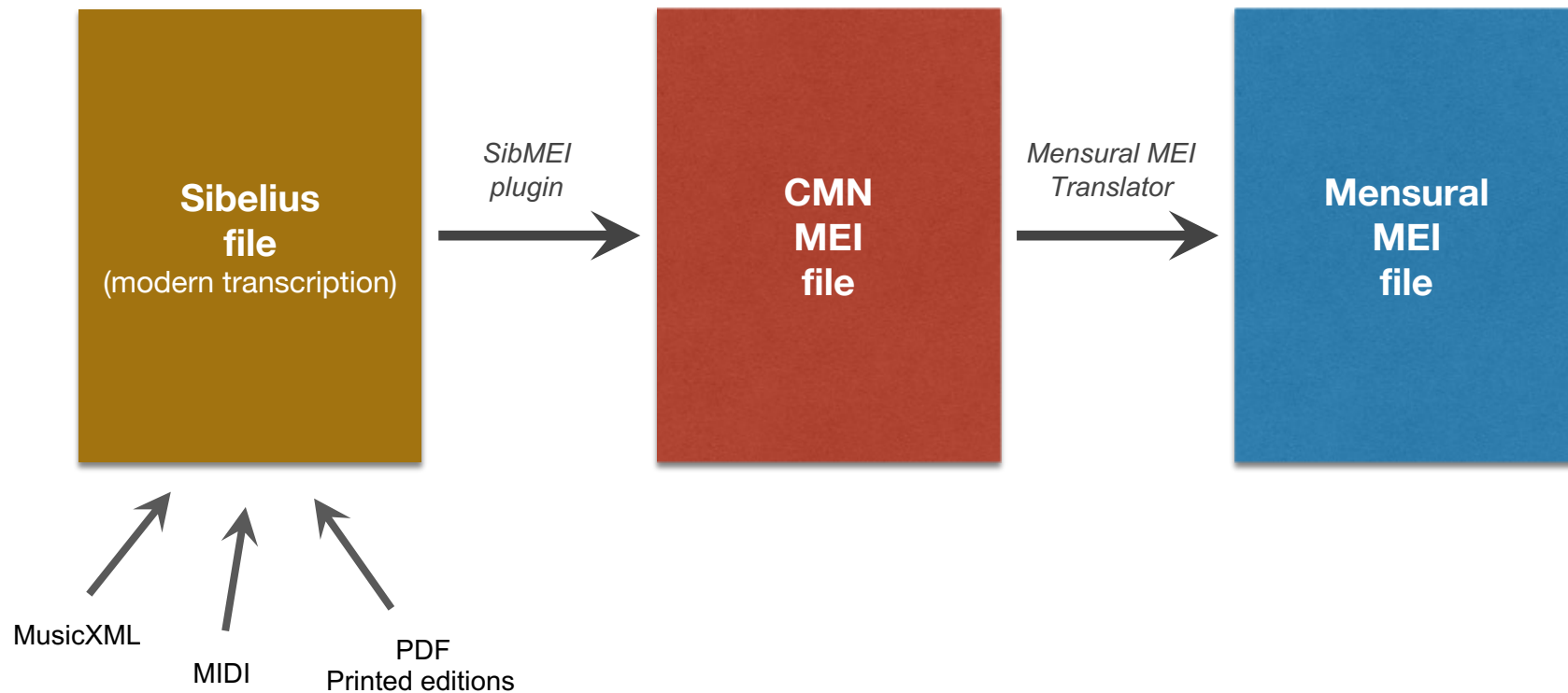
Mensural MEI Translator

Python module

Parameters:

- Piece
- Style (*Ars antiqua* or *Ars nova*)
- Mensuration of each voice

In Conclusion



In Conclusion

- Streamlines the process for digitally encoding this repertory
- Encodes the original medieval notation in a standardized machine-readable format
 - Searched or analyzed
 - Available to other websites and applications
- The pieces can be displayed in Verovio
 - Freely available to performers, scholars, and the public

Thank you!

https://github.com/DDMAL/CMN-MEI_to_MensuralMEI_Translator



SIMSSA | Single Interface for Music
| Score Searching and Analysis



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Social Sciences and Humanities
Research Council of Canada

Conseil de recherches en
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Canada



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École de musique Schulich



Centre for Interdisciplinary Research
in Music Media and Technology

