Historical Corpus and Historical Dictionary: Merging Two Ongoing Projects of Old French by Integrating their Editing Systems

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Abstract

To combine corpus data with dictionary data has two advantages: (i) It embeds the vocabulary of the corpus texts within the overall system of the language, and it semantically disambiguates the texts. (ii) The corpus data enrich the dictionary and shed new light on the comprehension of the vocabulary. The retrospective integration of corpus data into a dictionary is a task that has to focus on two aspects, (i) on the integration of the word forms, and (ii) on the semantic integration of the words. This second aspect continues to be an important issue, particularly for historical languages. Automated solutions do not exist. In this paper, we present the retrospective integration – both with a graphical and a semantic focus – of the corpus of Old French legal texts, *Documents linguistiques galloromans* (with approx. 800,000 attestations of Old French lexemes), into the *Dictionnaire étymologique de l'ancien français* (with 83,000 dictionary entries). We have implemented a semi-automated process resulting in a time-saving editorial workflow to accomplish the data integration. Further, we have created a twofold publication concept for the dictionary entries that makes for a straightforward way of enriching the dictionary with the valuable material of the domain of Old French law.

Keywords: historical lexicography, corpus linguistics, Old French, dictionary writing system, scholarly digital text edition, history of law

1 Introduction

The retrospective integration of two large and long-standing projects of Medieval French, i.e., the corpus of Old French legal documents, *Documents linguistiques galloromans* – DocLing, and the comprehensive dictionary of the Old French language, *Dictionnaire étymologique de l'ancien français* – DEAF, is a challenging task. Such a retrospective approach cannot profit from the advantages that a newly created corpus lexicographic venture has. The latter typically defines its linguistic corpus in the initial phase of the project as a well-integrated part of the system architecture. An example in the field of Old French is the *Dictionnaire Électronique de Chrétien de Troyes* – DÉCT (Kunstmann 2007–2014).

Instead, combining the two long-established projects DocLing and DEAF has to deal with distinct data formats that are specific for the corpus and the dictionary, respectively, and with the adaptation of a tailor-made electronic dictionary writing system.

In this paper, we present our data integration that focuses on two main aspects. Firstly, we have implemented the integration with respect to the word forms attested in the corpus texts. This means that we merge the approximately 800,000 word occurrences of DocLing within the parts of the approximately 83,000 DEAF entries that present the graphical realizations of the lexemes. Secondly, we have implemented the integration with respect to the meaning of the words. This means that we perform a semantic mapping of the word occurrences within the DEAF entries. This second aspect is not an obvious task and continues to be a challenging issue, particularly for historical languages.

From the point of view of historical linguistics, the data integration has two main benefits: (i) It enriches the dictionary with data from the discourse tradition of medieval law that had previously been widely unnoticed by lexicography. (ii) It embeds the vocabulary of the corpus texts within the overall system of the medieval French language. At the same time, it creates a means for the semantic disambiguation of the vocabulary and, thus, for the understanding of its meaning. We believe our approach is promising for the integration of other corpora and dictionaries.

This paper is structured as follows: In Section 2, we introduce the two lexical resources DEAF and DocLing. Section 3 explains our integration approach, and Section 4 presents the semi-automated workflow of the data integration: First, we discuss the mapping of the data models and the rules for the data import and export. Then, we show the steps of the semi-automated workflow and the graphical user interfaces we developed for the integration. Section 5 presents the online publication of the integrated resources with two successive release steps. Section 6 discusses the added values for both the dictionary and for the corpus from the point of view of the historical content. In Section 7, we address the remaining issue of how to link back from the corpus to the dictionary, and Section 6 concludes our work.

2 The Lexical Resources

The DEAF (Baldinger, Möhren & Städtler 1971–) is a longstanding dictionary compiled under the aegis of the Heidelberg Academy of Sciences and Humanities in Heidelberg, Germany. It researches the Old French language from its first resource 842 AD until ca. 1350. The dictionary is traditionally published as a series of printed books. Since 2010, it is also published as a versatile electronic version with online dictionary entries and elaborate research functions, called DEAF *électronique* (DEAF*él*).[1] The DEAF organizes the Old French lexicon in word families to show the etymological relations between single lexemes. The *main-lemma* of a dictionary entry is the lexeme that is developed or borrowed from a Latin, Greek, etc., origin. The derivations from this lexeme are the *sub-lemmata*.

The online publication DEAF*él* consists of two parts: DEAF*pré* and DEAF*plus*. DEAF*plus* is the online version of the well-known dictionary DEAF; it consists of extensive articles of the scientifically acknowledged lexicographical quality that has characterized the DEAF for more than 30 years (DEAF*plus* features a number of added values compared to the printed book and explaining the ‘plus’, *cf*. Tittel 2010). DEAF*pré* is not a dictionary in its proper sense, but offers the complete raw material of the DEAF. This material is accessible online in the form of compendious articles that are orthographically and semantically structured in a semi-automated manner. Therefore, it is valuable for all research within our discipline as long as DEAF*plus* does not cover the entire alphabet. Together, DEAF*plus* and DEAF*pré* form DEAF*él* with approximately 83,000 entries.[2]

The dictionary draws its source material from an open textual corpus. This corpus consists of three components: (i) the entirety of accessible scholarly text editions of Old French texts (currently around 3,000 primary texts within around 10,000 manuscripts), (ii) the information published in the secondary literature (monographies, journals), and (iii) the information published in related dictionaries. The 1.5 million handwritten and now digitized *fiches* (slips) lead to 12 million attestations within the corpus. For the most part, the textual corpus of the dictionary cannot be digitally accessed. Even though

[1] See https://deaf-server.adw.uni-heidelberg.de [accessed 03-28-2018].

[2] The lemmata treated in the form of DEAF*plus* (letters D – K) will add up to approximately 9,000 in 2020; approximately 73,000 lemmata will remain as DEAF*pré* (the rest of the alphabet) for the time being. The division of the dictionary into two considerably different parts has been implemented in 2010; it is due to changed monetary conditions affecting the duration of the project.

the editorial process does to some extent integrate corpus queries on a few digital texts, we can say that the DEAF is clearly not a corpus lexicographic endeavor.

In 2014, the DEAF started a cooperation with DocLing (University of Zurich, Glessgen 1998–).[3] DocLing is one of the most significant projects of Old French corpus linguistics. It comprises digital scholarly text editions of 2,185 Medieval French charters (deeds of donation, contracts of purchase, inheritance matter, etc.) dating between 1205 AD and ca. 1450 and with approximately 800,000 word-occurrences.[4] These text editions were created within the framework of the corpus project.[5] They make accessible the important textual genre of legal documents, and are textual witnesses that cover all aspects of human social interaction. For the time being, the DocLing material will be integrated into the part of the DEAF that we call DEAF*pré*.

3 Integration Approach

The aim of the DocLing-DEAF cooperation is the full integration of the DocLing data into the DEAF dictionary. The attestations of Old French lexemes from the text editions of DocLing shall find their correct place within the dictionary entries of the DEAF.

According to Asmussen (2013), there exist two prototypical approaches to the retrospective integration of a corpus and a dictionary. The first is to add "deliberately selected and processed text material from a corpus […] to a dictionary to give more citations for each definition in the dictionary" (Asmussen 2013: 1084). He qualifies this approach as being a tedious and error-prone task that should not be carried out (*ib.*: 1087). Instead, he promotes the second approach, i.e., to establish a virtual interlinking based on orthographical and morphological matches of the lemmatized corpus data with dictionary entries. We consider this second approach insufficient for the following reason: The interlinking focuses only on the graphical realizations of the lexemes. The question of how to establish pointers from the lexical units to the right sense within a dictionary entry is thus not resolved. It is clear that this approach still needs the semantic disambiguation of the corpus data and a correct semantic mapping. As such, the error-prone task remains. Asmussen identifies the question of how to semantically map the corpus data as an important issue for future research (*ibid.*). We will present our solution to this question in this paper.

With the integration, we follow the second approach while we also address the issue of how to perform the semantic mapping. Hence, we have two objectives. The first objective is to integrate the corpus data with respect to the graphical realizations of the lexemes, i.e., within he *apparatus of graphical variants* of the respective dictionary articles.[6] The second objective – and this is our main concern – is to integrate the corpus data with respect to the meaning of the words, i.e., within the

[3] See http://www.rose.uzh.ch/docling/ [accessed 03-28-2018].

[4] DocLing also comprises documents of the Romance speaking Suisse regions and the Francoprovençal linguistic area. For the moment, these are not relevant for our purposes.

[5] Most other corpora with texts of Old French incorporate already existing text editions, e.g. the *Textes de Français Ancien* – TFA (Kunstmann, Ottawa, http://artfl-project.uchicago.edu/content/tfa [accessed 03-27-2018]), the *Base de Français Médiéval* – BFM (Guillot / Heiden / Lavrentiev / Marchello-Nizia / Prévost, Lyon, http://bfm.ens-lyon.fr [accessed 03-27-2018]) and the *Corpus représentatif des premiers textes français* – CoRPTeF (Guillot, Lyon, http://corptef.ens-lyon.fr [accessed 03-27-2018], the editions of the two oldest texts have been redone for this purpose, i.e. the *Serments de Strasbourg*, 842 AD, and the *Séquence de sainte Eulalie*, ca. 900 AD).

[6] Similar to the medieval stage of other Romance languages, Old French does not have a consistent orthographic norm. Each scribe of a manuscript realized the sound of a word in his own fashion, influenced both by random circumstances and by his dialect that could differ significantly from what we consider the standardized Old French language. Thus, we find a great variety of spellings for the same word that we assign, as graphical variants, to the canonical form that is the lemma of the dictionary entry (*cf.* Möhren 2015).

semantic tree of the respective dictionary entries. To achieve this, we have established a workflow for the graphical integration as well as for the semantic mapping to the corresponding sense.

We merge the corpus and the dictionary data – graphically as well as semantically – based on the following assumption: The DEAF dictionary entries constitute a lightweight ontology. Note that this ontology is characterized by a very low degree of axiomatization as opposed to other, more formalized types of ontologies within the ontology spectrum, such as taxonomies and logical languages (*cf.* Grimm et al. 2011: 522–525). In this ontology, we understand the dictionary entries, their hierarchical organization into main- and sub-lemmata, and their respective semantic trees of *main-senses* and *sub-senses* as entities. This ontology constitutes the framework for the integration of the corpus data: We assign the lexical units of DocLing to the concepts of the ontology. These entities are represented in the data format.

4 Integration with Semi-Automated Workflow

The integration of the DocLing data into the dictionary is carried out on both the level of the back-end and on the front-end, i.e., on the level of the applications and also on the level of their graphical user interfaces (GUIs). In the following, we refer to the DocLing application as Phoenix2. The DEAF application is the tailor-made dictionary writing system, in the following referred to as DEAF-DWS.

4.1 Mapping of the Data Models

On the level of the back-end we have implemented a bidirectional data exchange: Each word occurrence plus a specific set of metadata is imported from Phoenix2 into DEAF-DWS, edited there and then written back to Phoenix2.

Naturally, the data models differ between the two systems. The data models of Phoenix2 and DEAF-DWS represent the structure specific to the textual domain of DocLing and the lexicographical domain of the DEAF, respectively. Fortunately, the parts of the data models relevant to the integration match conceptually to a large degree: The basic data entity to model an attestation of a given lexeme in Phoenix2 is the *occurrence*; this entity corresponds closely to what is called the fiche in DEAF-DWS. Moreover, we identified a large overlap of metadata that are associated to DocLing occurrences and DEAF fiches, respectively. These metadata can easily be mapped onto each other: the written representation of the lexeme (called *surface* in Phoenix2, *Zettelwort* in DEAF-DWS), the part-of-speech information, the siglum (the abbreviation used for the text), the text-reference, the date of the text, and the scripta (i.e., the written form of a spoken dialect of Old French). Also, every DocLing occurrence is assigned to a *lemma*, and so is the DEAF fiche. The fiche is the basic data unit of the DEAF. It is the starting point for the editorial process. With the data import, the DEAF-DWS turns a DocLing *occurrence* into a DocLing fiche to make it compliant with the DEAF fiche. Conceptually, the DEAF-DWS treats DocLing fiches as a sibling type to the original DEAF fiche (i.e., they share a common supertype fiche). Each DocLing fiche corresponds to exactly one occurrence in DocLing. To allow for a mapping of a given DocLing fiche to the corresponding occurrence during the write-back to Phoenix2, each DocLing fiche contains the *occurrenceID* of its associated occurrence as an attribute. The *occurrenceID* is a unique identifier for each DocLing occurrence within Phoenix2 that had been imported.

The only integration-relevant difference between the data models, prior to the integration, was the handling of the lemma structure. DEAF-DWS models the lexemes as word families with one main-lemma and one to many sub-lemmata. In contrast, Phoenix2 categorized according to sub-lemmata, only.

To allow for a unique mapping of lemma entities in Phoenix2 to lemma entities in DEAF-DWS, we added the main-lemma to the Phoenix2 data model too.

The prerequisite for the data exchange is a *compliant set of lemmata* for both DocLing and DEAF. Originally, the DocLing data were lemmatized according to the Modern French orthographical norm. Thus, a preparatory step for the integration was to migrate the Modern French lemmata to Old French lemmata. This manual re-lemmatization necessarily followed the standard lemmatization of Old French conducted by the DEAF. This lemmatization is widely accepted as the norm of middle 12th century French. During this preparatory step, the 800,000 occurrences in Phoenix2 were attached to approximately 5,300 Old French lemmata.

4.2 Import and Export of Data

The applications communicate via a *REpresentational State Transfer* / REST web service (*cf.* Fielding 2000). The compliant set of lemmata of DocLing and DEAF is the foundation for the data exchange: For each lemma, we import the attached occurrences from Phoenix2 into DEAF-DWS. This import includes the following information that is assigned to a given occurrence in Phoenix2: *surface*, *lemmaPOS* (part-of-speech), *sigel* (siglum), *division* (text-reference), *date*, and *scripta*. These information units correlate with the DEAF data structure. In addition to this, the import includes *scriptorium* (where the document was written), *context* (the textual context of the occurrence), *URL* (of the electronic edition within the DocLing website), and, finally, the *occurrenceID*.

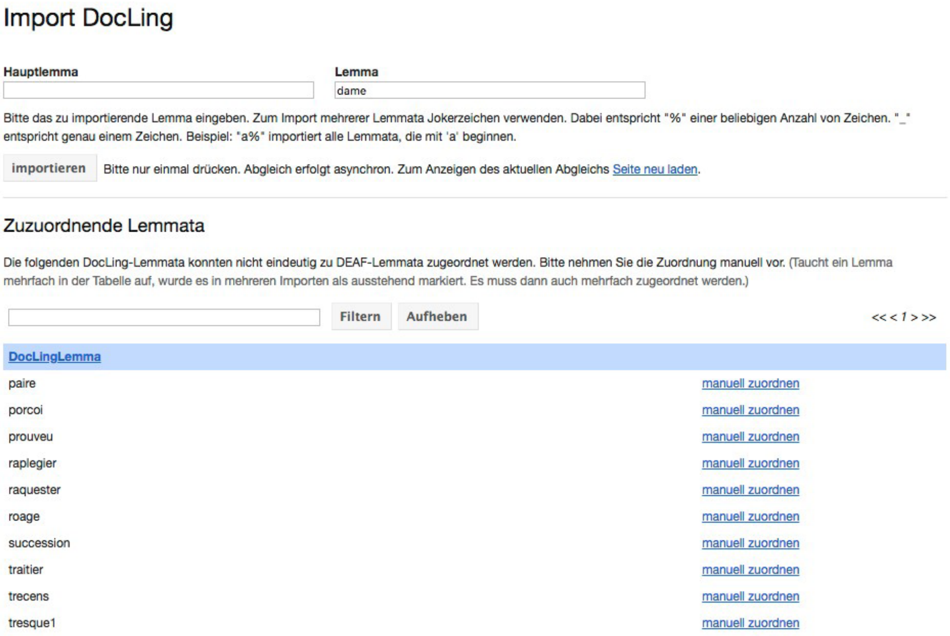
After its initial import into the DEAF-DWS, an occurrence ‘exists’ twice, i.e., as an occurrence in Phoenix2 and as a fiche in DEAF-DWS. To prevent data inconsistencies between these two representations of the same occurrence, each metadata property of an occurrence can only be modified by exactly one of the two systems. More specifically, only the DEAF-DWS is allowed to change the lemma assignment of an occurrence (technically, of a fiche that corresponds to an occurrence). All other metadata except the lemma must only be changed by Phoenix2, e.g., the date, scripta and scriptorium. After every data modification, the systems need to be synchronized in order to make the modification visible to both systems.

4.3 Workflow and Graphical User Interfaces

The workflow comprises (i) the import (from Phoenix2 into DEAF-DWS), the assignment and write back (to Phoenix2) of DocLing occurrences, and (ii) the graphical and semantic integration of the data into the respective dictionary entries. It consists of automated and manual steps. We have implemented a number of features including the necessary GUIs to the DEAF-DWS to perform these steps.

4.3.1 Lemma Assignment

The import of DocLing occurrences into the DEAF-DWS is triggered by hand. Figure. 1 shows the feature implemented for the import: The editor searches for a given lemma (in the respective field, e.g., *dame*) and imports all occurrences attached to the lemma. Technically, the lemma assignment is not carried out on the level of the lemmata, but on the level of the occurrences. However, the GUI displays the lemmata as the unit that is most familiar to the editor. Below the search field, the GUI displays the pending lemmata, i.e., DocLing lemmata that have not been assigned to a DEAF lemma (Fig. 1).



Import DocLing

Hauptlemma

Lemma: dame

Bitte das zu importierende Lemma eingeben. Zum Import mehrerer Lemmata Jokerzeichen verwenden. Dabei entspricht "%" einer beliebigen Anzahl von Zeichen. "_" entspricht genau einem Zeichen. Beispiel: "a%" importiert alle Lemmata, die mit 'a' beginnen.

importieren Bitte nur einmal drücken. Abgleich erfolgt asynchron. Zum Anzeigen des aktuellen Abgleichs Seite neu laden.

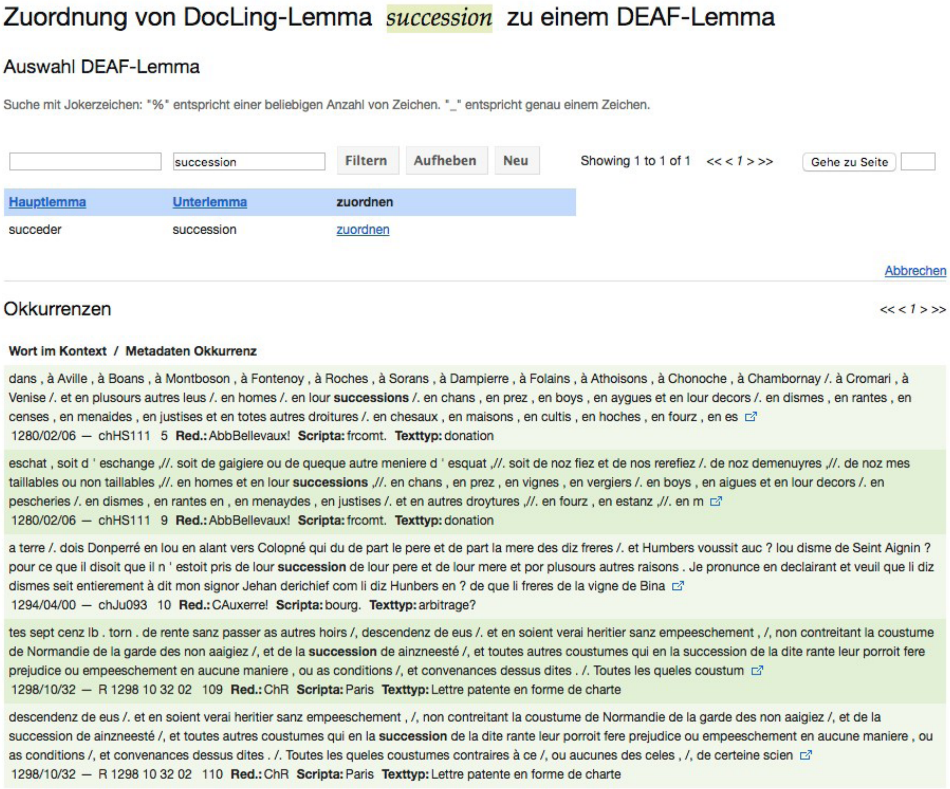
Zuzuordnende Lemmata

Die folgenden DocLing-Lemmata konnten nicht eindeutig zu DEAF-Lemmata zugeordnet werden. Bitte nehmen Sie die Zuordnung manuell vor. (Taucht ein Lemma mehrfach in der Tabelle auf, wurde es in mehreren Importen als ausstehend markiert. Es muss dann auch mehrfach zugeordnet werden.)

DocLingLemma	
paire	manuell zuordnen
porcoi	manuell zuordnen
prouveu	manuell zuordnen
raplegier	manuell zuordnen
raquester	manuell zuordnen
roage	manuell zuordnen
succession	manuell zuordnen
traitier	manuell zuordnen
trecens	manuell zuordnen
tresque1	manuell zuordnen

Figure 1: Import of DocLing occurrences (via a lemma).

By clicking on the button for the lemma assignment (‘*manuell zuordnen*’), the interface as shown in Fig. 2 opens up. The assignment needs to be done manually whenever the given lemma is imported for the first time. The DEAF system supports this step by suggesting a main-lemma-sub-lemma combination it finds within the DEAF data where the sub-lemma matches the incoming DocLing lemma. In our example in Fig. 2, the lemma to assign is *succession* (subst. fem.) that is a sub-lemma of the main-lemma *succeder* (verb) within the DEAF-DWS.



Zuordnung von DocLing-Lemma succession zu einem DEAF-Lemma

Auswahl DEAF-Lemma

Suche mit Jokerzeichen: "%" entspricht einer beliebigen Anzahl von Zeichen. "_" entspricht genau einem Zeichen.

succession

Hauptlemma	Unterlemma	zuordnen
succeder	succession	zuordnen

Okkurrenzen

Wort im Kontext / Metadaten Okkurrenz

dans , à Aville , à Boans , à Montboson , à Fontenoy , à Roches , à Sorans , à Dampierre , à Folains , à Athoisons , à Chonoche , à Chambornay /. à Cromari , à Venise /. et en plusours autres leus /. en homes /. en lour **successions** /. en chans , en prez , en boys , en aygues et en lour decors /. en dismes , en rantes , en censes , en menaides , en justises et en totes autres droitures /. en chesaux , en maisons , en cultis , en hoches , en fourz , en es
1280/02/06 — chHS111 5 **Red.:** AbbBellevaux! **Scripta:** frcomt. **Texttyp:** donation

eschat , soit d ' eschange ,//. soit de gaigiere ou de queque autre meniere d ' esquat ,//. soit de noz fiez et de nos rerefiez /. de noz demenuyres ,//. de noz mes taillables ou non taillables ,//. en homes et en lour **successions** ,//. en chans , en prez , en vignes , en vergiers /. en boys , en aigues et en lour decors /. en pescheries /. en dismes , en rantes en , en menaydes , en justises /. et en autres droytures ,//. en fourz , en estanz ,//. en m
1280/02/06 — chHS111 9 **Red.:** AbbBellevaux! **Scripta:** frcomt. **Texttyp:** donation

a terre /. dois Donperré en lou en alant vers Colopné qui du de part le pere et de part la mere des diz freres /. et Humbers voussit auc ? lou disme de Seint Aignin ? pour ce que il disoit que il n ' estoit pris de lour **succession** de lour pere et de lour mere et por plusours autres raisons . Je pronunce en declairant et veuil que li diz dismes seit entierement à dit mon signor Jehan derichief com li diz Hunbers en ? de que li freres de la vigne de Bina
1294/04/00 — chJu093 10 **Red.:** CAuxerre! **Scripta:** bourg. **Texttyp:** arbitrage?

tes sept cenz lb . torn . de rente sanz passer as autres hoirs /, descendenz de eus /. et en soient verai heritier sanz empeeschement , /, non contreitant la coustume de Normandie de la garde des non aaigiez /, et de la **succession** de ainzneesté /, et toutes autres coustumes qui en la succession de la dite rante leur porroit fere prejudice ou empeeschement en aucune maniere , ou as conditions /, et convenances dessus dites . /. Toutes les queles coustum
1298/10/32 — R 1298 10 32 02 109 **Red.:** ChR **Scripta:** Paris **Texttyp:** Lettre patente en forme de charte

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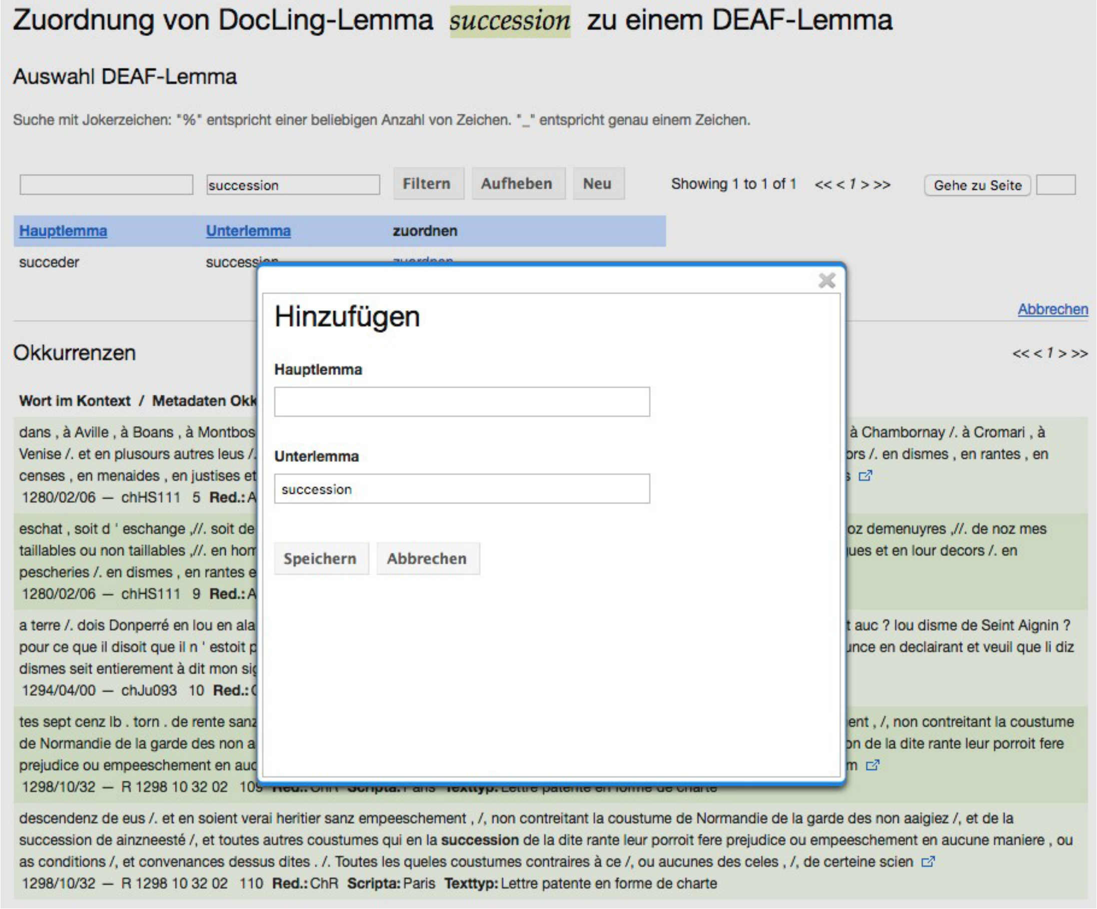
1298/10/32 — R 1298 10 32 02 110 **Red.:** ChR **Scripta:** Paris **Texttyp:** Lettre patente en forme de charte

Figure 2: Assignment of DocLing occurrences to a DEAF main-lemma-sub-lemma combination.

In cases when the system finds several homonyms for the given lemma it will display all possibly fitting main-lemma-sub-lemma combinations for the editor to choose from. In cases when none of the suggested combinations is the correct one or the lemma in question is yet unknown to the DEAF system the editor can manually create a main-lemma-sub-lemma combination (Fig. 3).



Zuordnung von DocLing-Lemma *succession* zu einem DEAF-Lemma

Auswahl DEAF-Lemma

Suche mit Jokerzeichen: "%" entspricht einer beliebigen Anzahl von Zeichen. "_" entspricht genau einem Zeichen.

succession

Hauptlemma	Unterlemma	zuordnen
succeder	successi	zuordnen

Hinzufügen

Hauptlemma

Unterlemma

succession

Okkurrenzen

Wort im Kontext / Metadaten Okk

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pescheries /. en dismes , en rantes e
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succession de ainzneesté /, et toutes autres coustumes qui en la **succession** de la dite rante leur porroit fere prejudice ou empeeschement en aucune maniere , ou
as conditions /, et convenances dessus dites . /. Toutes les queles coustumes contraires à ce /, ou aucunes des celes , /, de certeine scien
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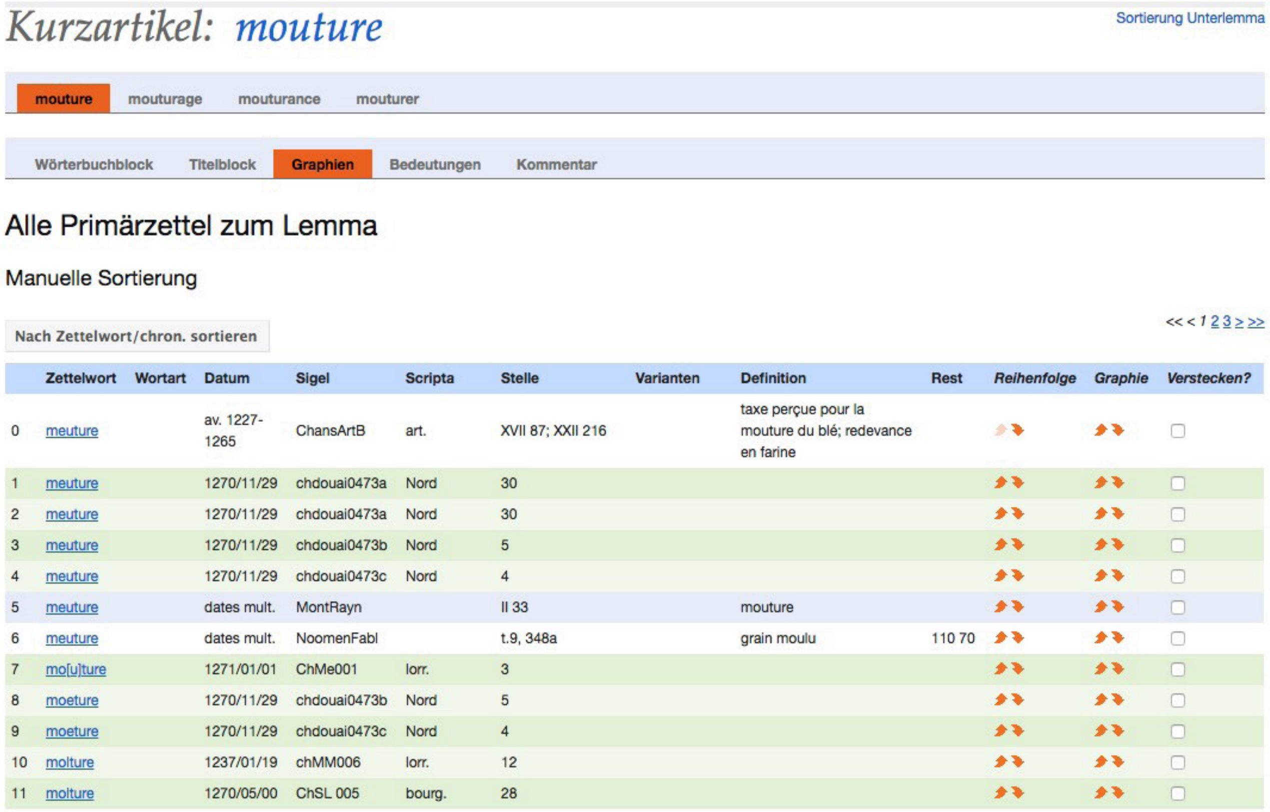
Figure 3: Creation of a new main-lemma-sub-lemma combination.

The result of the lemma assignment is presented in a second table (not shown). The export of the data to Phoenix2 is again triggered by hand (it can also be done at a later date). Via the REST web service, the export writes back the main-lemma-sub-lemma combination for each DocLing fiche to the corresponding DocLing occurrence in Phoenix2. The lemma assignment needs to be performed only for the first import. When a second import of the same lemma is triggered, the DEAF system will perform the assignment automatically based on the already existing information in DEAF-DB. As mentioned earlier, after the successful import-export procedure each Phoenix2 occurrence now has a corresponding DocLing fiche representation in DEAF-DWS.

To be able to track all imports and write-backs, detect errors, etc., all processes are stored in a third table (not shown).

4.3.2 Integration into a Dictionary Entry

After the data import and lemma assignment, the corpus data need to be merged into the respective dictionary entries. For this purpose, the DEAF-DWS displays the DocLing fiches within two GUIs, one for the editing of the graphical apparatus and one for the editing of the semantic part of the dictionary entry.



Kurzartikel: mouture

Alle Primärzettel zum Lemma

Manuelle Sortierung

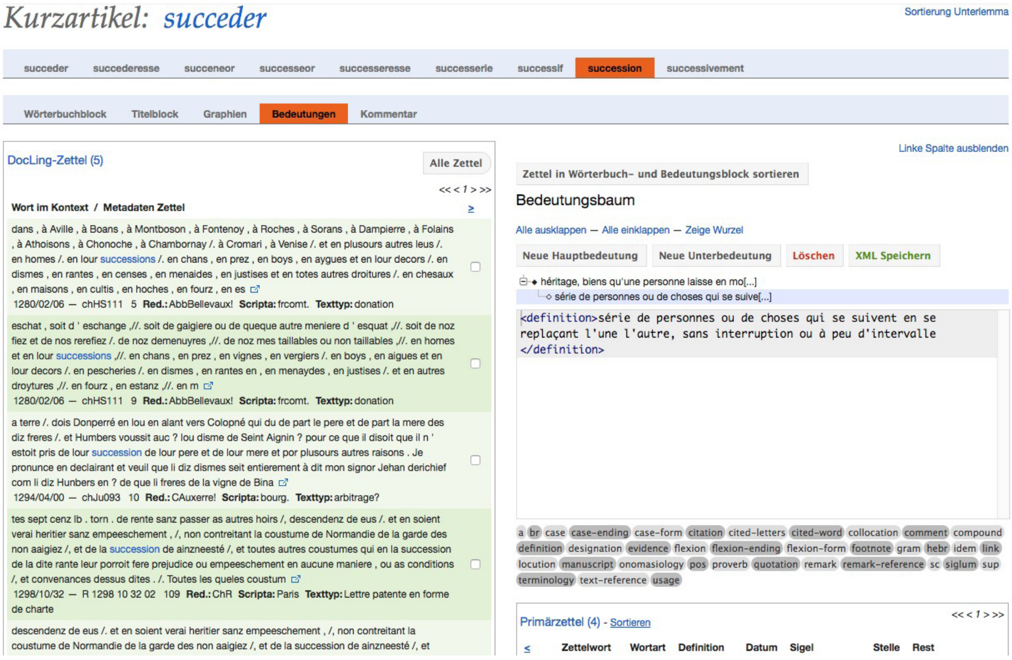
	Zettelwort	Wortart	Datum	Sigel	Scripta	Stelle	Varianten	Definition	Rest	Reihenfolge	Graphie	Verstecken?
0	meuture		av. 1227-1265	ChansArtB	art.	XVII 87; XXII 216		taxe perçue pour la mouture du blé; redevance en farine		↑↓	↑↓	□
1	meuture		1270/11/29	chdouai0473a	Nord	30				↑↓	↑↓	□
2	meuture		1270/11/29	chdouai0473a	Nord	30				↑↓	↑↓	□
3	meuture		1270/11/29	chdouai0473b	Nord	5				↑↓	↑↓	□
4	meuture		1270/11/29	chdouai0473c	Nord	4				↑↓	↑↓	□
5	meuture		dates mult.	MontRayn		II 33		mouture		↑↓	↑↓	□
6	meuture		dates mult.	NoomenFabl		t.9, 348a		grain moulu	110 70	↑↓	↑↓	□
7	mo[u]ture		1271/01/01	ChMe001	lorr.	3				↑↓	↑↓	□
8	moeture		1270/11/29	chdouai0473b	Nord	5				↑↓	↑↓	□
9	moeture		1270/11/29	chdouai0473c	Nord	4				↑↓	↑↓	□
10	molture		1237/01/19	chMM006	lorr.	12				↑↓	↑↓	□
11	molture		1270/05/00	ChSL 005	bourg.	28				↑↓	↑↓	□

Figure 4: Editing feature for the graphical apparatus of a dictionary entry.

Figure 4 shows the GUI for the editing of the apparatus of graphical variants. The DEAF-DWS classifies the graphical realizations attested by the imported DocLing data within the apparatus. Using *surface* of the DocLing fiche and *Zettelwort* of the DEAF fiche, it arranges all graphical variants in alphabetical order and merges the DocLing data with the original DEAF data. Within the alphabetical order it collates the attestations in chronological order and, as a third assorting step, also in alphabetical order of the sigla (using the DEAF metadata units *Datierung* and *Sigel* / DocLing metadata units *date* and *sigel*). This is done in a fully automated way. Moreover, options for a manual post-processing are also provided. Note that the merged DEAF fiches and DocLing fiches are displayed within the same table for the convenience of the editor. To be distinguishable, DEAF fiches and DocLing fiches are displayed in white/blue and in shades of green, respectively.

The semantic integration of the DocLing material needs to be performed manually with linguistic expertise, and this process has recently been started. The editing process of the entries of DEAF*pré*, on the other hand, were completed in 2017. As such, the starting point for the semantic integration of the DocLing data into an entry is a completed DEAF*pré* entry with the semantic tree already established. Figure 5 shows the semantic tree ('*Bedeutungsbaum*') for the lexeme *succession* (subst. fem.) with one main-sense and one sub-sense. We can see that the (white and blue) DEAF fiches have already been assigned to the proper sense and they are displayed in a table on the right-hand side of the GUI. The newly added (green) DocLing fiches initially appear in the table on the left-hand side. Each of them needs to be assigned to the correct sense of the semantic tree. The GUI offers several drag-and-drop mechanisms and other features to do this in a time-saving way.

As soon as all DocLing fiches are merged, the updated dictionary entry can be exported as an XHTML file that is used for the online publication.


Kurzartikel: succeder
Sortierung Unterlemma
succeder
succederesse
succeneor
successeor
successeresse
successerie
successif
succession
successivement
Wörterbuchblock
Titelblock
Graphien
Bedeutungen
Kommentar
Linke Spalte ausblenden
Alle Zettel
<< < 1 > >>
Zettel in Wörterbuch- und Bedeutungsblock sortieren
Alle ausklappen — Alle einklappen — Zeige Wurzel
Neue Hauptbedeutung
Neue Unterbedeutung
Löschen
XML Speichern
a br case case-ending case-form citation cited-letters cited-word collocation comment compound definition designation evidence flexion flexion-ending flexion-form footnote gram hebr idem link locution manuscript onomasiology pos proverb quotation remark remark-reference sc siglum sup terminology text-reference usage
Primärzettel (4) - Sortieren
<< < 1 > >>
≤ Zettelwort Wortart Definition Datum Sigel Stelle Rest

DocLing-Zettel (5)

Wort im Kontext / Metadaten Zettel ≥

dans , à Aville , à Boans , à Montboson , à Fontenoy , à Roches , à Sorans , à Dampierre , à Folains , à Athoisons , à Chonoche , à Chambornay /. à Cromari , à Venise /. et en plusours autres leus /. en homes /. en lour successions /. en chans , en prez , en boys , en aygues et en lour decors /. en dismes , en rantes , en censes , en menaides , en justises et en totes autres droitures /. en chesaux , en maisons , en cultis , en hoches , en fourz , en es ☐
1280/02/06 — chHS111 5 **Red.:** AbbBellevaux! **Scripta:** frcomt. **Texttyp:** donation

eschat , soit d ' eschange ,//. soit de gaigiere ou de queque autre meniere d ' esquat ,//. soit de noz fiez et de nos rerefiez /. de noz demenuyres ,//. de noz mes taillables ou non taillables ,//. en homes et en lour successions ,//. en chans , en prez , en vignes , en vergiers /. en boys , en aigues et en lour decors /. en pescheries /. en dismes , en rantes en , en menaydes , en justises /. et en autres droytures ,//. en fourz , en estanz ,//. en m ☐
1280/02/06 — chHS111 9 **Red.:** AbbBellevaux! **Scripta:** frcomt. **Texttyp:** donation

a terre /. dois Donperré en lou en alant vers Colopné qui du de part le pere et de part la mere des diz freres /. et Humbers voussit auc ? lou disme de Seint Aignin ? pour ce que il disoit que il n ' estoit pris de lour succession de lour pere et de lour mere et por plusours autres raisons . Je pronunce en declairant et veuil que li diz dismes seit entierement à dit mon signor Jehan derichief com li diz Hunbers en ? de que li freres de la vigne de Bina ☐
1294/04/00 — chJu093 10 **Red.:** CAuxerre! **Scripta:** bourg. **Texttyp:** arbitrage?

tes sept cenz lb . torn . de rente sanz passer as autres hoirs /, descendenz de eus /. et en soient verai heritier sanz empeeschement , /, non contreitant la coustume de Normandie de la garde des non aaigiez /, et de la succession de ainzneesté /, et toutes autres coustumes qui en la succession de la dite rante leur porroit fere prejudice ou empeeschement en aucune maniere , ou as conditions /, et convenances dessus dites . /. Toutes les queles coustum ☐
1298/10/32 — R 1298 10 32 02 109 **Red.:** ChR **Scripta:** Paris **Texttyp:** Lettre patente en forme de charte

descendenz de eus /. et en soient verai heritier sanz empeeschement , /, non contreitant la coustume de Normandie de la garde des non aaigiez /, et de la succession de ainzneesté /, et

Bedeutungsbaum

- héritage, biens qu'une personne laisse en mo[...]
  - série de personnes ou de choses qui se suive[...]

```
<definition>série de personnes ou de choses qui se suivent en se
replaçant l'une l'autre, sans interruption ou à peu d'intervalle
</definition>
```

Figure 5: Editing feature for the semantic part of an entry.

5 Online Publication

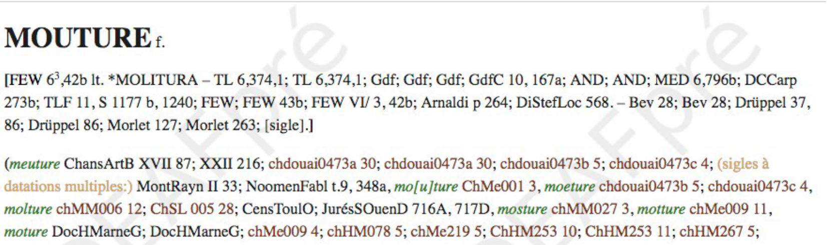
With the integration of the DocLing material, the entries of DEAF*pré* are enriched with attestations that are integrated into the apparatus of graphical variants and into the semantic part.

As we have shown above, the graphical integration of the corpus material is performed automatically by the DEAF-DWS. However, the manual integration of the DocLing material into the semantic structure of each article is time-consuming, and will be performed gradually in the years to come. To compensate for the long-lasting workflow, we implemented two release steps for the publication. As a first release step, we created a preliminary publication that is the result of a fully automated process. This enables us to give online access to the valuable new material before the task of the semantic integration will be accomplished. We execute the second release step after the manual post-processing has been completed, i.e., after the semantic integration of the DocLing data.

5.1 Release Step #1: Automated Processing

For the display of the new material, we have modified the design of the online publication of DEAF*pré*.

The modification of the entry's graphical apparatus was straightforward. We display each DocLing attestation with its siglum and text-reference as we do with the original DEAF attestations (Fig. 6).


MOUTURE f.

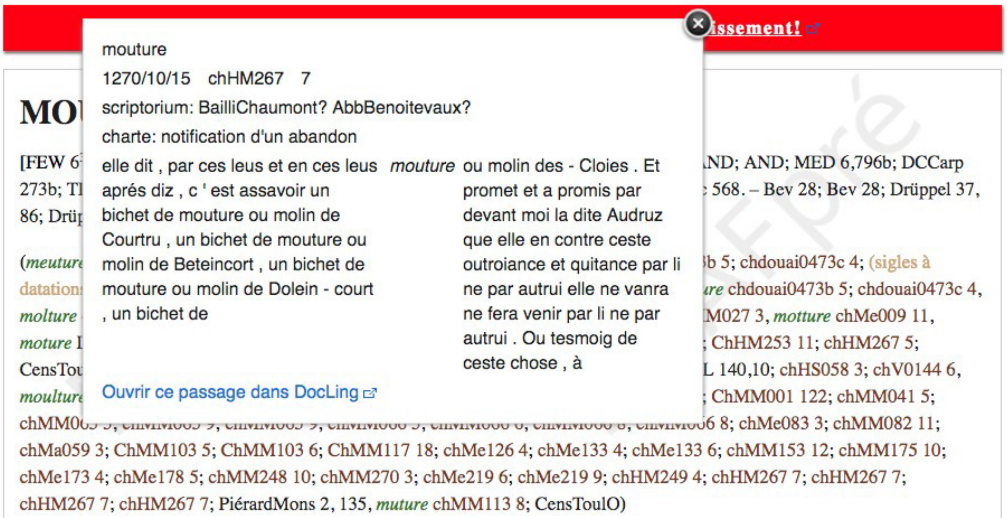
[FEW 6^3,42b lt. *MOLITURA – TL 6,374,1; TL 6,374,1; Gdf; Gdf; Gdf; GdfC 10, 167a; AND; AND; MED 6,796b; DCCarp 273b; TLF 11, S 1177 b, 1240; FEW; FEW 43b; FEW VI/ 3, 42b; Arnaldi p 264; DiStefLoc 568. – Bev 28; Bev 28; Drüppel 37, 86; Drüppel 86; Morlet 127; Morlet 263; [sigle].]

(*meuture* ChansArtB XVII 87; XXII 216; chdouai0473a 30; chdouai0473a 30; chdouai0473b 5; chdouai0473c 4; (sigles à datations multiples:) MontRayn II 33; NoomenFabl t.9, 348a, *mo[u]ture* ChMe001 3, *moeture* chdouai0473b 5; chdouai0473c 4, *molture* chMM006 12; ChSL 005 28; CensToulO; JurésSOuenD 716A, 717D, *mosture* chMM027 3, *motture* chMe009 11, *moture* DocHMarneG; DocHMarneG; chMe009 4; chHM078 5; chMe219 5; ChHM253 10; ChHM253 11; chHM267 5;

Figure 6: DEAF*pré* entry *mouture* (subst. fem.): (headword, dictionaries, secondary literature, and) part of the graphical apparatus.

To enable the user to recognize the origin of the DocLing material we display it in a color different from the one used for the DEAF attestation. This is important because the DocLing material is of a significantly better quality compared to the original DEAF*pré* material. The attestations given in a DEAF*pré* article are not verified in the sources, i.e., in the editions of the primary texts. The reason for this major flaw is the very limited time that the two-fold concept described above allowed for the editing of the DEAF*pré* articles (and it is the most significant difference to DEAF*plus* where every information is verified). In contrast to this, the DocLing material is sound evidence that deserves to be identifiable as such.

The fact that we import the context of each attestation, the URL and the other metadata from Phoenix2 allows us to make this information accessible to the user. By clicking on any DocLing attestation, the user can display this information (Fig. 7). The button '*Ouvrir ce passage dans* DocLing' provides the hyperlink to the respective document within the DocLing website.



mouture
1270/10/15 chHM267 7
scriptorium: BailliChaumont? AbbBenoitevaux?
charte: notification d'un abandon

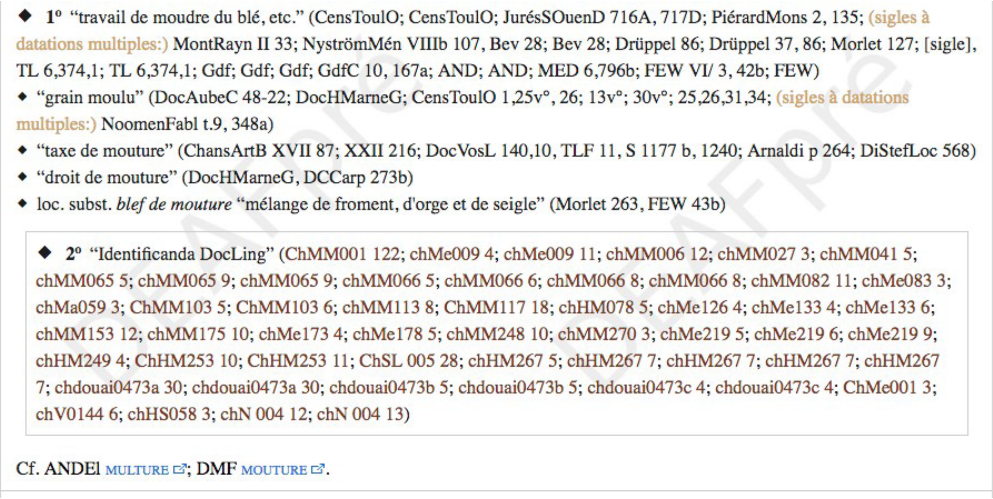
elle dit , par ces leus et en ces leus après diz , c ' est assavoir un bichet de mouture ou molin de Courtru , un bichet de mouture ou molin de Beteincort , un bichet de mouture ou molin de Dolein - court , un bichet de *mouture* ou molin des - Cloies . Et promet et a promis par devant moi la dite Audruz que elle en contre ceste outroiance et quitance par li ne par autrui elle ne vanra ne fera venir par li ne par autrui . Ou tesmoig de ceste chose , à

Ouvrir ce passage dans DocLing

chMa059 3; ChMM103 5; ChMM103 6; ChMM117 18; chMe126 4; chMe133 4; chMe133 6; chMM153 12; chMM175 10; chMe173 4; chMe178 5; chMM248 10; chMM270 3; chMe219 6; chMe219 9; chHM249 4; chHM267 7; chHM267 7; chHM267 7; chHM267 7; PiérardMons 2, 135, *muture* chMM113 8; CensToulO)

Figure 7: Display of a DocLing fiche within DEAF*pré*.

For the creation of the semantic part of the entry, the export routines of the DEAF-DWS place all DocLing material (again with attestations and text-references) that is not yet properly semantically integrated into a container. In the online publication, we display this container as clearly distinguishable addenda ('*Identificanda* DocLing') to the semantic tree of the respective entry (Fig. 8).



◆ 1° "travail de moudre du blé, etc." (CensToulO; CensToulO; JurésSOuenD 716A, 717D; PiérardMons 2, 135; (sigles à datations multiples:) MontRayn II 33; NyströmMén VIIIb 107, Bev 28; Bev 28; Drüppel 86; Drüppel 37, 86; Morlet 127; [sigle], TL 6,374,1; TL 6,374,1; Gdf; Gdf; Gdf; GdfC 10, 167a; AND; AND; MED 6,796b; FEW VI/ 3, 42b; FEW)
- "grain moulu" (DocAubeC 48-22; DocHMarneG; CensToulO 1,25v°, 26; 13v°; 30v°; 25,26,31,34; (sigles à datations multiples:) NoomenFabl t.9, 348a)
- "taxe de mouture" (ChansArtB XVII 87; XXII 216; DocVosL 140,10, TLF 11, S 1177 b, 1240; Arnaldi p 264; DiStefLoc 568)
- "droit de mouture" (DocHMarneG, DCCarp 273b)
- loc. subst. *blef de mouture* "mélange de froment, d'orge et de seigle" (Morlet 263, FEW 43b)

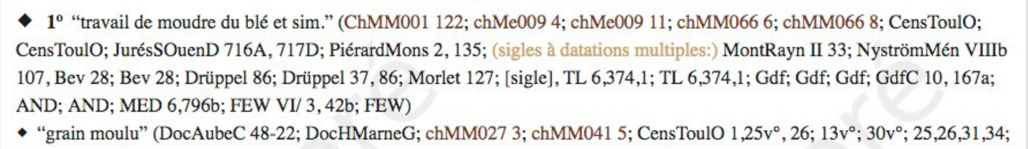
◆ 2° "Identificanda DocLing" (ChMM001 122; chMe009 4; chMe009 11; chMM006 12; chMM027 3; chMM041 5; chMM065 5; chMM065 9; chMM065 9; chMM066 5; chMM066 6; chMM066 8; chMM066 8; chMM082 11; chMe083 3; chMa059 3; ChMM103 5; ChMM103 6; chMM113 8; ChMM117 18; chHM078 5; chMe126 4; chMe133 4; chMe133 6; chMM153 12; chMM175 10; chMe173 4; chMe178 5; chMM248 10; chMM270 3; chMe219 5; chMe219 6; chMe219 9; chHM249 4; ChHM253 10; ChHM253 11; ChSL 005 28; chHM267 5; chHM267 7; chHM267 7; chHM267 7; chHM267 7; chdouai0473a 30; chdouai0473a 30; chdouai0473b 5; chdouai0473b 5; chdouai0473c 4; chdouai0473c 4; ChMe001 3; chV0144 6; chHS058 3; chN 004 12; chN 004 13)

Cf. ANDEl MULTURE; DMF MOUTURE.

Figure 8: DEAF*pré* entry *mouture* (subst. fem.): semantic part with container 'Identificanda DocLing'.

5.2 Release Step #2: Manual Post-Processing

The second release step results from the accomplished task of the semantic integration (and thus it does not concern the graphical apparatus). The publication merges all attestations in the semantic tree, as shown for the first main-sense “*travail de moudre du blé et sim*’’ of the lexeme *mouture* in Fig. 9.



◆ **1°** “travail de moudre du blé et sim.” (ChMM001 122; chMe009 4; chMe009 11; chMM066 6; chMM066 8; CensToulO; CensToulO; JurésSOuenD 716A, 717D; PiérardMons 2, 135; (sigles à datations multiples:) MontRayn II 33; NyströmMén VIIIb 107, Bev 28; Bev 28; Drüppel 86; Drüppel 37, 86; Morlet 127; [sigle], TL 6,374,1; TL 6,374,1; Gdf; Gdf; Gdf; GdfC 10, 167a; AND; AND; MED 6,796b; FEW VI/ 3, 42b; FEW)

◆ “grain moulu” (DocAubeC 48-22; DocHMarneG; chMM027 3; chMM041 5; CensToulO 1,25v°, 26; 13v°; 30v°; 25,26,31,34;

Figure 9: DEAF*pré* entry *mouture* (subst. fem.):
semantic part with semantically integrated DocLing attestations.

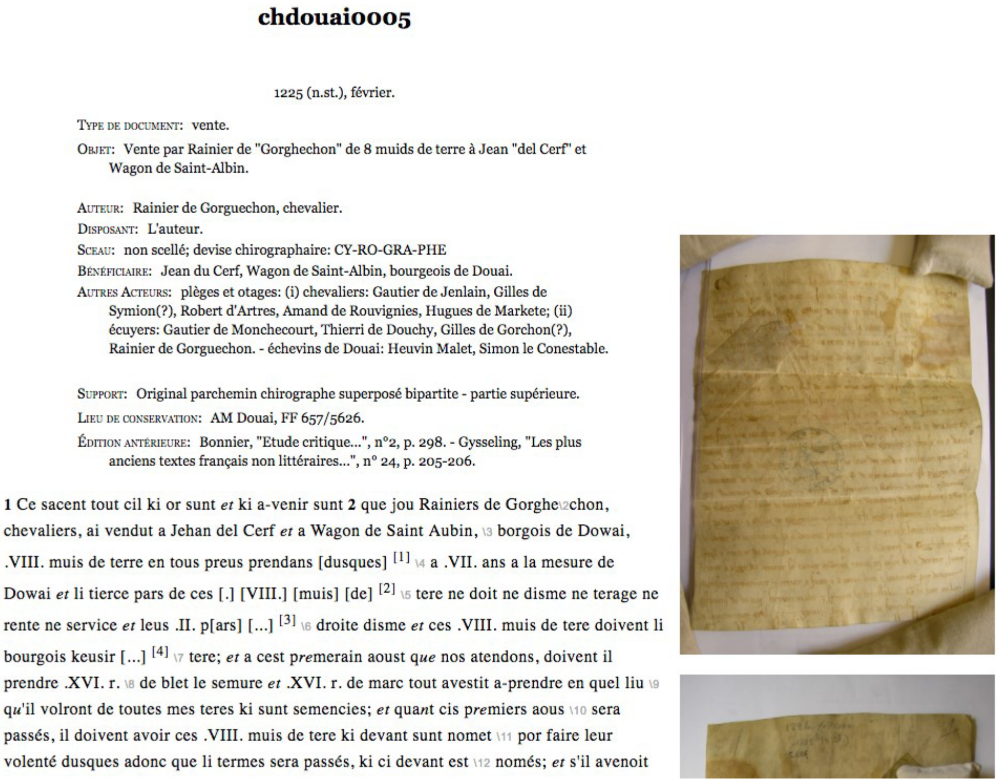
6 Added Value for Both the Dictionary and Corpus

Our aim is to merge the data with mutual benefit for the corpus project and for the dictionary. From the dictionary’s point of view, the vocabulary of the DocLing corpus texts enriches the dictionary’s material with the medieval language of law which previously had been widely unregarded by Old French lexicography. It helps to develop the comprehension of the lexemes in a considerable way, producing added value within the historical lexicography of Old French. This clearly extends the limits of the traditional historical dictionary. The added value is also of specific interest for the historical sciences focusing on medieval law and the application of law that is witnessed in the documentary sources. We foresee that the new source material will shed light on the senses of many lexemes of DEAF*pré*, in particular because it represents the discourse tradition of legal documents. Therefore, the DocLing material will add to a better understanding of the semantic scope of these lexemes. As a consequence, the editor’s task while integrating the DocLing material will be to evaluate the semantic tree of the DEAF*pré* entry and to improve and expand it if necessary. This will increase the quality of the DEAF*pré* entries in a significant way.

From the corpus’ point of view, one benefit is the semantic disambiguation of the corpus data. Traditionally, digital text editions – both as a single publication and as a part of a larger corpus – are standalone products. The publication usually does not offer an instrument (e.g., a comprehensive glossary) that supports the reader to understand the text. With the integration of the data into the dictionary we create a means that helps the reader to grasp the comprehension of the vocabulary. Also, with the integration, we embed the specific juridical vocabulary of the DocLing texts within the overall system of the Medieval French language as it is established by the DEAF. This reveals the place of the lexical units attested in the corpus within the broader semantic range of the Old French lexicon and the significance of the vocabulary within the history of the language.

7 Establishing Links from the Corpus to the Dictionary

A remaining issue is how to establish a link from a given word occurrence within a DocLing text edition (Fig. 10) back to the publication of the respective entry in DEAF*él*.



chdouai0005

1225 (n.st.), février.

Type de document: vente.

Objet: Vente par Rainier de "Gorghechon" de 8 muids de terre à Jean "del Cerf" et Wagon de Saint-Albin.

Auteur: Rainier de Gorguechon, chevalier.

Disposant: L'auteur.

Sceau: non scellé; devise chirographaire: CY-RO-GRA-PHE

Bénéficiaire: Jean du Cerf, Wagon de Saint-Albin, bourgeois de Douai.

Autres Acteurs: plèges et otages: (i) chevaliers: Gautier de Jenlain, Gilles de Symion(?), Robert d'Artres, Amand de Rouvignies, Hugues de Markete; (ii) écuyers: Gautier de Monchecourt, Thierri de Douchy, Gilles de Gorchon(?), Rainier de Gorguechon. - échevins de Douai: Heuvin Malet, Simon le Conestable.

Support: Original parchemin chirographe superposé bipartite - partie supérieure.

Lieu de conservation: AM Douai, FF 657/5626.

Édition antérieure: Bonnier, "Etude critique...", n°2, p. 298. - Gysseling, "Les plus anciens textes français non littéraires...", n° 24, p. 205-206.

1 Ce sacent tout cil ki or sunt *et* ki a-venir sunt **2** que jou Rainiers de Gorghe\2chon, chevaliers, ai vendut a Jehan del Cerf *et* a Wagon de Saint Aubin, \3 borgois de Dowai, .VIII. muis de terre en tous preus prendans [dusques] [1] \4 a .VII. ans a la mesure de Dowai *et* li tierce pars de ces [.] [VIII.] [muis] [de] [2] \5 tere ne doit ne disme ne terage ne rente ne service *et* leus .II. p[ars] [...] [3] \6 droite disme *et* ces .VIII. muis de tere doivent li bourgois keusir [...] [4] \7 tere; *et* a cest p*re*merain aoust q*ue* nos atendons, doivent il prendre .XVI. r. \8 de blet le semure *et* .XVI. r. de marc tout avestit a-prendre en quel liu \9 q*u*'il volront de toutes mes teres ki sunt semencies; *et* qua*n*t cis p*re*miers aous \10 sera passés, il doivent avoir ces .VIII. muis de tere ki devant sunt nomet \11 por faire leur volenté dusques adonc que li termes sera passés, ki ci devant est \12 només; *et* s'il avenoit

Figure 10: Online edition of a document in DocLing.

Based on the successful integration of the DocLing data into the DEAF database and the semantic mapping of the lexical units, we foresee the possibility to establish an automated interlinking process using the *occurrenceID* of each DocLing fiche and DocLing occurrence, respectively. This needs to be further evaluated in a follow-up study.

Independent from the above-described data integration is an approach that parts from the XML/TEI data of a digital text edition, as described in Tittel, Bermúdez-Sabel and Chiarcos (accepted paper): With the insertion of RDFa compliant attributes (*cf.* Herman et al. 2015) into the existing XML elements, the data of the text edition can automatically be enriched with hyperlinks to the DEAF dictionary. The fact that the DocLing corpus texts are published in an XML/TEI format (TEI Consortium 2017) makes this a promising approach for the creation of references from DocLing to DEAF.

8 Conclusion

To the best of our knowledge, this is the only example of a retrospective and successful integration of two voluminous and longstanding projects of a historical (Romance) language both from a graphical and a semantic point of view. We have implemented a semi-automated process resulting in a time-saving editorial workflow. We argue that our approach to fully integrate the corpus data of DocLing is a promising way to solve the problem of semantic mapping. We show how to perform the semantic mapping of the lexical units of DocLing using an existing dictionary writing system. A flexible publication concept with two release steps compensates for the time-consuming semantic integration, as it makes it possible to publish two versions of each dictionary entry: one that is created in a completely automated way, and another that shows the result of the manual post-processing with linguistic expertise. This clearly contradicts Asmussen 2013: 1087: “Combining existing dictionaries with existing corpora will inevitably yield products of second quality”.

Also, we conclude that the integration of DocLing and DEAF is a promising pilot project for the integration of other corpus linguistic data into a dictionary. At the same time, it emphasizes the role of the DEAF as a standard reference that can also be used for other single scholarly editions of Old French texts that are digitally published.

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