

2 Representing a Medieval Repertory and its Sources: The Music of Hildegard von Bingen

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Abstract

The music of the twelfth-century nun Hildegard von Bingen has been the subject of extensive scholarly research in recent decades, but the repertory remains puzzling in several respects, and recently discovered additions to it further complicate some issues. Yet some questions might be more readily answered with quantitative results than with customary qualitative approaches. Since Hildegard's *oeuvre* constitutes the only twelfth-century repertory which is fully accessible today, its systematic study offers an opportunity not only to probe these questions but to establish a methodology suited to related repertories. Our preliminary approach has been to develop a scheme for encoding the music of Hildegard for later processing with the *Humdrum Toolkit*.

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The music of the German Benedictine abbess and visionary Hildegard von Bingen (1098-1179) has been the subject of several musicological studies during this century. The writings of some German scholars between 1920 and 1930 (Bronarski 1922), the activities of the sisters at Eibingen monastery in the 1950s and 1960s and Marianne Pfau's doctoral thesis of 1990 (Pfau 1990) mark some of the stations of the work done in the past.

Whereas the earlier studies judged Hildegard almost exclusively against the background of traditional chant repertoire, Pfau's work for the first time tried to understand Hildegard's music both from a standpoint situated within her work and also considered against the broader context of twelfth-century music, as far as that was possible ten years ago. Her analyses concentrated on the relationship between text and music and on the choice of modes which characterize this very special music of Hildegard.

For the celebration of Hildegard's 900th anniversary in 1998, a need was felt in the scholarly community to look even more closely at Hildegard's musical work, which still remains somewhat puzzling. This led to an International Musicological Congress on Hildegard von Bingen in the city of Bingen, Germany in September 1998.

The Congress, prepared for nearly a year by an international group of scholars from all over the world and organized by the Institute of Musicology at the University of Basel, primarily saw the deconstruction of established ideas and modern myths that have surrounded Hildegard's work not only in the popular perception but also in the realm of scholarly research. The work done at Bingen mainly focused on Hildegard's musical and historical context within the twelfth century. It also considered the relationship between text and music, and debated the feasibility or impossibility of approaching the complex connections between words and music in Hildegard.¹

The Congress in effect charted out a new research agenda, made possible in part by the identification of new manuscript sources that furnish a more clearly defined context for Hildegard, and made clear that well-established approaches to more mainstream twelfth-century repertoires are highly unlikely to yield good results for this special repertory.

¹ Some of the major findings of this Congress, including my own, were presented at the International Congress on Medieval Studies, Kalamazoo 2000; a report of the Bingen Congress with detailed studies is slated to appear in 2001. I wish to thank all my colleagues in Basel and Bingen for their very fruitful suggestions and vivid discussions of my work.

2.1 Hildegard in the Computer?

During the work described above it became evident that several questions concerning Hildegard's music would benefit from computer-assisted research. Typically this is true for questions of a quantitative nature for which answers could be found manually only in a rather tedious way. Beside the computer's ability to accomplish such work very fast and probably with more accuracy, there is always a potential for detecting new facts and unexpected relations among them easily overlooked otherwise.

In recent years there have been several approaches to computer-assisted research in medieval music, each one pursuing different goals and using different strategies and kinds of encodings (Binford-Walsh 1991, Haas 1992, Haas 1997, and for an overview: Selfridge-Field 1990). The questions under consideration in these studies in most cases are similar to the research tasks concerning Hildegard's music, including the relationship between words and music or between words and neume types, and the recognition of patterns and scribal practices, to name but a few.

Hildegard differs in that she is the only known composer of the twelfth century of whom probably the entire musical output is known today. In fact, the efforts of the Congress community to find a transmission of Hildegard's compositions outside the two main codices, Dendermonde (D) and the so called "Riesencodex" (R) in Wiesbaden, failed.² It seems that her compositions were not even preserved in the monasteries closely related to her, and it is unlikely that new compositions will still be found.

The fact, I would propose, that the material under consideration stems not from an anonymous source but has a finite extension, makes this repertory highly suitable for computer-assisted analytical research. In other monophonic repertories irritating questions frequently arise with regard to the representative nature of our observations for a whole corpus. For the Hildegard corpus, such questions can be answered with greater reliability.

The disadvantage here is the restriction of possible findings to a very special and evidently extremely isolated repertory. The more contemporary source materials we consult for purposes of comparison, the clearer it becomes that this music indeed differs in almost every aspect from other music of the twelfth century. But in turn, this observation will further our understanding of non-Hildegard twelfth-century music.

² Some individual items of Hildegard's music do exist in additional manuscripts. All sources are related to the Rupertsberg scriptorium.

2.2 Project Goals

In order to explore the possibilities of computer-assisted musical research, a project was launched at the Department of Computer Sciences at Tübingen University (Prof. R. Loos) during Fall 1999, encoding Hildegard's music for the purpose of facilitating analysis of this repertory.

As always, "the best choices for encoding methods must be made with due regard for both the nature of the original material and the purposes for which the machine-readable code will be used" (Selfridge-Field 1990, 23). This concerns the choice of information and the extent of encoding. Since computer programs are always models of facts and reality, it is important to influence the modeling from the beginning by selecting which facts should be represented in what way.

As a general guideline, we determined that as much as possible of the original manuscript notation and the information provided therein should be reflected in the encoding. We then presented the project to the scholars of the Bingen conference and invited them to formulate their expectations of a database of Hildegard's music.

It became clear that, generally, the encoding should preserve the source notation with respect to neume types and pitches, that it should allow searches for relations between words and music as well as for textual and musical patterns, and that it should facilitate comparison of variants in the manuscripts. Very specific questions, however, require a highly flexible tool.

Objections were also raised, questioning whether the potential results would be worth the amount of time needed for encoding, especially in the case of such a very special repertory. We included this among the questions to be answered by a pilot study of a subgroup of Hildegard's music, e.g. the C-mode compositions.

We chose the *Humdrum Toolkit* as our encoding language rather than DARMS, which has been the language of choice in many studies since the 1960s. The strengths of David Huron's *Humdrum Toolkit* are well known and documented today. It seems very suitable for the task of encoding a special repertory such as Hildegard's because its structure is open enough to allow representation of different and specialized musical information. Its power clearly derives from the fact that the user is not limited to only

one way of representing music; several kinds of representation can be employed concurrently, in order to focus on various points of the same musical information. Therefore, the toolkit has become a preferred choice in the scholarly community during the last years.

The weaknesses of *Humdrum* have been clearly recognized by the scholars too. They concern the rudimentary representation of layout-related information and the complexity of its command-line interface, which requires a substantial knowledge of Unix tools by the user. Without familiarity with Unix, it is impossible to see in actual notation the contents of the database and what results the queries will yield. This clearly demands development and design of user interfaces for *Humdrum* which will allow easier access to the toolkit (Kornstädt 1995/96). In the meantime musicological questions will have to be translated by a Unix-proficient user, and a tool for translation into actual notation will be developed at a later stage of this project. The first aim is the creation and accumulation of a database for Hildegard's music as presented in the manuscripts.

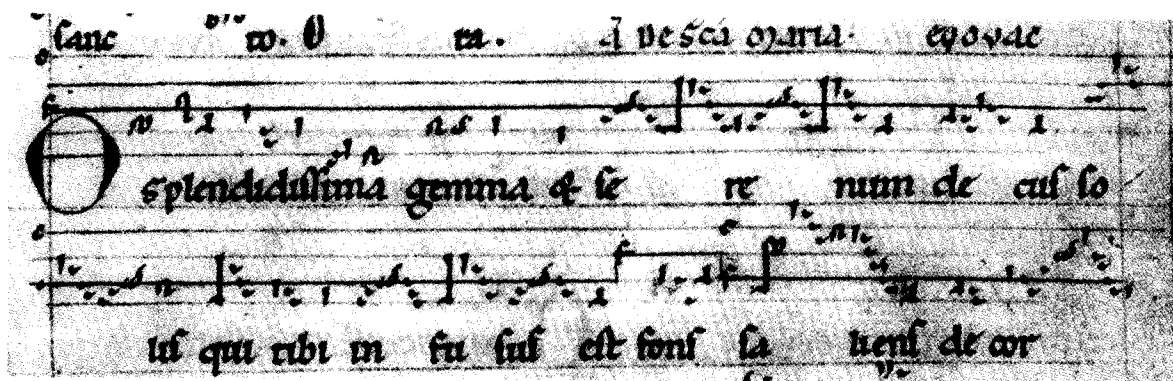
2.3 The ****Hildegard** Representation

The *Humdrum toolkit* provides a potentially open-ended set of representation schemes that may and should be augmented by user-defined schemes for specific research tasks. For our project, we designed a new ****Hildegard** representation, designed for the encoding of the notation as presented in the sources.

A primary expectation for the project was the examination of scribal practices in the Hildegard manuscripts. The use of the quilisma, for example, inspected recently in a twelfth-century antiphoner by Ilke de Loos (de Loos 1996), remains obscure in Hildegard. The ****Hildegard** representation should therefore provide means for encoding not only of notes, but also of the specific neume forms used for a sequence of tones. It should preserve the relationship between text and neumes. In addition, non-notational data should be included as well, including folio indication, clef changes, indication of differentiae, etc. Moreover, there should be means of showing scribal errors and different readings in the parallel source. A sample document is given in Figure 2 with a text version of the encoding of Hildegard's antiphon "O splendidissima gemma," following the version in Dendermonde f. 154/154^v as primary source; for purposes

of comparison, the original notation is presented in Figure 1. In order to save space, the header of the file containing meta-information has been omitted.

Figure 1. The beginning of “O splendidissima gemma” as found in Dendermonde, f.154.



Section 2.4 illustrates the proposed *Hildegard* representation. Its design is closely related to the proposed *Solesmes* representation designed by David Huron, who kindly gave me insight into his draft on this subject. To save space, only the first items of the *Hildegard* representation, following the documentation style for *Humdrum* representations outlined by David Huron (Huron 1994, 41/42), are reproduced here.

The *Hildegard* representation is expected to be accompanied by concurrent spines for the actual sequence of pitches, using the predefined *kern* representation, as well as for the underlying text, using the *silbe* representation.

2.4 Formal Description

The *Hildegard* scheme can be used to represent the basic information of the notation used in the manuscripts containing Hildegard's music.

The *Hildegard* representation allows a monophonic encoding of the various neume forms used by the scribes of the main manuscripts.

Hildegard is primarily designed to facilitate analytic applications rather than music printing or sound generation.

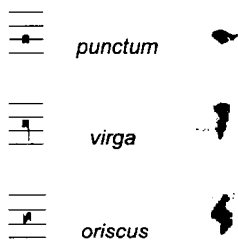
Other *Humdrum* representations should be used for these latter purposes.

Since one main purpose of ***Hildegard* is to allow research tasks concerning scribal practices in the manuscripts, the layout and the orthographic information of the manuscripts are represented rather exactly.

Non-notational information, such as clef setting and position of the music within the manuscripts (folio) and on the page (line number), is represented using tandem interpretations and local comments.

These types of data tokens are distinguished in ***Hildegard*: neumes and flat or natural icons.

Neumes can encode a variety of attributes including neume-type, accidental and liquescence-type.



Pitches are not directly encoded in the ***Hildegard* representation. Instead, a parallel ***kern* spine is expected to encode the corresponding pitches, as well as a parallel spine for the text.

A wide variety of neume types can be encoded using ***Hildegard*. The following table identifies these individual types.

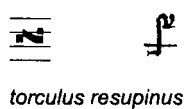
2.4.1 Single-Tone Neumes

P	<i>punctum</i>
t	<i>tractulus</i>
v	<i>virga</i>
o	<i>oriscus</i>

2.4.2 Ligatures

The first element of a ligature (which connects two or more tones to one neume) is represented by the signifier itself, the following elements by using the null token.

	P	<i>pes</i> (or <i>podatus</i>)
	C	<i>clivis</i>

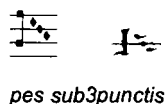


Tr *torculus rotundus* (with round first element)
 Tq *torculus quadratus* (with square first element)
 U *torculus resupinus*

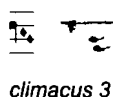


R *porrectus*
 E *porrectus flexus*

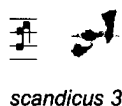
2.4.3 Compound Neumes



P# *pes sub # punctis*
 M# *climacus* (# elements in total)
 I# *climacus resupinus* (# elements in total)



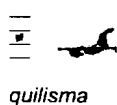
S# *scandicus* (# elements in total)



Q *quilisma*
 QT *quilisma-torculus*

F *pressus minor*
 G *pressus maior*

D *bistropba*
 H *tristropba*



a1 (before neume token) augmentative liquescent
 d1 (before neume token) diminutive liquescent

By way of illustration, an epiphonus can be represented by d1P, a cephalicus by d1C.

At some places the manuscripts contain very special groupings of neumes not found in the common classification of neumes. These neume-groups are encoded using open and close parentheses to denote the beginning and end of the group.

The only accidentals in Hildegard's notation are the flat (b rotundum) and the natural (b quadratum) sign.

The *Hildegard* representation makes a distinction between two types of flat and natural signifiers:

An orthographic and a semantic flat or natural.

Orthographic accidentals frequently appear well before the notes they modify. For example, an accidental may appear two or more neumes prior to the modified note.

The notated accidental icon (orthographic accidental) is signified by the *at* or commercial A-sign [A] for a flat and by the percentage sign [%] for a natural.

In addition, it is useful to identify specific notes that are modified by the accidental. These (semantic) accidentals are represented by the ampersand [&] for a flat and by the caret [^] for a natural and placed immediately after the neume signifier.

In summary, accidentals are represented both by their physical location in the manuscript and also by the modified note. In the former case, the accidental is signified as a separate token (encoded on a separate data record). In the latter case, the accidental is signified as a modifier of a neume token.

In representing any work, editorial interpretations are inevitable.

It may be necessary to make explicit certain implicit information in a manuscript (such as expanding abbreviations), or it may be necessary to estimate missing or unreadable information.

The ***Hildegard* representation provides several special-purpose signifiers to help make explicit various classes of editorial amendments, interpretations, or commentaries. Five types of editorial signifiers are made available:

(1) sic

MEANING: information is encoded literally, but is questionable
SIGNIFIER: Y

(2) invisible symbol

MEANING: the symbol is logically implied but not written
SIGNIFIER: y

(3) editorial interpretation

MEANING: a “modest” editorial act of interpretation, such as the interpretation of accidentals
SIGNIFIER: x

(4) editorial intervention

MEANING: a “significant” editorial intervention

SIGNIFIER: X

(5) footnote

MEANING: accompanying local or global comment, provides a text commentary pertaining to a specified data token

SIGNIFIER: ?

2.4.4 File-Name Extension

It is recommended that files containing predominantly ***Hildegard* data should be given names with the distinguishing *.hgd extension.

2.4.5 Summary of Encoding Symbols in ***Hildegard*

Table 1 summarizes the ***Hildegard* mappings of signifiers and signifieds.

Table 1. Summary of encoding symbols.

p	punctum
t	tractulus
v	virga
o	oriscus
P	pes (or podatus)
C	clivis
Tr	torculus rotundus (with round first element)
Tq	torculus quadratus (with square first element)
U	torculus resupinus
R	porrectus
E	porrectus flexus
P#	pes sub#punctis
M#	climacus (# elements)
I#	climacus resupinus (# elements)
S#	scandicus (# elements)
Q	quilisma
QT	quilisma-torculus
F	pressus minor
G	pressus maior
D	bistropa
H	tristropa

a1 (before neume token) augmentative liquescent

d1 (before neume token) diminutive liquescent

(start special neume-group
)	end special neume-group
@	orthographic flat
⌘	orthographic natural
&	semantic flat
^	semantic natural

2.4.6 Summary of Interpretation Indicators

Table 2 gives a summary of interpretation indicators.

Table 2. Summary of interpretation indicators in the proposed ***Hildegard* representation.










x	editorial interpretation: immediately preceding signifier is interpreted
xx	editorial interpretation: entire data token is interpreted
X	editorial intervention: immediately preceding signifier is an editorial addition
XX	editorial intervention: entire data token is an editorial addition
y	editorial mark: invisible symbol; unwritten note, but logically implied
yy	editorial mark: entire data token is implied
Y	editorial mark: <i>sic</i> marking; information is encoded literally, but is questionable
YY	editorial mark: <i>sic</i> marking; entire data token is present in the original but questionable
?	editorial mark: immediately preceding signifier has accompanying editorial footnote in an ensuing comment
??	editorial mark: entire preceding data token has accompanying editorial footnote in an ensuing comment

Many of these features are implemented in Figure 2, a representation of the antiphon “O splendidissima gemma.”

The encoding includes the marking of erasures in the Dendermonde MS (D) as well as the differences found in the parallel Riesencodex (R). Note

that in contrast to most *Humdrum* encodings this one has no measure indicators, since rhythmic information is imprecise in musical notation of this period, when the concept of barring and the use of regular meters were unknown.

Figure 2. An encoding of the beginning of Hildegard's antiphon "O splendidissima gemma."

		**kern	**Hildegard	**silbe
R (<i>porrectus</i>)		!	*mode4 !154,7	*LLatin !
		*	*clefC5,F3	*
		E	R	O
C (<i>clivis</i>)		D	.	.
		E	.	.
		G	C	splen-
		E	.	.
P (<i>pes</i>)		D	P	.
		E	.	.
		F	M3	-di-
M3 (<i>climacus3</i>)		D	.	.
		C	.	.
		E	v	-dis-
S3 (<i>scandicus3</i>)		AA	S3	-si-
		BB	.	.
		C	.	.
		BB	C	-ma
		AA	.	.
		E	C	gem-
d1P (<i>diminutive liquescent pes</i>)		D	.	.
		D	d1P	.
		E	.	.
		E	v	-ma
		D	v	&
		E	p	se-
Q (<i>quilisma</i>)		F	Q	.
		G	.	.
		F	p	.
		E	p	.
		D	p	.
		D	P	.
I6 (<i>climacus resupinus6</i>)		A	.	.
		A	I6	.
		G	.	.
		F	.	.
		E	.	.
		D	.	.
		E	.	.
		D	p	-re-
		E	p	.
		F	Q	.
		G	.	.
		F	p	.
		E	p	.
		D	p	.
		D	P	.
M4 (<i>climacus4</i>)		A	.	.
		A	M4	.
		G	.	.

P2 (*pes
sub2punctis*)



F	.	.
E	P	-num
D	.	.
E	P2	de-
E	.	.
F	.	.
E	.	.
D	.	.
G	M3	.
F	.	.
E	.	.
D	P	-cus
E	.	.
G	p	so-
G	p	.??
! [-R]	! [-R]	! [-R]
A	p	.
C	M3	.
B	.	.
A	.	.
!	!154, 8	!
*	*clefC4, F2	*
A	M4	.
G	.	.
F	.	.
E	p	.
D	p	.
E	Q	.
F	.	.
G	C	-lis
E	.	.
D	P3	qui
A	.	.
G	.	.
F	.	.
E	.	.
F	M3	ti-
E	.	.
D	.	.
E	v	-bi
D	p	in-
E	p	.
F	Q	.
G	.	.
F	p	.
E	p	.
D	p	.
D	P	-fu-
A	.	.
A	M4	.
G	.	.
F	.	.
E	.	.
D	p	-sus
E	p	.
F	Q	.
G	.	.
F	p	.
E	p	.
D	P	est
E	.	.

U (*torculus
resupinus*)



o (*oriscus*)



*	*clefF3	*
E?	M3	fons
!D	!Erasure	!
D?	.	.
!C	!Erasure	!
BB	.	.
D	P	.
E	.	.
*	*clefC4,F2	*
E	U	sa-
B	.	.
A	.	.
B	.	.
e	M4	.
d	.	.
c	.	.
B	.	.
c	C	.
B	.	.
c	M4	-li-
B	.	.
A	.	.
G	.	.
G	o	.??
![-R]	![-R]	![-R]
F	p	.
E	p	.
D?	P	.
!E	!Erasure	!
E?	.	-ens
!F	!Erasure	!
*_	*_	*_

2.5 Outlook

The project presented so far is just in the first stage of development. The proposed representation is a preliminary document. Some of the information included in the representation may prove superfluous, unnecessary, or may have to be changed as the project progresses. Some of the commands provided by *Humdrum*, such as the *mint*, *semits* and *patt/pattern* commands, will be very useful for approaching the questions outlined above. For other tasks it will be necessary to create new commands by doing some AWK-programming. Ideas and proposals for the project are always highly appreciated.

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