

Computers which help me do  
musicology? I'm still waiting!  
Some personal reflections on more  
than two decades of frustration

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1. Beginning
2. Middle
3. End





















# Lute music

Large, under-explored repertory

Historical importance undeniable, yet persistently ignored

At least as much music in manuscripts as in printed sources


In a strange notation



# Italian lute tablature typeset 1592



# French lute tablature typeset 1594



**FLORILEGIVM.** 1.

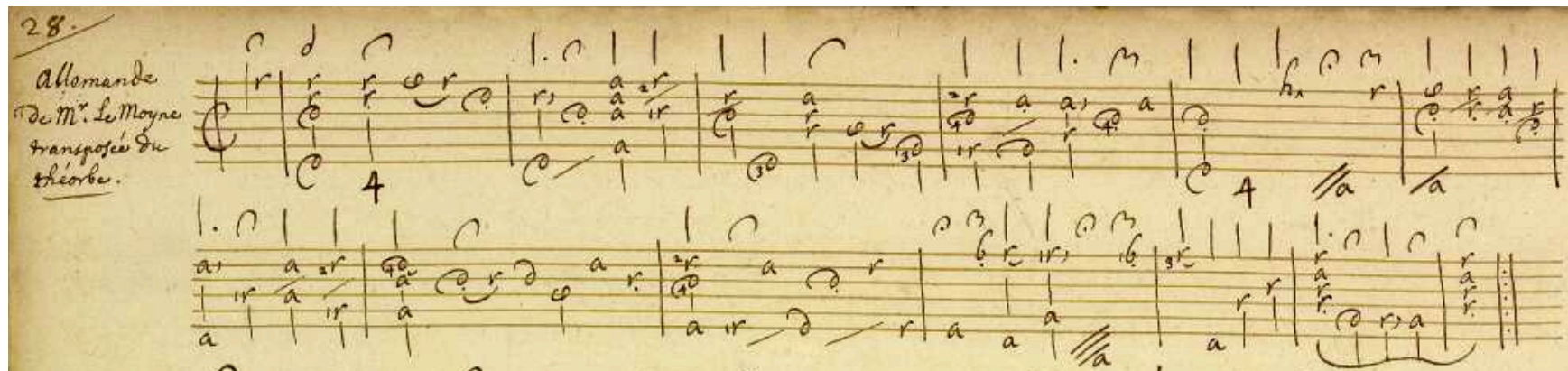
1  $\beta$   $\beta$   $\beta$   $\beta$   $\beta$   $\beta$   $\beta$

Quam gloriosum. à 4.

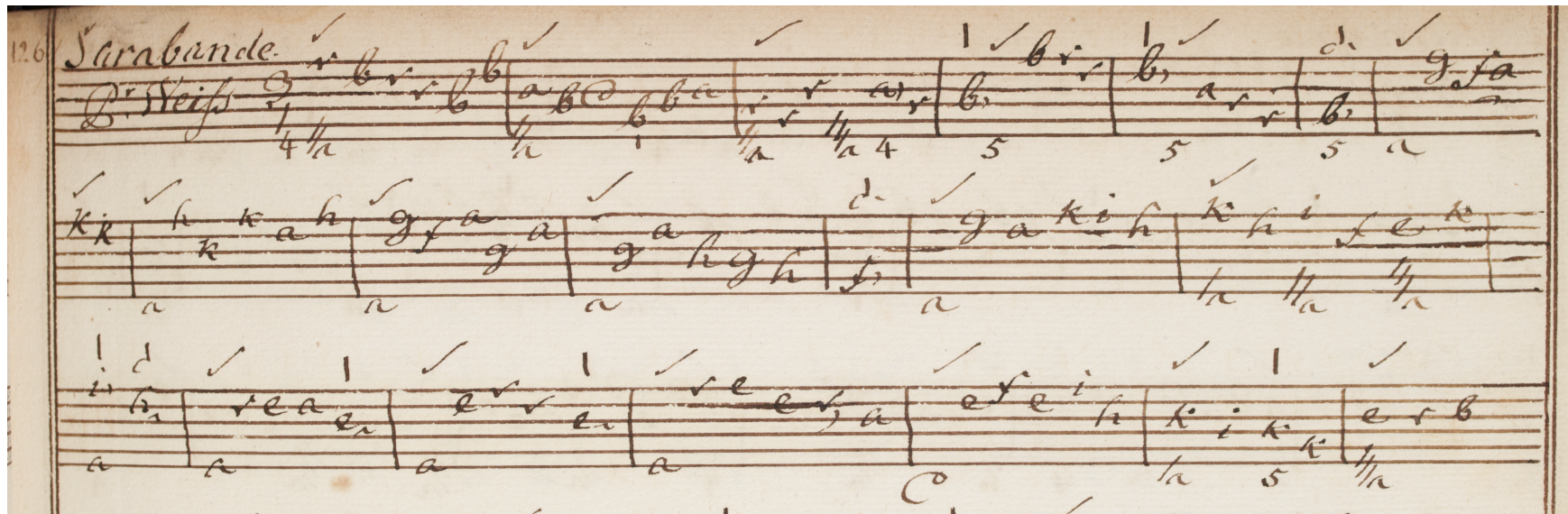
$\beta$   $\beta$   $\beta$   $\beta$   $\beta$   $\beta$   $\beta$   $\beta$

The image displays a page from a 1594 French lute tablature manuscript. On the left is a large, ornate circular decorative initial. The main title 'FLORILEGIVM.' is centered at the top, with a small '1.' in the upper right corner. The first system of music consists of six staves, each with a single letter (a, b, c, d, e, f) above it, representing the fret positions for the six strings. The second system is a four-part setting of the text 'Quam gloriosum. à 4.', featuring four staves with various musical notations including letters and rhythmic symbols.

# French lute MS, c. 1699



# ?Austrian/?German lute MS, c. 1760



# Lute music

Fixed forms of 'the work' are rather rare – possibly due to the persistence of the improvisatory tradition

Contents of lute sources not catalogued in RISM

But large proportion (probably at least 50%) of repertory consists of arrangements

Ripe for computational treatment – one might think!

# Electronic Corpus of Lute Music (ECOLM)

Lute tablature is easy to encode – or so I thought!

ECOLM (I) – manual encoding

ECOLM II – manual – then we discovered OMR!

*Gamera!*

... then we discovered ...

*Aruspix!*

ECOLM III: *Gamera* + *Aruspix*

# ECOLM

Most lute music is anonymous in most sources, but some pieces appear often.

*How can we identify music in tablature?*

Often, pieces contain quotations or allusions to earlier music.

*How do we search for musical passages within tablature?*

50% of the lute repertory consists of arrangements.

*How can we find concordances with music in other forms of notation?*

# Online Music Recognition And Searching (OMRAS)

Initially a Digital Library project

Funded by NSF Digital Libraries (US) & JISC (UK)

Audio and score involved from the start

Language modelling based on harmonic profiles  
allows cross-matching between audio and score

Continued as OMRAS 2



# International Symposium for Music Information Retrieval (ISMIR)

Founded in 2000 (partially) as offshoot of OMRAS

Initially music-librarians were the 'client base'

Soon outnumbered by audio engineers

Chroma feature ( $\sim$  pitch-class profile) is useful

Identifying cover songs – still a challenge!

# ISMIR 2005

Nicholas Cook, 'The Compleat Musicologist',  
keynote address at ISMIR 2005 (London)

## Nicholas Cook, 'The Compleat Musicologist'

“... musicologists are used to working with highly reduced data. ...

Scores ... are such drastically simplified representations of musical sound that you almost want to say they symbolize rather than represent it ...

Whereas the score is tangible the sound is intangible ...”

## Nicholas Cook, 'The Compleat Musicologist'

“... musicologists have thought it proper to work very closely—some might say myopically—with very small data sets, usually a single musical work, or even a movement.

... working with larger data sets will open up new areas of musicology.”

## Nicholas Cook, 'The Compleat Musicologist'

“There may be a few musicologists who are actively hostile to computational approaches, but there are many more who simply don't see the point,

and I think a major reason for this is the feeling that musicology is based on the experience of music—and that once you bring computers in the experience goes out, meaning that the whole exercise becomes pointless.”

## Nicholas Cook, 'The Compleat Musicologist'

“... musicologists aren't going to be comfortable using computational methods until they have come to see them ... as elements of the musicological toolkit.

In fact, I think it might be a good idea if we stopped talking about 'computational musicology' at all, and instead just talked about doing musicology with computers.”



[www.transforming-musicology.org](http://www.transforming-musicology.org)



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NB Broader (UK?) definition of 'musicology', adding to 'historical musicology' aspects of music theory and analysis, plus music psychology and ethnomusicology.

Not including composition, or performance per se (but performance analysis, e.g. from recordings, is included).

Basically, for us: *Musicology = The deep study of music*





AHRC call for proposals for Large Grants under their Digital Transformations theme

Coincided with end of various related projects – team more-or-less in place

Importance of impact and adventure explicit in the call



“An opportunity to transform musicology’s impact and status by recognising the full implications of its multidisciplinary nature and taking advantage of the potentials of technology for studying the vast musical resources of the Internet.”



Stimulate creativity through multidisciplinary collaborative working:

“In the past, musicologists have tended to be lone scholars; regular collaboration in a multidisciplinary research environment will in future be essential for them to find what is ‘interesting’ in potentially huge collections of music.”



In some senses it's OMRAS 3, but more explicitly and very strongly motivated to aid musicology

Three main research strands (the first continues ECOLM work)



## *16th-century Lute and Vocal Music*

Uses computational methods to strengthen the evidential base for a musicological study. Based on a resource of traditional musical documents for an important era of music history (16c vocal and lute music from *Early Music Online*), it uses, extends and enhances ECOLM.



## *Wagner & the leitmotive*

Investigates new modes of study (principally audio-searching, text/music markup and Linked Data) on a historical musicological topic with a considerable literature spanning over a century of commentary.

Also a parallel psychological study to conduct experiments in music memory and music perception to establish empirical traits of leitmotives and their use.



## *Musicology of Social Media*

New methods for musicology which use massive amounts of new evidence. What form this new musicology takes is implied by what the modern shift in distribution enables; musicological questions can be considered and answered in a datadriven and socio-cultural way, impossible before the ubiquitous availability of music and digitisation of social sharing.



### *Four mini-projects*

to broaden the reach of the overall project and bring into its purview possibilities and problems which might otherwise have been overlooked

to allow musicologists to work alongside technologists to help them realise innovative musicologically-motivated ideas





Mini-projects selected for:

transformative potential

contrast with the musicological concerns of other project strands

potential to profit from sharing of software and other digital resources, especially those produced by the project



1. *Large-scale corpus analysis of historical electronic music using MIR tools* (Electronic music, 1948-1998; human analyses from a previous project)
2. *In Concert: Towards a Collaborative Digital Archive of Musical Ephemera* (contextualising concert programmes, 1700-1900)
3. *Medieval Music, Big Data and the Research Blend* (tracing origins of 900 medieval Latin poems in *conductus* settings)
4. *Characterising stylistic interpretations through automated analysis of ornamentation in Irish traditional music recordings* (traditional Irish flute playing)



Continuing research into technical methodologies with new emphasis on musicology:

*Audio technology and symbolic pattern-matching*

*Audio feature-design and selection for musicology*

*Mid-level semantic music representation*

*Semantic Web Technologies for Musicology*



Looking outward ...

Obligation to generate 'impact' and serve the wider community and encourage participation

Contact with other projects – such as MEI and SIMSSA – is vital to our success

# MEI and what it can do for T-Mus

Some books in EMO require us to encode mixed  
tablature/mensural notation

37

**A**

Manti mici ij Poi che contenti state e di la chime og

n'hor bagnat'il uiso uenite al chiaro sole uenite al chiaro sole del paradiso

*Licui raggi cortesi honesti Amanti  
Conuertirete in pianto allegrezza e riso  
Venite al chiaro sole del Paradiso*

*Quiui s'accordon i sdegni e mal passati  
E non si perde il lume e mira fiso  
Venite al chiaro sole del Paradiso*

*Felice senza hauer piu altro al mondo  
Spauento di pensier cattini, e rei  
Sole che luce apporta a gl'occhi miei*

Gabriel Fallamero, *Il Primo Libro de Intavolatura* (1584)

FLORILEGIUM.

1.

Quam gloriosum. à 4.

DISCANTVS.

BASSVS.

Chri  
sto gaudeat oēs sancti omnes sancti  
amici flo-  
ris al-  
bis  
gaudeat  
flo-  
ris  
in  
quo  
cum  
Chri  
sto  
gaudeat  
oēs  
sancti  
omnes  
sancti  
amici  
flo-  
ris  
al-  
bis

FLORILEGIUM.

1.

Quam gloriosum. à 4.

A

Adrian Denss, *Florilegium* (1594)



Gio: Maria Nannino

osi vn leggria d'ro canto Acquera l'ire e moue il riso el pian.  
 to C' spetra vn duro co re' Che spre' i lacci il foco i strai da  
 moro' Che spre' i lacci il fo co i strai d'Amore

4

osi vn leggria d'ro canto Acquera l'ire e moue il riso el  
 pian to C' spetra vn duro coro' Che spre' i lacci il foco i  
 strai d'Amo re' Che spre' i lacci il foco i strai d'Amo re

osi vn leggria d'ro canto Acquera l'ire e moue il riso el pian.  
 to C' spetra vn duro coro' Che spre' i lacci il foco  
 strai d'Amore Che spre' i lacci il foco strai d'Amore.

Simone Verovio, *Lodi della Musica* (1595)



# MEI and what it can do for T-Mus

Some books in EMO require us to encode mixed tablature/mensural notation

Aruspix exports mensural MEI with extra location data for individual symbols

We have an xml version of our TabCode for lute tablature

How can we exploit this?

# What T-Mus can do for MEI

We are working on an 'MEI-compliant' lute-tablature encoding schema which is more general in application than our current 'TabCode' (which was designed for data-entry).

Could be extended to other tablatures – e.g. guitar (both historical and modern) and keyboard – with large and important repertoires.

# MEI, T-Mus and what we can do for each other

Some interesting issues which MEI doesn't really handle at present (as far as we can see):

*Ornament-signs*

*Fingerings*

*Instrument-identification/description*

# Ornament-signs

MEI just uses names like 'trill'; historical scores/tablatues use symbols

Alignment of ornament-symbols with names is interpretation, and different editors will disagree

There are 'standard' ways to perform ornaments (such as trills) in modern scores, but the same cannot be said for historical ornament-signs, such as those discussed at length in treatises such as C.P.E. Bach's 1753 *Versuch*

So reference to ornament-signs by name is not safe

# Ornament-signs

We cannot ‘describe’ a graphical symbol in text; we should point to an example using the established methods of Linked Data

An expert editor might also wish to point to a description of its performance at a discoverable URI

The decision to make that explicit link can be recorded as part of the provenance – maybe using TEI’s ‘responsibility’ tag (?)

There may indeed be several such ‘interpretative links’ for a particular symbol

# Fingerings

Fingerings are important for some instruments, notably piano and stringed instruments

Some composers give detailed fingerings for expression (Elgar)

They frequently occur in lute tablatures, so we devised a way to handle them which could be useful for MEI

Lute and (baroque) guitar tablatures also use signs for using right hand fingers for various kinds of strumming, as well as barré indications for the left hand

Linked Data URIs can give useful descriptions or interpretations of unusual fingering signs when they are encountered

# Instruments

Instrument descriptions in MEI just identify MIDI sounds for playback; they don't associate music with a particular instrument

This usually doesn't matter for standard orchestral instruments

In historical scores, instrumentation is often unspecified, underspecified or ambiguous.

Sometimes doesn't agree with the received understanding of what a named instrument is





# Gibson Tenor Lute TL4 (1924)



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Sometimes doesn't agree with the received understanding of what a named instrument is

Here an editor might wish to point to an external source of information

Again, Linked Data seems a sensible way around the issue



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