

The Making of the Digital Salzinnnes

Jennifer Bain
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Barbara Swanson

Colophon (Detail)

obuiam christo domino. Euouac. *Anno* .ss. ss. ss.

Ce liure fist faire Dame Julienne
de gymes prieuse de salines Jaudit
grande chantre de ce lieu. Priyes
dieu pour elle.

Colophon, 1555

- Che libure feist faire Dame Julienne de glymes prieuse de Salsines Jadit grande chantre de ce lieu. Pryes dieu pour elle.
- [Lady Julienne de Glymes, Prioress of Salsines, formerly the cantrix of this place had this book made. Pray to God for her.]

The Abbey of Salzinnes



L'abbaye de Salzinnes au début du XVIII^e siècle
Anonyme. Huile sur toile. 109,5 x 99,5 cm.
Séminaire de Namur.

The Salzinnes Antiphonal

The Patrick Power Library, Saint Mary's University, Halifax



Archbishop William Walsh



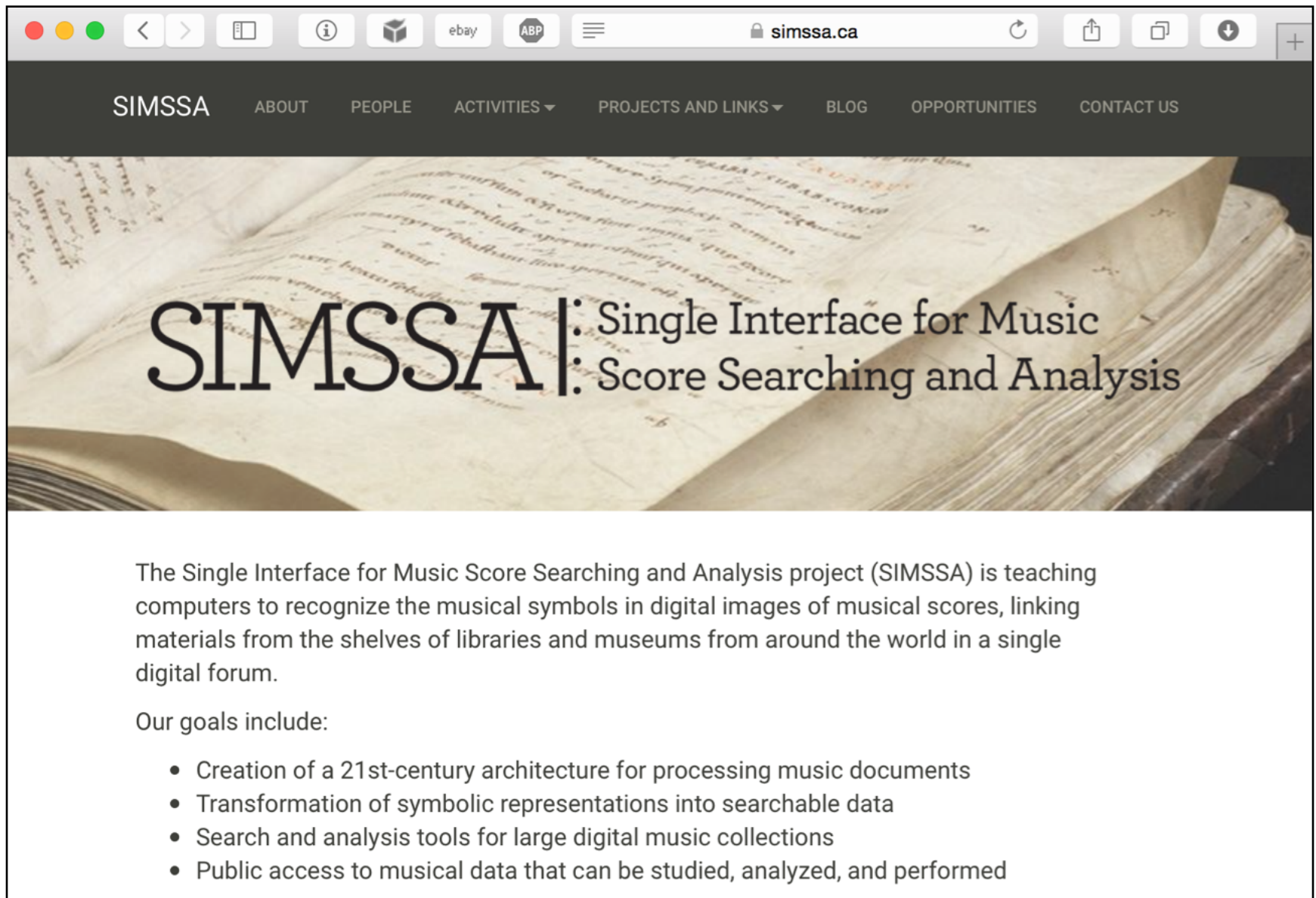
Cantus Ultimus

- Ichiro Fujinaga, McGill
- Jennifer Bain, Dalhousie
- Julie Cumming, McGill
- Elsa De Luca, University of Bristol
- Debra Lacoste, University of Waterloo
- Andrew Hankinson, McGill
- Alessandra Igniesti, McGill
- Kate Helsen, University of Western Ontario
- Jan Kolářček, Charles University
- Barbara Swanson, Dalhousie

CANTUS.SIMSSA.CA



SIMSSA.CA



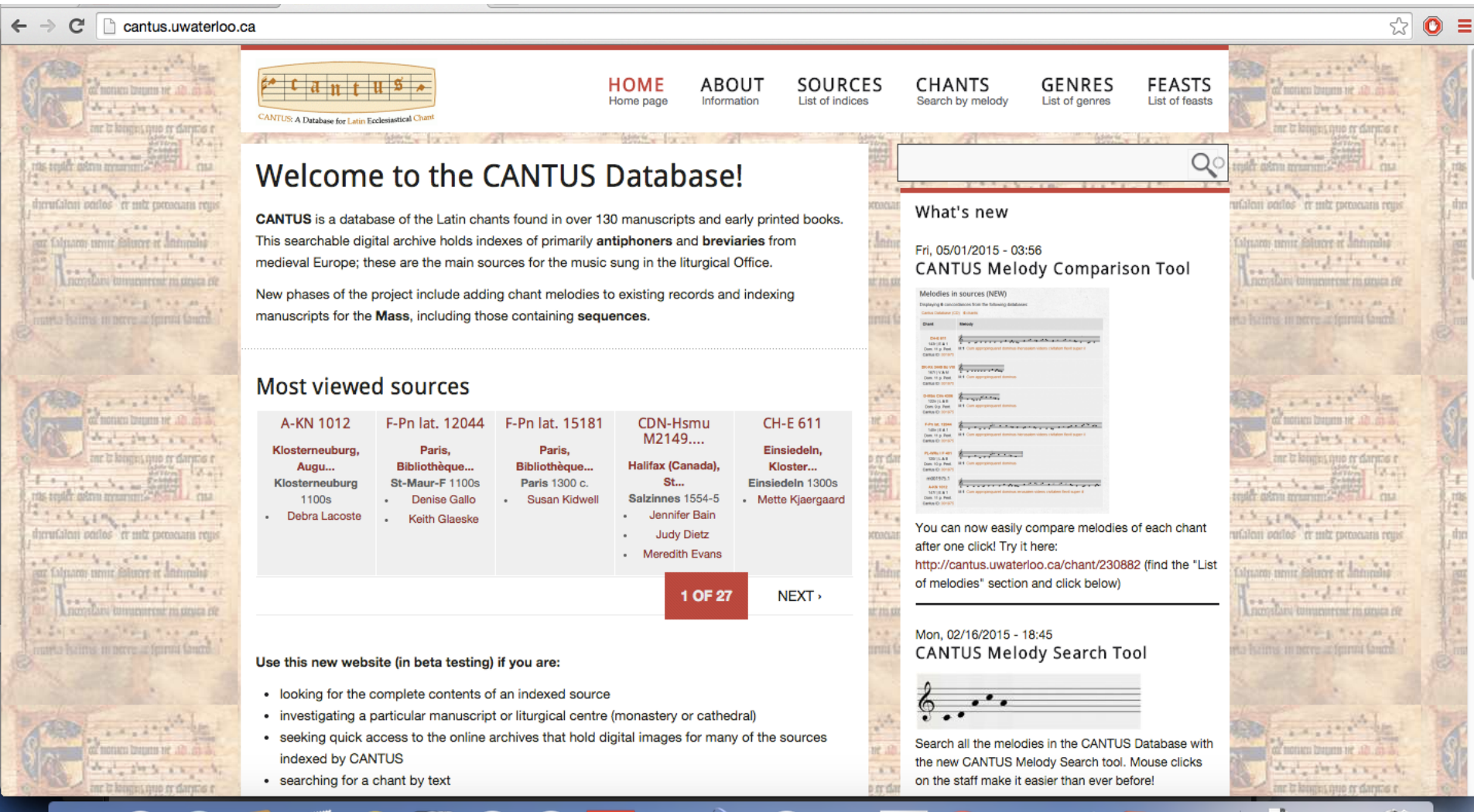
The SIMSSA.CA website is displayed in a browser window. The address bar shows the URL simssa.ca. The navigation menu includes links to SIMSSA, ABOUT, PEOPLE, ACTIVITIES, PROJECTS AND LINKS, BLOG, OPPORTUNITIES, and CONTACT US. The main banner features a background image of an open manuscript with the text "SIMSSA | Single Interface for Music Score Searching and Analysis".

The Single Interface for Music Score Searching and Analysis project (SIMSSA) is teaching computers to recognize the musical symbols in digital images of musical scores, linking materials from the shelves of libraries and museums from around the world in a single digital forum.

Our goals include:

- Creation of a 21st-century architecture for processing music documents
- Transformation of symbolic representations into searchable data
- Search and analysis tools for large digital music collections
- Public access to musical data that can be studied, analyzed, and performed

CANTUS Database



liber.simssa.ca: neume search

liber.simssa.ca/#type=neumes&query=podatus clivis clivis&result=1&p=124

Search the Liber Usualis

What is this? [Find out more about what we are trying to do.](#)

podatus clivis clivis Neumes Search Clear

previous Result 1 of 814 for podatus clivis clivis next

Go to page Go
Current page: 124 of 2340

12 The Asperges.

IN PASCHAL TIME
i. e. from Easter Sunday till Whitsun inclusive.

Ant. Idi áquam * egre- di- éntem de tém-plo, x. c.

a lá- te-re déx- tro, alle- lú- ia : et ómnes, ad

CANTUS Database index of Salzannes Antiphonal

← → ↻ cantus.uwaterloo.ca/index?source=123723

CANTUS Manuscript Index: Halifax (Canada), St. Mary's University - Patrick Power Library, M2149.L4 1554

The source index contains 2932 chants.

Siglum	Marg	Folio	Seq	Feast	Office	Genre	Pos	Incipit	Cantus ID	Mode	Diff	Concordances
CDN-Hsmu M2149.L4		001r	1	Dom. 1 Adventus	V	A		Custodit dominus*	002085	*		E H S
CDN-Hsmu M2149.L4		001r	2	Dom. 1 Adventus	V	R		Missus est Gabriel*	007170	*		GBEMVHRDFS
CDN-Hsmu M2149.L4		001r	3	Dom. 1 Adventus	V	W		Rorate caeli desuper et nubes	008188	*		CGBEMVHR FSL
CDN-Hsmu M2149.L4		001r	4	Dom. 1 Adventus	V	A	M	Ecce nomen domini venit de	002527	1	G1	CGBEMVHR FS
CDN-Hsmu M2149.L4		001r	5	Dom. 1 Adventus	C	H	01	Quem terra pontus aethera colunt	008375			B SL
CDN-Hsmu M2149.L4		001r	6	Dom. 1 Adventus	C	H	02	Cui luna sol et sidera	008375a			B SL
CDN-Hsmu M2149.L4		001r	7	Dom. 1 Adventus	C	H	03	Beata mater munere cuius supremus	008375c			B SL
CDN-Hsmu M2149.L4		001v	1	Dom. 1 Adventus	C	H	04	Beata caeli nuntio fecunda sancto	008375d			B SL
CDN-Hsmu M2149.L4		001v	2	Dom. 1 Adventus	C	H	05	Laus honor virtus gloria deo	008375i			B SL
CDN-Hsmu M2149.L4		001v	3	Dom. 1 Adventus	M	I		Ecce venit rex occurramus obviam	001074	4T	NE	CGBEMVHRDFS
CDN-Hsmu M2149.L4		001v	4	Dom. 1 Adventus	M	A	1.1	Domine in virtute tua laetabitur	002349	8	G1	E H L
CDN-Hsmu M2149.L4		001v	5	Dom. 1 Adventus	M	W	1.	Ex Sion species decoris eius	008060	*		C BE VHRDFS
CDN-Hsmu M2149.L4		002r	1	Dom. 1 Adventus	M	R	1.1	Aspiciens a longe ecce video	006129	7		GBEMVHRDFS
CDN-Hsmu M2149.L4		002v	1	Dom. 1 Adventus	M	V	01	Quique terrigenae et filii hominum	006129a	7		GBEMVHRDFS
CDN-Hsmu M2149.L4		002v	2	Dom. 1 Adventus	M	V	02	Qui regis Israel intende qui	006129b	7		GBEMVHRDFS
CDN-Hsmu M2149.L4		002v	3	Dom. 1 Adventus	M	V	03	Excita domine potentiam tuam et	006129d	7		G DFS
CDN-Hsmu M2149.L4		002v	4	Hebd. Adventus	M	R	1.1	Aspiciens*	006129	*		GBEMVHRDFS
CDN-Hsmu M2149.L4		002v	5	Dom. 1 Adventus	M	R	1.2	Aspicebam in visu noctis et	006128	6		GBEMVHRDFS
CDN-Hsmu M2149.L4		003r	1	Dom. 1 Adventus	M	V	01	Potestas eius potestas aeterna quae	006128b	6		G V DFS
CDN-Hsmu M2149.L4		003r	2	Dom. 1 Adventus	M	R	1.3	Missus est Gabriel angelus ad	007170	7		GBEMVHRDFS
CDN-Hsmu M2149.L4		003r	3	Dom. 1 Adventus	M	V	01	Ave Maria gratia plena dominus	007170a	7		BEMVHRD
CDN-Hsmu M2149.L4		003v	1	Dom. 1 Adventus	M	R	1.4	Ave Maria gratia plena dominus	006157	7		GBEMVHRDFS
CDN-Hsmu M2149.L4		003v	2	Dom. 1 Adventus	M	V	01	Quomodo fiet istud quoniam virum	006157a	7		G E V DFS
CDN-Hsmu M2149.L4		003v	3	Dom. 1 Adventus	M	A	2.	Dominus defensor*	002404	*		E VH SL
CDN-Hsmu M2149.L4		003v	4	Dom. 1 Adventus	M	W	2.	Egredietur dominus de loco sancto	008043	*		C BE VHRDFS
CDN-Hsmu M2149.L4		003v	5	Dom. 1 Adventus	M	R	2.1	Salvatorem expectamus dominum Jesum Christum	007562	3		GBEMVHRDFS
CDN-Hsmu M2149.L4		004r	1	Dom. 1 Adventus	M	V	01	Sobrie et iuste et pie	007562b	3		G V DFS
CDN-Hsmu M2149.L4		004r	2	Dom. 1 Adventus	M	R	2.2	Audite verbum domini gentes et	006149	3		GBEMVHRDFS
CDN-Hsmu M2149.L4		004r	3	Dom. 1 Adventus	M	V	01	Annuntiate et auditum facite loquimini	006149b	3		G V DFS
CDN-Hsmu M2149.L4		004r	4	Dom. 1 Adventus	M	R	2.3	Ecce virgo concipiet et pariet	006620	3		GBEMVHRDFS
CDN-Hsmu M2149.L4		004v	1	Dom. 1 Adventus	M	V	01	Super solum David et super	006620b	3		G V DFS
CDN-Hsmu M2149.L4		004v	2	Dom. 1 Adventus	M	R	2.4	Obsecro domine mitte quem missurus	007305	5		GBEMVHRDFS
CDN-Hsmu M2149.L4		004v	3	Dom. 1 Adventus	M	V	01	Memento nostri domine in beneplacito	007305zc	5		
CDN-Hsmu M2149.L4		004v	4	Dom. 1 Adventus	M	A	3.	Alleluia*		8	G1	
CDN-Hsmu M2149.L4		004v	5	Dom. 1 Adventus	M	W	3.	Egredietur virga de radice Jesse	008044	*		C E VHRDFS
CDN-Hsmu M2149.L4		005r	1	Dom. 1 Adventus	M	R	3.1	Laetentur caeli et exsultet terra	007068	2		GBEMVHRDFS
CDN-Hsmu M2149.L4		005r	2	Dom. 1 Adventus	M	V	01	Ecce dominator dominus cum virtute	007068a	2		GBEMVHRD
CDN-Hsmu M2149.L4		005r	3	Dom. 1 Adventus	M	R	3.2	Alieni non transibunt per Jerusalem	006066	8		EMV RDFS
CDN-Hsmu M2149.L4		005r	4	Dom. 1 Adventus	M	V	01	Ego veniam dicit dominus et	006066a	8		V RDF
CDN-Hsmu M2149.L4		005v	1	Dom. 1 Adventus	M	R	3.3	Montes Israel ramos vestros expandite	007177	1T		BEMV RDFS
CDN-Hsmu M2149.L4		005v	2	Dom. 1 Adventus	M	V	01	Rorate caeli desuper et nubes	007177a	1T		BEMV RDFS
CDN-Hsmu M2149.L4		005v	3	Dom. 1 Adventus	M	R	3.4	Confortamini manus fatigatae et genua	006321	1T		E V RDFS

Salzinnes Antiphonal: old interface

Salzinnes Antiphonal (CDN-Hsmu M2149.L4)

485 1st Sunday of Advent (001r)

Toggle grid Control zoom Previous/Next Go to folio/page Go to feast

Link Info

Huberte

Found 1 results.

198r: O **Huberte** dedicatam aulam a te primitus tuae quoque subarratam sepulturae dotibus et corpore ()

De sancto Huberto Episcopo. Antiphona

O huberte dedicatam aulam a te primitus tue quoque subarratam sepulture dotibus et corpore consecratam serva tuis precibus atque plebem congregatam hic in tuis laudibus.

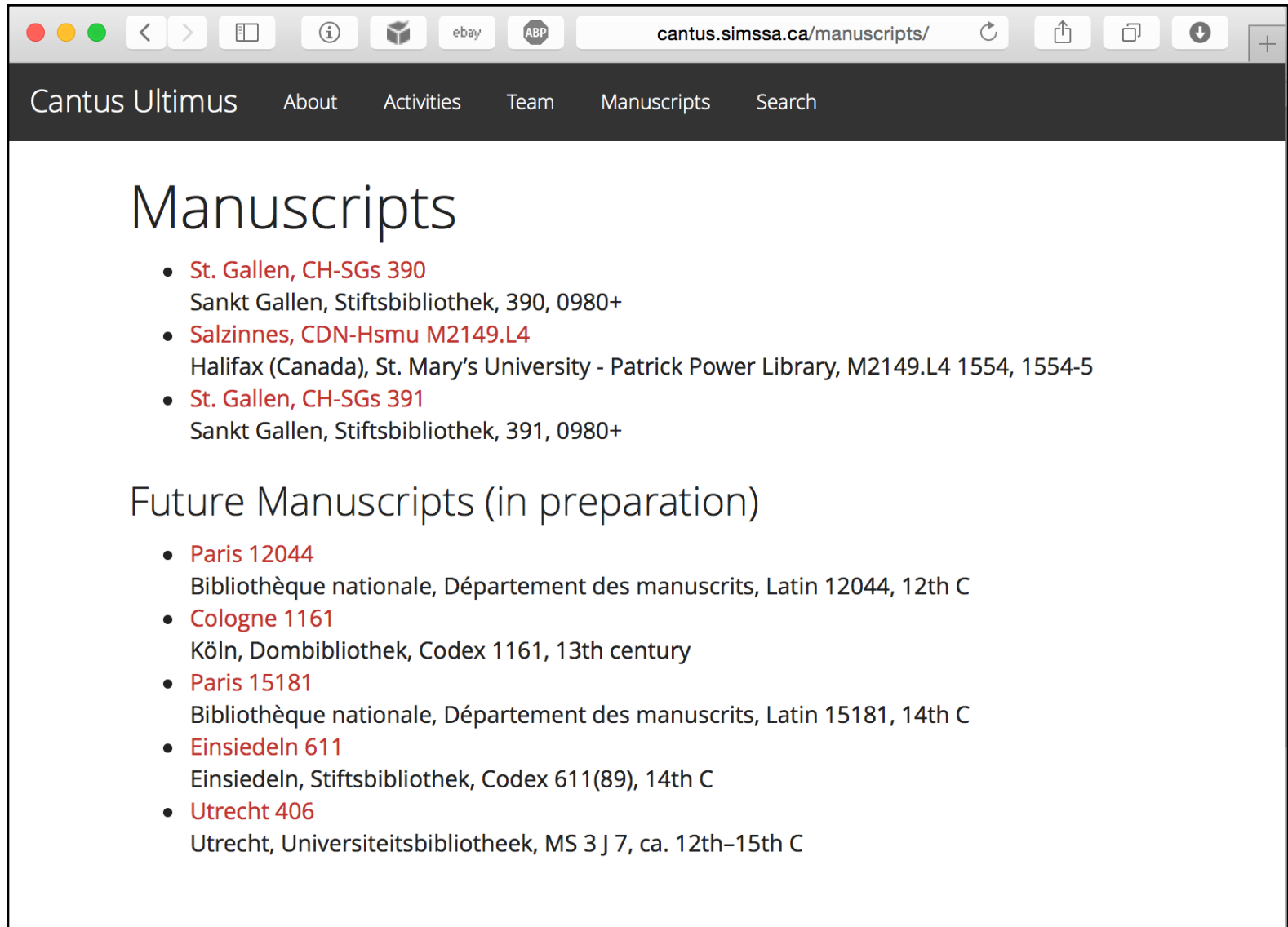
Magt. Enouac. Benedicta sis mater creatoris omnium que huberto tuum prestat hodie palatium cuius virtus et potestas non habet initium in qua nulla sit egestas sed ubertas omnium.

Folio: 198r
Feasts on this folio:

▼ O Huberte dedicatam aulam a

- Mode: Mode 7
- Office: First Vespers
- Genre: Antiphon
- Liturgical Position: Antiphon for the Magnificat
- Standard Text: O Huberte dedicatam aulam a te primitus tuae quoque subarratam sepulturae dotibus et corpore consecratam serva tuis precibus atque plebem congregatam hic in tuis laudibus
- Manuscript Text: O huberte dedicatam aulam a te primitus tue quoque subarratam sepulture dotibus et corpore consecratam serva tuis precibus atque plebem congregatam hic in tuis laudibus
- Feast Name: Huberti ()
- CAO Number: slz0229

New Cantus Ultimus interface



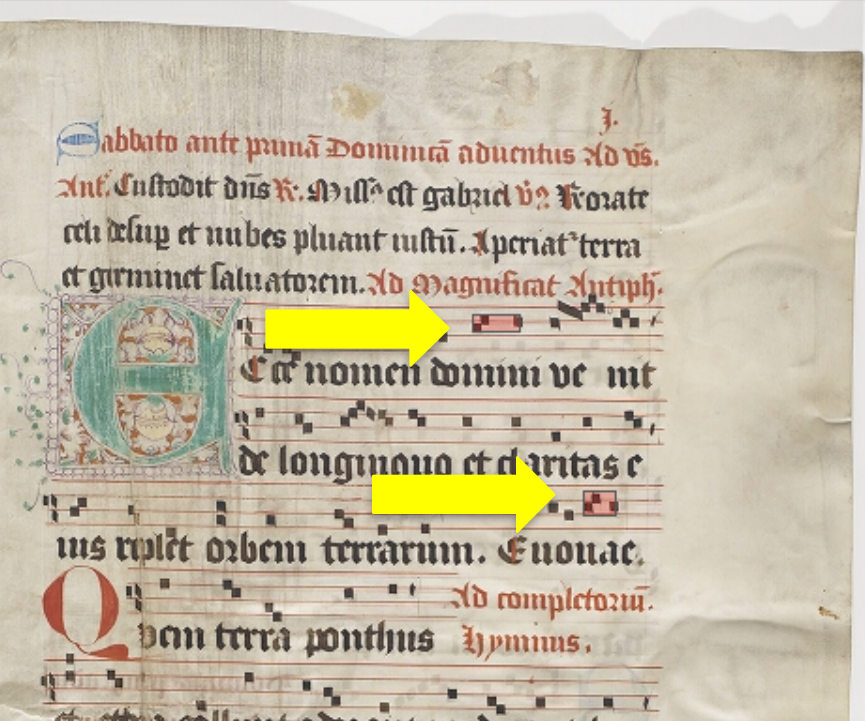
Salzinnes: neume search in images

Browser tabs: Jennifer Bain - Outlook We, Search the Liber Usualis, Salzinnes Antiphonal (CDN, Cantus Ultimus

Address bar: cantus.simssa.ca/manuscript/133/?folio=001r

Cantus Ultimus Manuscripts Search

Zoom level: 2 Page 1 of 479 Go



Halifax (Canada), St. Mary's University - Patrick Power Library, M2149.L4 1554

Folio Manuscript Details

Search Manuscript

Neumes: podatus punctum

Search

246 results found for query "neumes:podatus punctum"

« 1 2 3 4 5 6 7

Challenge 1: Displaying images

- Original images from Judith Dietz
- New digital images from the Canadian Conservation Institute (CCI) in 2012
- 6993 × 4414 pixels, uncompressed TIFF
- 479 page images
- 175 megabytes for each image, 80 gigabytes total

Salzinnes Antiphonal (CDN x)

Cantus Ultimus — Halifax (x)

← → ↺

salzinnes.simssa.ca

Salzinnes Antiphonal (CDN-Hsmu M2149.L4)

Toggle grid

Control zoom

↑

↓

Previous/Next

485

1st Sunday of Advent (001r)

Go to folio/page

Go to feast

Q

◀ ▶

Spiciamus
a long
tem vi
deo de
i potentiam veniunt tem et
nebu lam totam terram te
gen tem. 3 te ob man e
et dia te. 2 uncta no
bis si tu es ipse 2 in reg
natus es in populo israh.



Zoom level: 2

Folio 002r (3 of 479)

Go



Document image viewing: Diva.js

- Large image document viewer
- Users do not have to wait to download large image files; “instant-on” high-resolution document viewing
- Open source, available free for libraries and archives

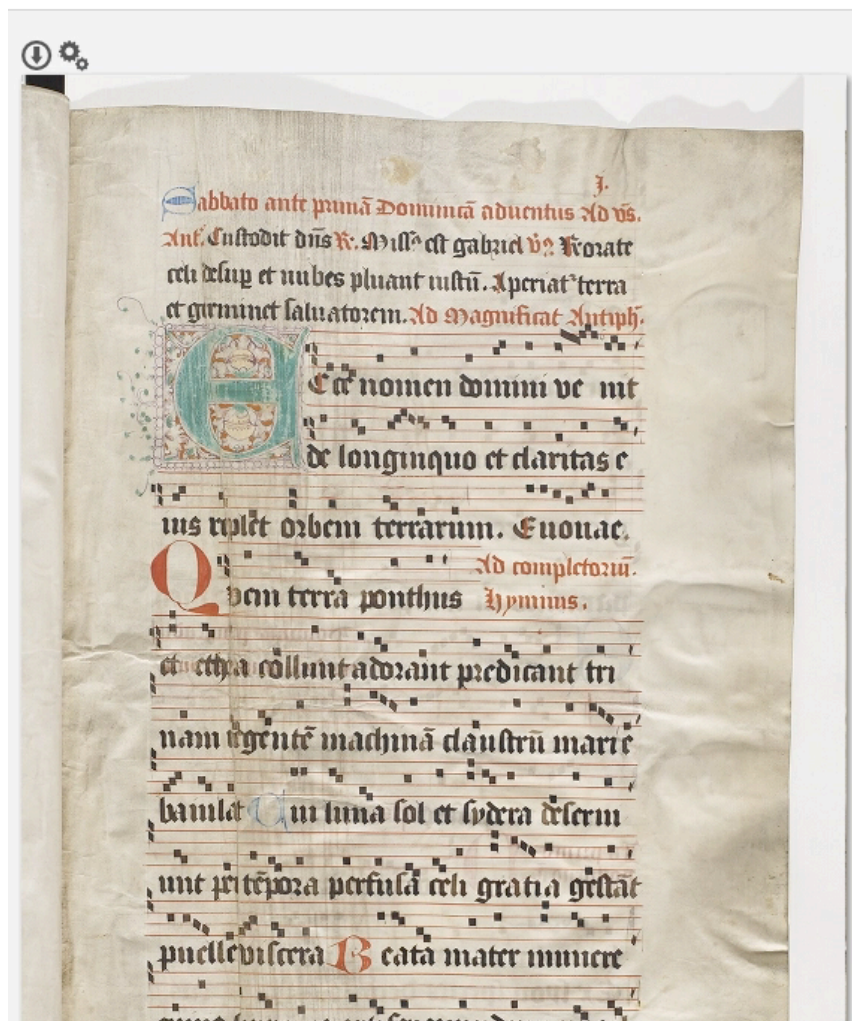
Challenge 2: Metadata in Context

- Metadata from 2,932 chants supplied by the Cantus Database project
- Expansion of Cantus cataloguing data:
“I” → “Invitatory antiphon”
- Search the metadata

Challenge 2: Metadata in Context

- Presents chant information in sync with page images
- Problem: How to store & retrieve lots of data very quickly
- Solution: Solr, a very fast search engine system

Zoom level: 2 Folio 001r (1 of 479) Go



Salzinnes, CDN-Hsmu M2149.L4

Folio

Search Manuscript

Folio 001r

Previous Folio

Next Folio

Chants

Custodit dominus*

Missus est Gabriel*

Rorate caeli desuper et nubes

Ecce nomen domini venit de

Quem terra pontus aethera colunt

Cui luna sol et sidera

Beata mater munere cujus supernus

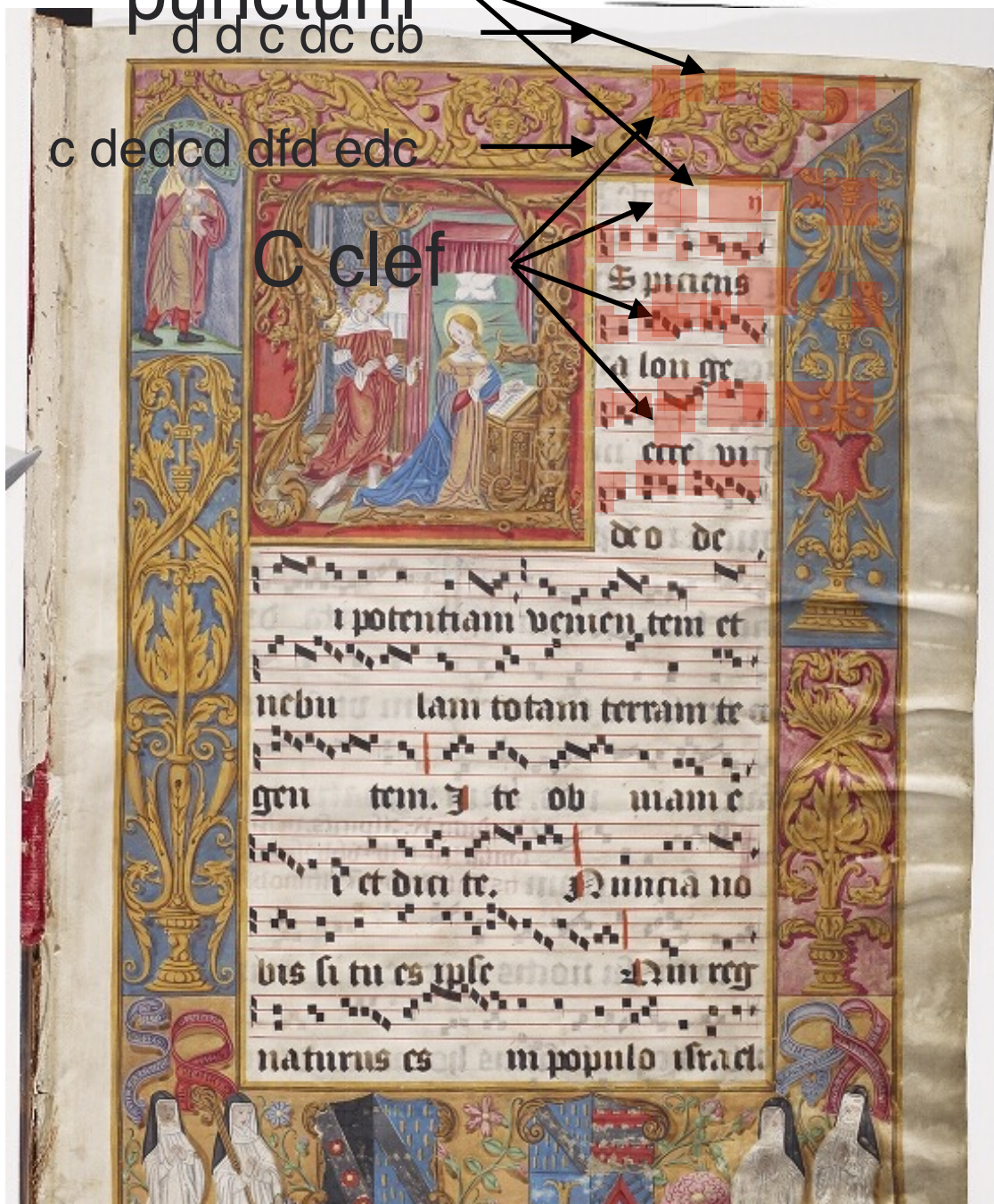
Challenge 3: Optical music recognition

- OMR is a set of processes for converting digital images to encoded music notation
- No “off-the-shelf” software for OMR of 16th-century Belgian MSS
- Developed software for building bespoke OMR systems

punctum
d d c dc cb

c dedcd dfd edc

C clef



Greyscale

Binarization

Border

Removal

Lyric Removal

Staff Removal

Shape

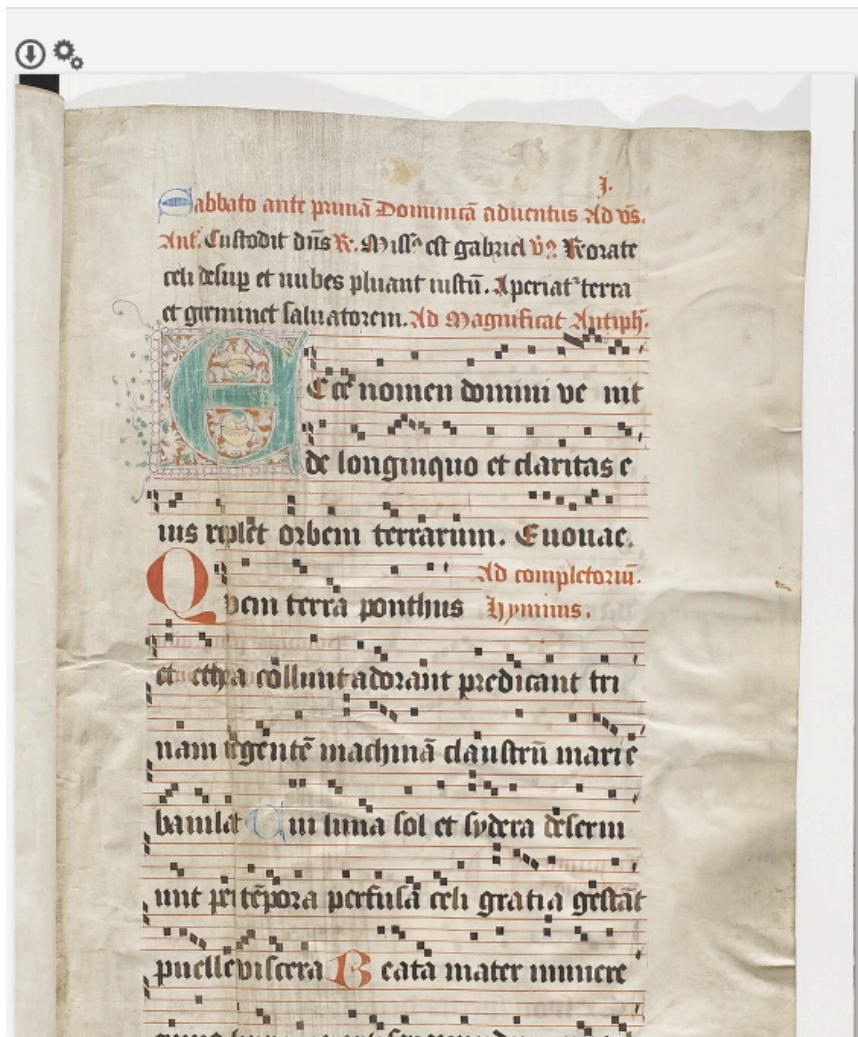
Classification

Music

Reconstruction

Shape/Image
Alignment

— + Zoom level: 2 Folio 001r (1 of 479) Go



Salzinnes, CDN-Hsmu M2149.L4

Folio

Search Manuscript

Folio 001r

Previous Folio

Next Folio

Chants

Custodit dominus*

Missus est Gabriel*

Rorate caeli desuper et nubes

Ecce nomen domini venit de

Quem terra pontus aethera colunt

Cui luna sol et sidera

Beata mater munere cujus supernus

Accuracy

- All OMR-derived data is automatically extracted; no human correction.
- Using human-transcribed Volpiano to “correct” OMR results.
- Corrected OMR results can then be used to make OMR better.
- Searches work now, will get better with corrections.

Searching = Results are listed as you type

Cantus Ultimus

AboutActivitiesTeamManuscriptsSearch

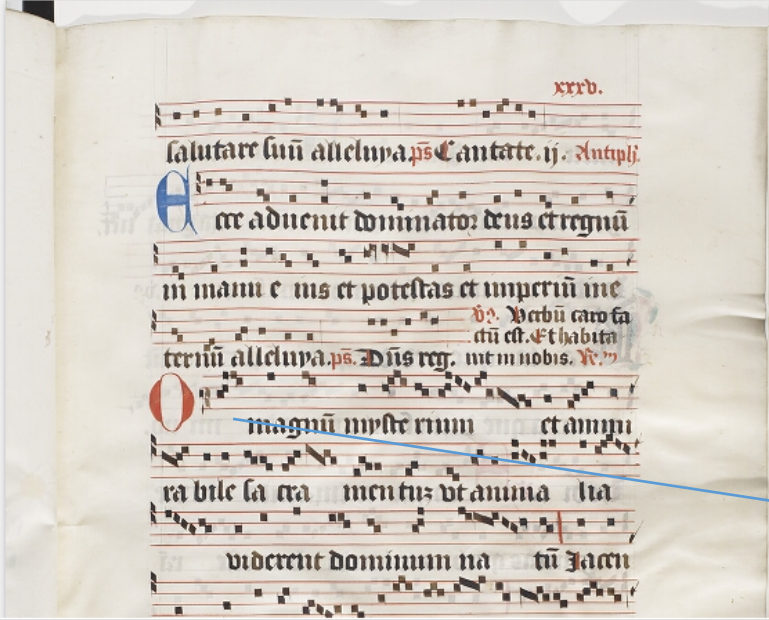
-

+

Zoom level: 2

Folio 035r (69 of 479)

Go



Salzannes, CDN-Hsmu M2149.L4

Folio

Search Manuscript

Search this Manuscript

Search

OMR Search

All Text Fields:

Query: magnum

Results:

Name	Mode	Folio	Genre
De Sion veniet qui regnaturus	1	021r	Antiphon
Dominus veniet occurrere illi dicentes	1	027v	Antiphon
O magnum mysterium et admirabile	3	035r	Responsory
Angelus ad pastores ait annuntio	7	041r	Responsory
Angelus ad pastores ait annuntio	7	041v	Antiphon

“Folio” view

Cantus Ultimus

AboutActivitiesTeamManuscriptsSearch

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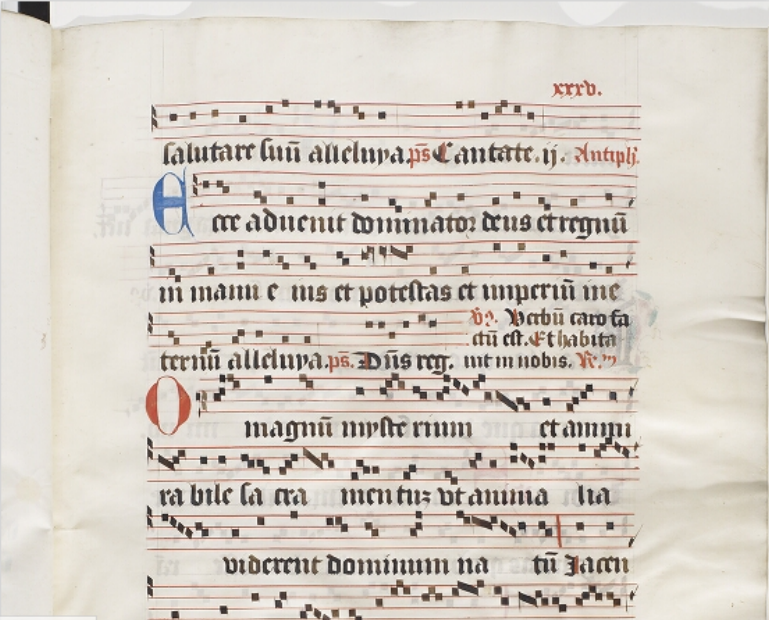
Zoom level: 2

Folio 035r (69 of 479)

Go







Folio

Search Manuscript

Folio 035r

Previous Folio

Next Folio

Chants

Ecce advenit dominator deus et

Verbum caro factum est

O magnum mysterium et admirabile

Sequence: 3

Feast: Nativitas Domini

Office: Matins

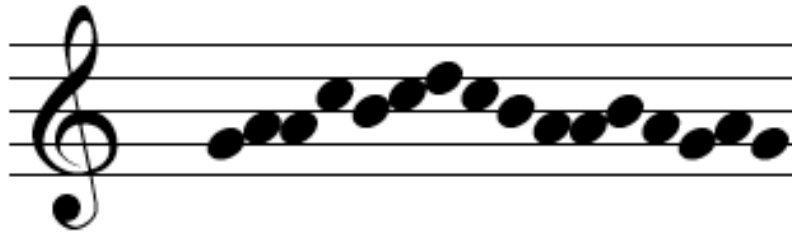
Genre: Responsory

Mode: 3

Full Text

Melody Search

- Volpiano font = 1--ghhkjklkjhhjhghg =



(gaacbcdcbaabagag)

Volpiano search

Cantus Ultimus

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Search

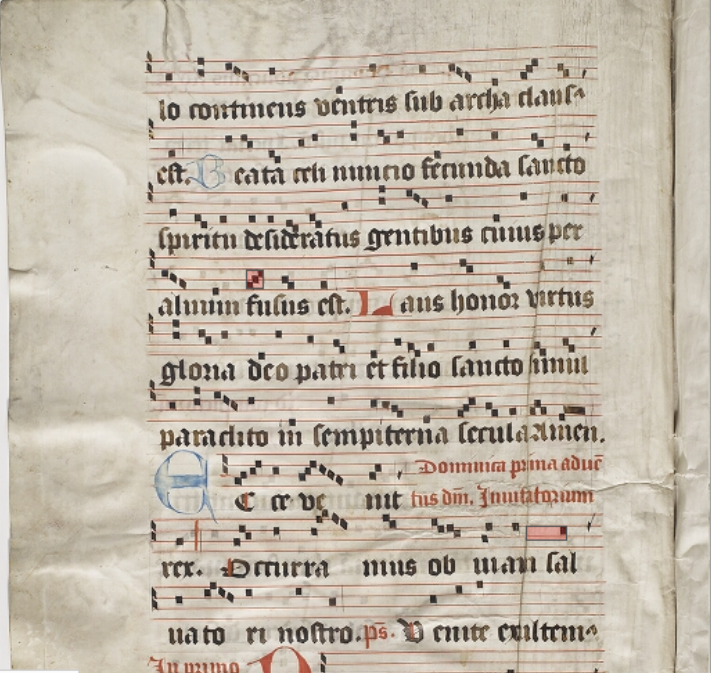
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Zoom level: 2

Folio 001v (2 of 479)

Go



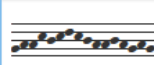
lo continens venter sub archa clausus
est. Beata et nuncio secunda sancto
spiritu desideratus gentibus cuius per
alium filius est. Laus honor virtus
gloria deo patri et filio sancto simul
paradiso in sempiterna secula amen.
Domina prima aduc
Et venit sus dñi. Inuitatum
rex. Occurramus ob uiam sal
uato ri nostro. ps. Venite exultem
In primo

Salzannes, CDN-Hsmu M2149.L4

Folio

Search Manuscript

Volpiano:



Query: ghkhjklkjhhjhghg

Results: 69

Name	Mode	Folio	Genre
Ego veniam dicit dominus et	8	005r	Responsory Verse
			
Dabo in Sion salutem et	8	010v	Responsory Verse
			

The same search with “pitch” letters

Cantus Ultimus

AboutActivitiesTeamManuscriptsSearch

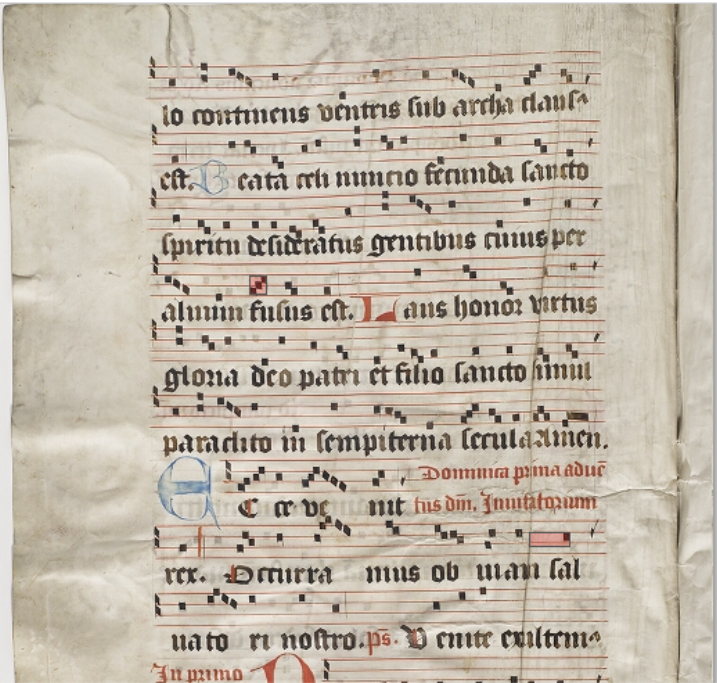
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Zoom level: 2

Folio 001v (2 of 479)

Go



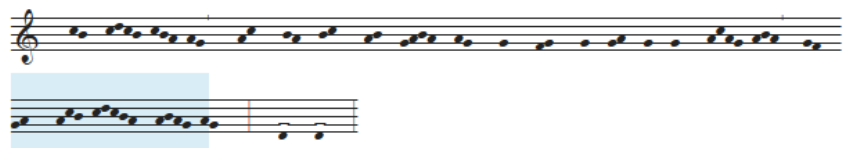
Salzannes, CDN-Hsmu M2149.L4

Folio

Search Manuscript

Query: gaacbcdcbabaga

Results: 69

Name	Mode	Folio	Genre
Ego veniam dicit dominus et	8	005r	Responsory Verse
			
Dabo in Sion salutem et	8	010v	Responsory Verse
			

OMR search for “cdcbaabaga”

Cantus Ultimus

AboutActivitiesTeamManuscriptsSearch

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Zoom level: 2

Folio 064r (131 of 479)

Go

Salzannes, CDN-Hsmu M2149.L4

Folio

Search Manuscript

Search this Manuscript

Search

OMR Search

Pitch:

▼

cdcbaabaga

Search

Pitch search

3 results found for query "cdcbaabaga"

«

1

2

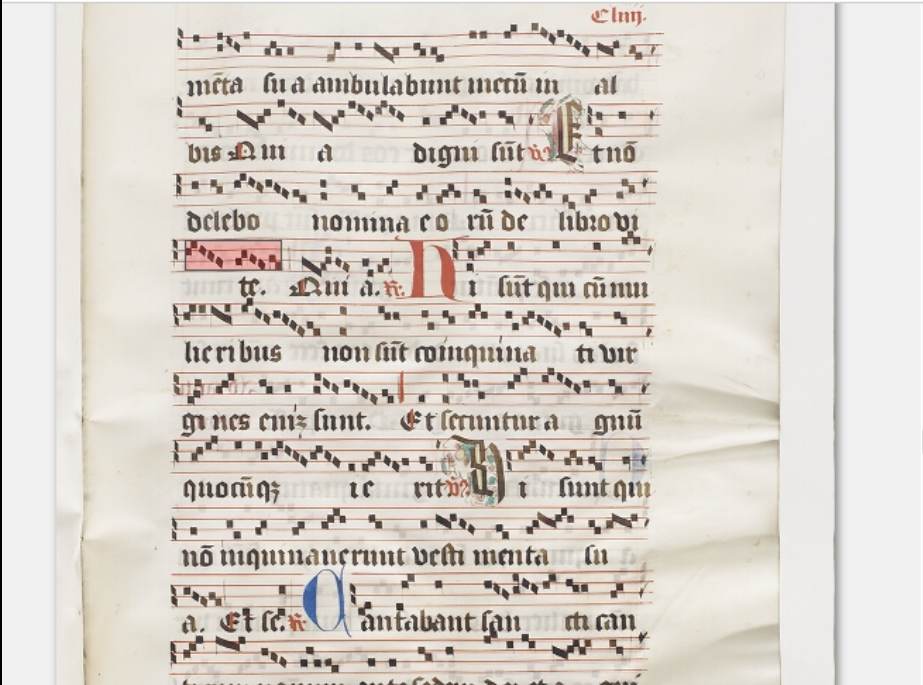
3

»

OMR Search Results in Mode 8 Verse-Tone

Cantus Ultimus About Activities Team Manuscripts Search

Zoom level: 2 Folio 154r (312 of 479) Go   



Salzannes, CDN-Hsmu M2149.L4

Folio Search Manuscript

Search this Manuscript

Search OMR Search

Pitch:  cdcbaabaga Search

Pitch search

3 results found for query "cdcbaabaga"

« 1 2 **3** »

Shorter Search String for OMR Data

Cantus Ultimus About Activities Team Manuscripts Search

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Zoom level: 2

Folio 025v (50 of 479) Go   

Salzinnes, CDN-Hsmu M2149.L4

Folio Search Manuscript

Search this Manuscript

Search

OMR Search

Pitch: 

abagag

Search

Pitch search

62 results found for query "abagag"

«

3

4

5

6

7

8

9

10

11

»

Back to “Folio” view

Cantus Ultimus

About Activities Team Manuscripts Search

-

+

Zoom level: 2

Folio 025v (50 of 479)

Go

Salzinnes, CDN-Hsmu M2149.L4

Folio

Search Manuscript

Folio 025v

Previous Folio

Next Folio

Chants

Juravi dicit dominus ut ultra

Juxta est salus mea ut

Sequence: 2

Feast: Dom. 4 Adventus

Office: Matins

Genre: Responsory Verse

Mode: 8

Full Text

juxta est salus mea ut veniat et iusticia mea ut reveletur | Et testamentum

OMR – Neume Search

Cantus Ultimus About Activities Team Manuscripts Search

- + Zoom level: 2
Folio 003r (5 of 479) Go

CCI # 90765 - B/T
QA L-2 V



Salzinnes, CDN-Hsmu M2149.L4

Folio Search Manuscript

Search this Manuscript

Neume: podatus podatus podatus

Neume search

65 results found for query "podatus podatus podatus"

«
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OMR – Neume search

Cantus Ultimus

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Search

– +

Zoom level: 2

Folio 001r (1 of 479)

Go

Salzinnes, CDN-Hsmu M2149.L4

Folio

Search Manuscript

Search this Manuscript

Search

OMR Search

Neume:

▼

podatus

Search

Neume search

12487 results found for query "podatus"

«

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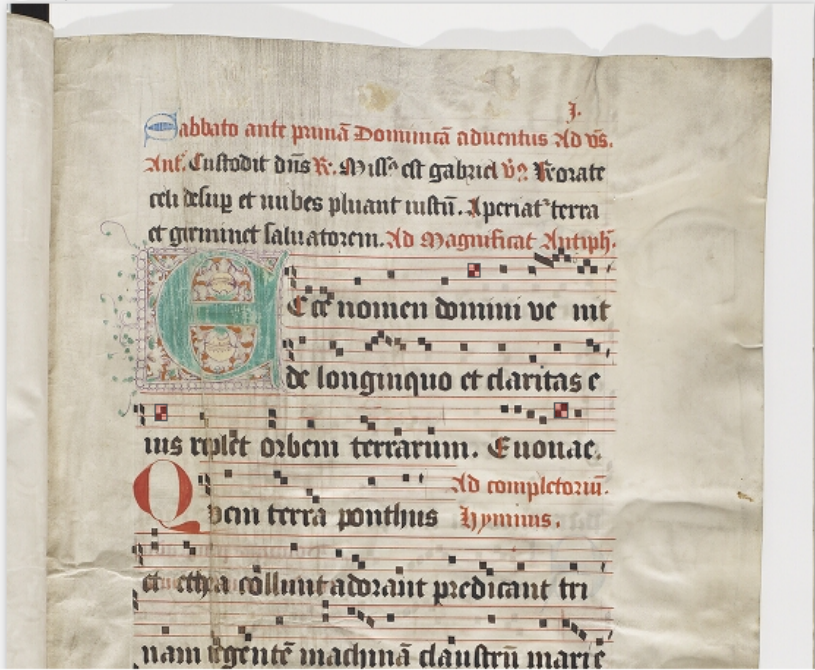
6

7

8

9

»



abbato ante primā Dominā aduentus Ad vs.
Ant. Custodit dñs R. Mill. et gabriel v. Forate
celi desup et nubes pluant iustū. Aperiat terra
et germinet saluatorem. Ad magnificat Antiph.
Et nomen domini ve nit
de longinquo et claritas e
ius replēt orbem terrarum. Euonac.
Quem terra pontus Ad completorium.
Hymnus.
et cetera collunt adorant predicant tri
nam gentē machinā claustrū marie

“Human” Cantus vs. “Machine” Cantus?



2 manual passes through
each manuscript: creation
and proofreading/editing



1 manual
pass:
proofreading/
editing

= time saved!

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