

# A Methodology for Encoding Mensural Music:

## Introducing the Mensural MEI Translator

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Martha E. Thomae, McGill University

**Music Encoding Conference**  
Tours, May 17<sup>th</sup>, 2017

# Edenhem

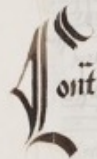


musical notation on staves with lyrics: *Edenhem*, *clerfon*, *cryste*, *clerfon*, *clerfon*

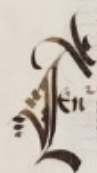


musical notation on staves with lyrics: *clerfon*, *cryste*, *clerfon*, *clerfon*

*Ancient caput de condito tenorem  
p. d. m. s. f. m. et sic p. totum m. s. f. m.*



musical notation on staves with lyrics: *Mont*, *clerfon*, *clerfon*, *clerfon*, *clerfon*



musical notation on staves with lyrics: *clerfon*, *cryste*, *clerfon*, *clerfon*, *clerfon*



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	☐	9	9	9	9 9
Long	9	☐	☐	☐	☐ ☐
Breve	☐	◇	◇	◇	◇ ◇
Semibreve	◇	↓	↓	↓	↓ ↓

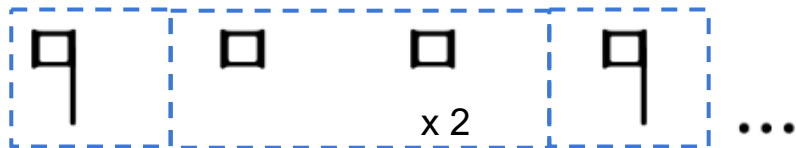


# Examples of Context Changing the Note's Value

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



Perfect  $\rightarrow$  Imperfect



Alteration



# Methodology for Encoding Mensural Music

# Methodology



F-Pn f. fr. 146, 44r

triplum

motetus

tenor

Neuma

Gar - rit gal-lus sten-do do-lo

In no - va fen

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

```

<staff n="1">
  <layer n="1">
    <note dur="longa" oct="4" pname="c" xsl:id="piccd4n0v1b1s1">
      <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="piccd4n5632v1b1s1"/>
      <dot />
    </tuplet>
  </layer>
</staff>
  
```

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

# Methodology



F-Pn f. fr. 146, 44r

tripulum

motetus

tenor

Neuma

Gar - rit gal-lus sten-do do-lo

In no - va fen

Neuma

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

# Methodology



F-Pn f. fr. 146, 44r

triplum  
Gar - rit gal-lus sten-do do-lo

motetus  
In no - va

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

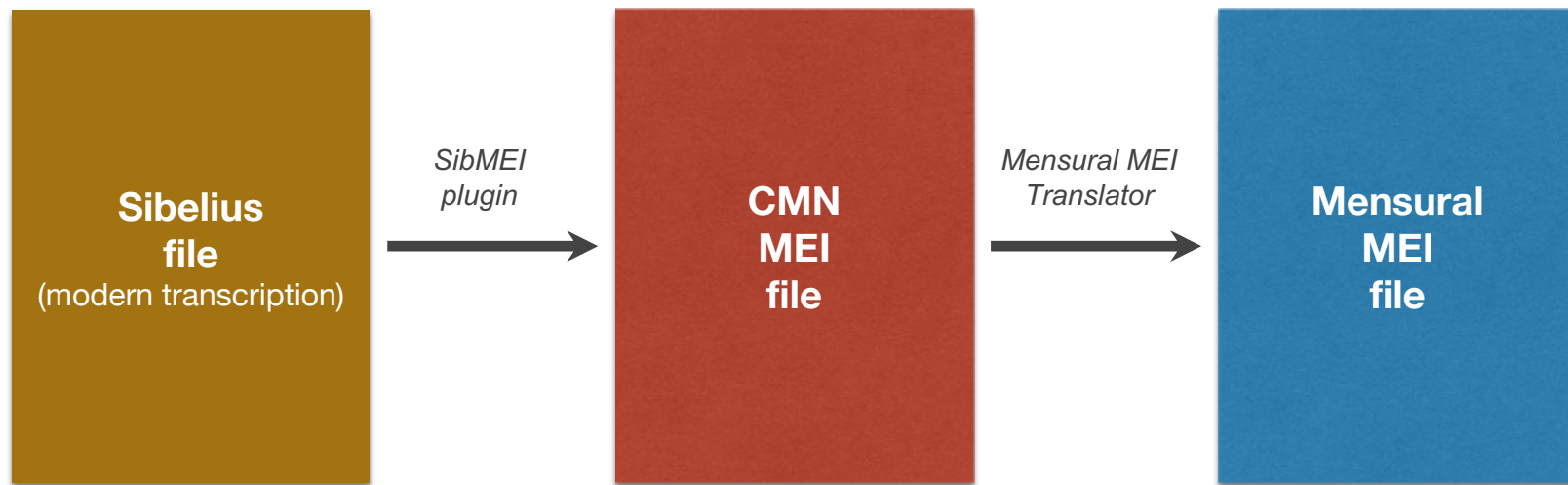
```
<staff n="1">
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      <verse n="1">
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      </verse>
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        <verse>
          <note>
            <note>
              <dot />
            </note>
          </tuplet>
        </layer>
      </staff>
```

**Common Music Notation MEI**

**Mensural MEI Document**

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.

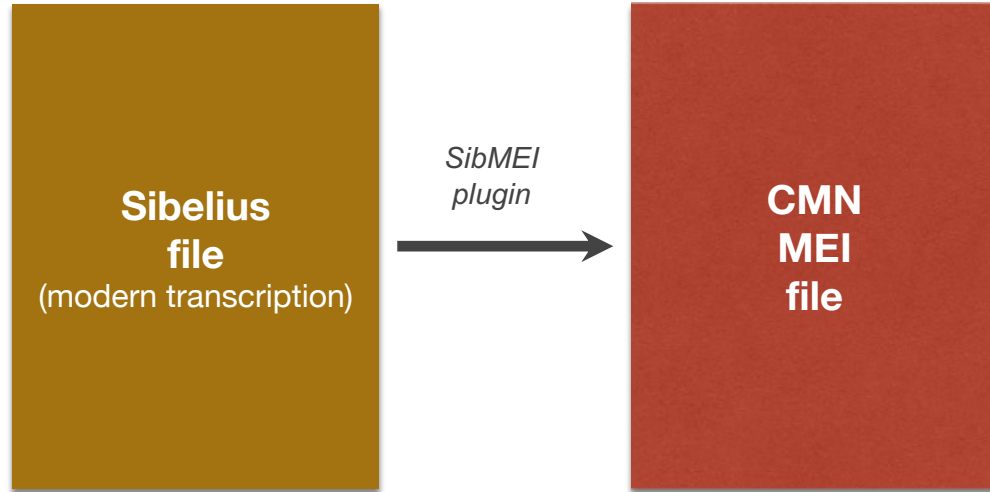


# Repertoire for first phase of 'Measuring Polyphony' project

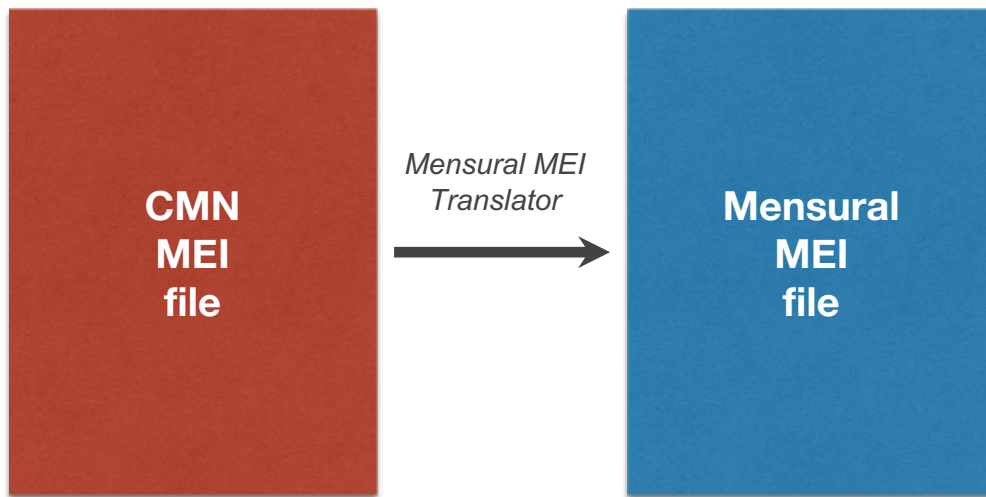
64 polyphonic motets representing:

- *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 capitolare, Ms. 115)

## Step 2: Convert into MEI



## Step 3: The Mensural MEI Translator




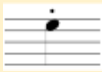

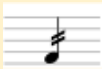

# Four actions

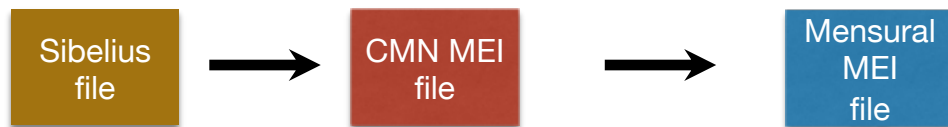
1. Removes measure-related information
2. Substitutes the CMN articulation marks with the appropriate mensural notation element (or attribute), according to the standards developed by the MEI
3. Changes the **CMN note names** to the corresponding **mensural note names**
4. Determines and encodes the quality (perfect / imperfect) of the note within the `<note>` element

# 1. Remove measure-related information















- The CMN MEI `<measure>` elements were removed
- The measure-rest `<mRest>` elements were substituted by `<rest dur = "longa">`

## 2. Substitutes the CMN articulation marks with the appropriate mensural notation element (or attribute)















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"

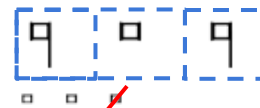


### 3. Changes the *CMN note names* to the corresponding *mensural note names*

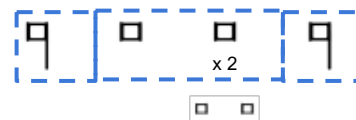
CMN MEI @dur value	Mensural MEI @dur value	Mensural MEI @dur value (if '+')
 “long”	 “longa”	 “brevis”
 “breve”	 “brevis”	 “semibrevis”
 “1”	 “semibrevis”	 “minima”
 “2”	 “minima”	 “semiminima”
 “4”	 “semiminima”	-

### 3. Changes the *CMN note names* to the corresponding *mensural note names*

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Perfect → Imperfect

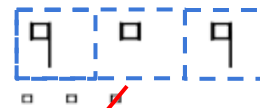


Alteration

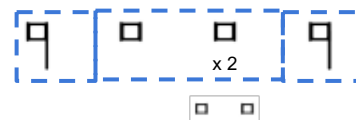


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Perfect → Imperfect



Alteration



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

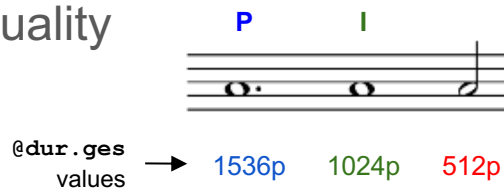
The quality values (relates to the **realized durations**) are:

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

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

To encode the quality of the note:

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



- Then, **mensuration** is used to determine whether the perfect / imperfect value, is the default value or an “exception”
  - In case of an “exception” value, the quality of the note is encoded by using the `@num` and `@numbase` attributes

# Examples: Imperfect, Altered, Perfect

The image displays a musical score for three voices: triplum, motetus, and tenor. The triplum part has the lyrics "Cum sta tu a Na bu co do na sor me". The motetus part has the lyrics "Hu go,". The tenor part has a green circle around the first note, a red circle around the second note, and a purple rounded rectangle around the third note. The notes are square and the staff is a four-line staff.

Verovio (Mensural)

**Piece:** Hugo  
(Lvrea)

# Examples: Minor and Major Semibreves

quadruplum

triplum

tenor

Displcebat

Verovio (Mensural)

Qua si non mi ni ste ri um

Tra hunt in pre ci pi ci a

This example shows three staves of mensural notation. 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 has a double bar line and a fermata. The text 'Displcebat' is written below the tenor staff, and 'Verovio (Mensural)' is written below the quadruplum staff.

*In ars antiqua pieces*

**Piece:** Ve qui gregi  
(*Fauvel*)

quadruplum

triplum

tenor

Displcebat ei etc.

Sibelius (CMN)

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

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

This example shows three staves of CMN notation. 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 has a double bar line and a fermata. The text 'Displcebat ei etc.' is written below the tenor staff, and 'Sibelius (CMN)' is written below the quadruplum staff.

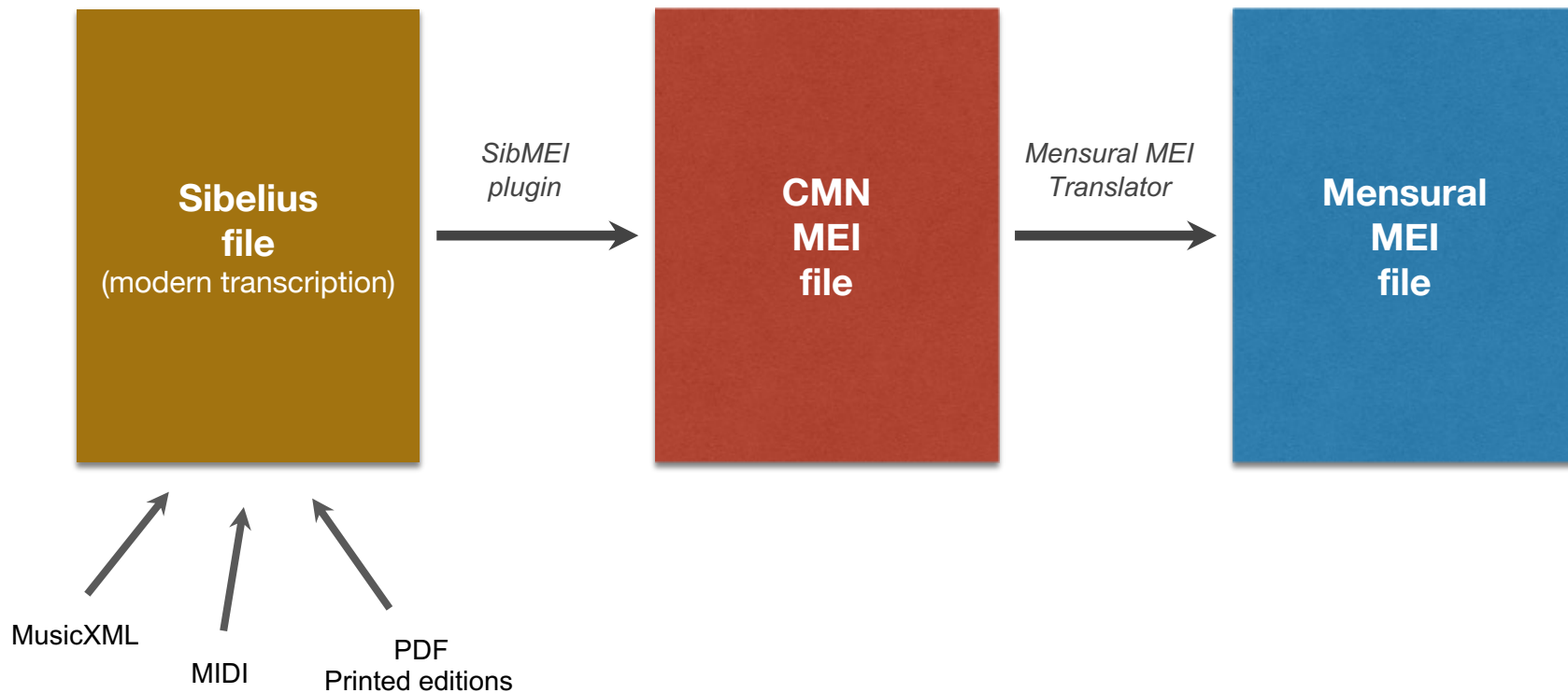
# Mensural MEI Translator

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
- Stay tuned for the 'Measuring Polyphony' website which will be launched in 2017/early 2018

<http://www.measuringpolyphony.com>



# Thank you!

[https://github.com/DDMAL/CMN-MEI\\_to\\_MensuralMEI\\_Translator](https://github.com/DDMAL/CMN-MEI_to_MensuralMEI_Translator)



**SIMSSA** | Single Interface for Music  
| Score Searching and Analysis



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