

# Report

## DFG reference number and title

GE 1864/1-1 – Entwicklung von Funktionalbegriffen im Französischen

## Project head

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## 1 State of knowledge and goals

French is characterized by a large number of nouns denoting functional concepts (FCs), such as *adresse*, *affaire*, *beauté*, *contenu*, *destin*, *longueur*, *épaisseur*, which assign an aspect or dimension with a value to a possessor argument. FCs show up syntactically as definite abstract nouns in a constructional head-noun position with their referent in dependent possessor argument position – in French typically realized as possessive *de*-construction – and with the value realized as a predicate, “object of measurement” or something similar: *La température de l'eau monte à trente degrés Celsius*. [with: *température* = FC, *eau* = POSSESSOR, *monte à* = OPERAND, *trente* = VALUE, *degré* = DIMENSION UNIT, *Celsius* → DIMENSION MEASURE].

The majority of these nouns are derived and nearly always transparent; they can either be traced back to descriptive adjectives (*long* → *longueur*) or to verbs (*contenir* → *contenu*). The project concentrated on the development of deverbal nouns, because these undergo significant semantic changes – on the basis of associative cognitive processes like metonymy and metaphor – in their transformation from verbs to functional nouns. Thus the transition from event frames to attribute frames seems to be decisive for concept development. Conversely, deadjectival nouns derived from descriptive adjectives like *long* → *longueur* show only minimal semantic change in their transition from property to functional concepts.

French deverbal nouns often comprise both sortal and functional readings and thus make concept formation easily observable. Many cases even evidence ambiguity between different readings, which may indicate pre-established points, in which change occurs in a radial semantic network. These frequent ambiguities often make it difficult to distinguish between sortal and functional readings without having supplementary contextual or situational information. Most deverbal nouns show fine-graded transitions from sortal event readings via resultative readings to functional readings or even sortal object readings (see *chauffage*, *col-*

*lection, composition, barrage, publication, corruption*).

To a large extent, French nouns denoting FCs are etymologically transparent. En. *size*, for example, goes back to an Old French posture verb denoting an event which was transformed via participle to a noun denoting a functional concept in Middle French: OFr. *asseoir* ‘to cause to sit’ → OFr. *assise* [PP fem. of *asseoir* ‘cause to sit’] → OFr. *assise* [verbal noun] ‘session, assessment, regulation, manner’ → MFr. *assise* ‘extent, amount, magnitude’ [*qe assyse de pain et de cervoise seit bien tenue* ‘that the assize of bread and beer be kept’ (as ordained)]. Thus, FC-formation in French shows astonishing parallels to Greek and Latin formations more than a thousand years before.

Once fully developed, FCs are qualified to perform domain specific functions. The following example shows ongoing metaphoric use of an FC, which allows different dimensional values to be assigned to its referents: Lt. *subjectum* ‘subject’ [logical meaning] → Fr. loan (1580) *sujet* ‘subject’ [logical meaning] → *le sujet d’une discussion* ‘subject of a discussion’ [communicative meaning] → *le sujet d’un roman* ‘subject of a novel’ [literary meaning] → *le sujet d’un tableau* ‘subject/theme of a picture’ [pictorial meaning], etc.

## 2 Results and their significance

### Objective 1: Synchronic and diachronic inventories of French FCs

Since no survey of FCs in French exists, the project started by gathering data from different domains (like *couleur, chaleur, forme, longueur, température*). We then initiated a more systematic investigation of the Modern French reference dictionary *Le Petit Robert* (PR), which allows us to estimate the full extent of Modern French FC use. The selected nouns were stored according to their different readings and pro and con arguments are added for doubtful cases. Our dictionary search produced an unexpectedly large number of nouns having at least one functional reading. The exact statistics for the letters J, K, L are as follows:

- J: 323 nouns, 87 having at least one functional reading (27%)
- K: 180 nouns, 36 having at least one functional reading (20%)
- L: 1070 nouns, 288 having at least one functional reading (36%)

If this can be corroborated with other data, it seems that French nouns are highly polysemous and at least 20% to 30% of them are potentially functional. Unfortunately, finding functional readings proves to be problematic.<sup>1</sup> Meaning definitions in dictionaries and short text extractions without context generally fall short of what is needed to unambiguously identify functional readings (see *chauffage, barrage, composition, construction, entrée, installation, publication*, and so on). For example, a deverbal noun like *chauffage* allows sortal and functional readings: 1) sortal event readings (*le chauffage de l’eau de piscine est une activité très énergivore*), 2) sortal object readings (*le chauffage est détraqué, le chauffage est dans le salon, le chauffage est au gaz*) and 3) functional readings (*le chauffage de la maison coûte cher, le*

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<sup>1</sup> This pertains in particular to deverbal nouns, whereas the concept types of deadjectival and denominal nouns are much more stable (*voyage, courage, langage* and *grandeur, longueur, profondeur*).

*chauffage est très rapide*).<sup>2</sup> Moreover, many readings only partially fulfill currently known criteria for FCs and are per se difficult to classify. These preliminary results indicate that deverbal nouns are particularly subject to type-shifting and require closer investigation, in order to generate a more precise classification of FCs.

An independent comparative sample of Old French nouns elicited contrasting results because of its overt lack of loans from Greek and Latin. Therefore, FCs had to be newly created in OFr. from native verbs. What is most astonishing is that the starting points revert back to the same sensory-motor bases and the semantic and formal processes involved follows the same routes that were traversed more than a thousand years before in Ancient Greek and Latin. Accordingly, OFr. deverbal nouns with functional readings are usually derived from verbs of GRASPING, HOLDING, STANDING, SITTING, etc.

Lt. *taliare* ‘cut off’ → OFr. *taillier* ‘cut off’ → *la taille* [*et me plesoit ma bealtee et ma taille* ‘and my beauty and my shape pleased me’]

Lt. *destinare* ‘to put (firmly on the ground)’ → OFr. *destiner* → *la destinée* [*pres du jour de sa mortelle destinee* ‘near the day of his deadly destiny’]

Lt. *trahere* ‘draw’ → *adtrahere* ‘heranziehen’ → OFr. *atraire* → *l’atrait* [*la alme sovent se assent a mal par atret de la char* ‘the soul often consents to sin by the desire of the flesh’]

These findings have not been sufficiently reflected in prior research, because OFr. was predominantly thought of as a “concrete” vernacular language scarcely endowed with abstract FCs.

## Objective 2: Semantic and formal principles of French FC-formation

Further and more systematic investigations of frequent deverbal nouns clearly support the assumption of kinesthetic grounding of FCs. An etymological investigation produced the surprising result that many nouns denoting them can be traced back to an exclusive group of verbs standing for sensory-motor concepts firmly grounded in human perception and action (Lt. *tenere* → *continere* → *contentum*, OFr. *faire* → Fr. *affaire* → Fr. *affaire*). These findings will be integrated into a general theory of embodiment reflecting current cognitive research in experientialism (see Hans Geisler: *Sensory-motor foundation of functional concepts*. Paper read at the Conference on *Concept Types and Frames in Language, Cognition and Science*, Düsseldorf, 20-22 August, 2007).

## Objective 3: Lexical and grammatical integration of FCs

### Objective 3a: Derivation

A great majority of nouns denoting FCs shows suffixal derivation. Depending on the suffix this group comprises many more functional readings due to the high percentage of deverbal and deadjectival nominalizations like *chauffer* → *chauffage* or *épais* → *épaisseur*. As a control sample from *PR* we used derived nouns with specific suffixes like *-age* (1479 ex.), *-ée*

<sup>2</sup> In some cases the type of suffix indicates the event or object reading (see *assemblage* vs. *assemblée*).

(336 ex.), *-ité* (931 ex.), *-tion* (2050 ex.), etc.

For example *-ité* has many native developments with deadjectival nouns (Lt. *fidelitas* → OFr. *feauté* ‘fealty’, Lt. *societas* → OFr. *soistié* ‘community, cohabitation, rent’, Lt. *aequalitas* → OFr. *ivelté, oelté* ‘even temper, moderation; [law] owelty’), which in most cases could not outlive the learned loans from a high-variety language like Latin (see learned Fr. *fidélité* ‘fidelity’, *société* ‘society’, semi-learned Fr. *égalité* ‘equality’). They have only survived within semantic niches (see OFr. *assise* ‘session’ → Fr. *Cour d’assises* ‘Assize Court’) or by lexicalizing a sortal object reading (see Lt. *civitas* ‘citizenship, community of citizens’ → Fr.  *cité* ‘city’, Lt. *manere* ‘to stay, to remain’ → Lt. *mansio* ‘sojourn, dwelling’ → Fr. *maison* ‘house’). Concretizations by way of metonymies like ACTIVITY FOR OBJECT or PLACE are frequent in Fr. (see with suffix *-age*: *armée, gelée, étage*, etc.).

### Objective 3b: Formal criteria for FCs (definiteness and possession)

FCs assign an aspect or dimension with a value to a possessor argument. They normally show up as definite nouns in a constructional head-noun position with their referent in dependent possessor argument position (cf. *la température de l’eau*). Therefore, the necessary (but not sufficient) formal conditions for FCs seem to be definiteness of the noun denoting the FC in association with a possessor-argument. We used these conditions to devise strategies for extracting nouns with functional readings from text by purely formal means. For test runs, we searched in *Frantext* (16<sup>th</sup> to 20<sup>th</sup> c.) for frequent spatial FCs, such as *dimension*, *grandeur*, *hauteur*, etc. For example, the number of matches for *dimension* amount to 4,519; for *grandeur* to 7,131; and for *hauteur* to more than 8,000. Restricting the search to 98 texts (comprising the time span between 1981- 1997) provided the following results:

1. *dimension* : 75 out of the 161 entries are singular; 36 % of them are used with a definite article; and 73 % in a possessive construction (i.e. preceded by a possessive pronoun or followed by a *de*-complement).
2. *hauteur* : 330 out of the 386 entries are singular; 45 % of them are used with a definite article; and 83 % in a possessive construction.

Most interesting is that between 90 % and 100 % matches pertaining to spatial FCs are specified in relation to their value. This specification can be expressed in various ways: by definite articles, possessive constructions, demonstrative pronouns, adjectives or relative clauses. Our findings in French texts confirm the FC criteria for English and German (see project report A5):

1. French FCs require a specification of definiteness which can be expressed either by definite articles or by possessive constructions.
2. The fact that a large majority of FCs occur with some kind of specification underlines their importance as attributes in frames (cf. Barsalou 1992).

Another – purely formal – search by means of an elementary query like  $(le|la|l’)\ &e(g=S)(de|du|de\ la)$  comprised 7 texts for a reduced search period from 1990 to 1991 and provided more than 1000 hits. Set up using *Frantext*’s own query language, the query will find all singular nouns immediately preceded by a definite article and immediately followed by a possessive construction. Nearly all extracted nouns have functional readings; which are predominantly induced by context. The most important outcome is that functional noun extraction

from untagged texts can be most profitably done for French by using formal morpho-syntactic features. As an important side-effect we can even sort out context-based functional readings of nouns not indicated in dictionaries (see for example *Encouragés par ce succès, les Anglais vont, l'année prochaine, élever encore six mètres le barrage du Nil*, Pierre Loti, *La mort de Philae*, 1909, 1349). This detail points to the fact that functionality in nouns, especially with deverbal nouns, seems to be highly context dependent.

It is quite possible that a more detailed analysis regarding the frequency of certain noun types and the verbs employed together with certain nouns could provide additional information on different degrees of functionality. We will focus on this in the follow up project.

### **Objective 3c: Verbal integration of FCs**

The study of the verbal integration of FCs was based on a corpus analysis. 319 texts from 1960 to 2000 were exemplarily searched for 34 representative FCs and the verbs employed together with them. 296 verbs were found with an FC in object position and 188 with an FC as subject (see Terhalle 2007).

The auxiliary verbs *être* and *avoir* are by far the most frequently employed (more than twice as much as any other verb), *être* being combined with subject and *avoir* with object FCs. Both of them can be replaced – often under idiomatic constraints – by a certain group of other verbs denoting the attribution of characteristics to a thing/person or a change in these characteristics (*prendre, atteindre, représenter, connaître, adopter*, etc.) in one of their readings.

A more detailed analysis uncovered certain parallels between the characteristics of FCs and so-called “verb models” (see Ballmer/Brennenstuhl 1986). The large group of “information verbs” for example often refers to the value scales underlying the FCs (*vérifier la température de qn, déterminer la position de qc*).

Thus, the assumptions concerning FCs in French can be verified by empirical evidence with regard to their particular verbal integration and the attribution of dimensions to possessors or values to dimensions. Analysis of the relation between more concrete and more abstract readings of FCs (for example *poids* ‘physical weight’ vs. ‘importance’) was undertaken as well, but this procedure requires an expanded data basis to produce convincing results.

### **Objective 3d: Use of FCs as subject**

The study of the role played by FCs in subject position of transitive verbs confirmed our initial assumptions for the most part. A majority of the most frequent verbs with subject FCs refers to value specifications and thus constitutes cases of pseudo-transitivity (*les relations dépassent l'intimité, la longueur excède la largeur*). They create abstract relations without agent or experiencer, which can nevertheless be readily expressed by maintaining the classical SVO sentence structure.

Another kind of pseudo-transitive verb construction refers to causal relations, in which the cause is expressed as an abstract agent. Sentences like *Son poids fit pencher la balance* or *Son comportement entraîne des dangers plus grands* create a certain objectivity of expression as the formulations avoid mentioning any kind of observer (*Le contenu des valises n'intéressait personne*).

Until recently, the detection of functional concepts has been carried out by dictionary search. The introduction of morphological constraints now allows us to reduce the number of

hits and to considerably increase the percentage of FCs among the searched nouns, because suffixes may serve as indicators of functional uses.

#### Objective 4: FCs and frames in scientific discourse

Frames are recursive attribute-value structures representing mental concepts, attributes in these frames are relationally interpreted functional concepts (Petersen 2007). Given the accuracy with which we can represent current knowledge in frames, it is possible to show how knowledge and more specifically scientific paradigms have changed over time.

We concentrated on the narrower field of Linguistic-FCs due to the fact that the history and development of this science is well-documented. Within linguistics the field of phonetics provides excellent insight into the change of a scientific branch, since its development in the last 150 years is indebted to inventions in physics and medicine and mirrors epoch-making transformations. Yet another motivation to concentrate on phonetics was the fact that French linguists like Paul Passy and Abbé Jean Pierre Rousselot were pre-eminent in the field in the 19<sup>th</sup> and 20<sup>th</sup> century.

We started with Saussure's famous *Cours de linguistique générale* (1916), because his structured approach to phonetics allows easy adaptation of FCs to attribute frames (see APERTURE, ATTITUDE, NASALITÉ, ARTICULATION etc.). Presently, we are constructing frames from texts by founders of phonetics like Passy (*Les Sons du Français*, 1887) and Rousselot (*Principes de phonétique expérimentale*, 1897) to shed light on paradigm shifts within the discipline of phonetics.

The next step will be to expand our investigation to the other linguistic disciplines, especially the theories and developments forwarded by French linguists, for example Saussure's theory of signs and his influence on semiotics.

### 3 Relation of work schedule to outcome

#### Geisler Hans

Since 01.03.2006	(8 std)	compilation and analyses of Old French FCs; etymologization of verb-based FCs; inventory of sensory-motor verb bases; verb to adjective transition; theoretical assumptions about verbalization of object affordances
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#### Gerland, Doris (WM, 1/2 BAT2A)

Since 01.03.2006	(19,5)	compilation and analyses of FCs
Since 01.09.2006	(19,5)	analyses of space-dimensional FC, analyses of value-specification by adjectives
Since 01.01.2007	(19,5)	compilation and analyses of FCs; transmission of FCs in database
Since 01.04.2007	(19,5)	compilation and analyses of functionality of nouns with special suffixes; compilation of linguistic-FC, analyses of morphological development

Since 01.09.2007	(19,5)	adaptation of Saussure's "Cours de linguistique générale" to frame structure
Since 01.11.2007	(19,5)	adaptation of Jespersen and Vietor, constructing frames, start of adaption of Passy; corpus analyses ( <i>Frantext</i> ) of space-dimensional FC concerning definiteness and possessive constructions

### Jarry, Aurélien (SHK)

15.04.2006 – 30.09.2006	(9)	collecting & analyzing FCs of space
01.10.2006 – 30.12.2006	(10)	collecting & analyzing selected FCs of different domains
01.01.2007 – 31.03.2007	(10)	collecting & analyzing all FCs with letter J, K, L (PR)
01.04.2007 – 30.09.2007	(10)	collecting & analyzing FCs with suffixes like <i>-age</i>
01.10.2007 – 31.12.2007	(10)	collecting & analyzing FCs with suffixes like <i>-ée</i>
01.01.2008 –	(12)	collecting & analyzing FCs with suffixes like <i>-tion, -ité</i>

A4

### Terhalle, Anselm (SHK)

01.05.2006 – 30.09.2006	(6)	collecting & analyzing FCs of space
01.10.2006 – 31.12.2006	(8)	collecting & analyzing selected FCs of different domains
01.01.2007 – 31.03.2007	(8)	collecting & analyzing all FCs with letter J, K, L (PR)
01.04.2007 – 30.09.2007	(8)	corpus based sense determination of FCs ( <i>Frantext</i> ); syntactic integration of FCs
01.10.2007 – 31.12.2007	(8)	corpus based sense determination of FCs ( <i>Frantext</i> ); syntactic integration of FCs;
01.01.2008 (WHK) –	(12)	beginning automated extraction of FCs

## 4 Cooperation

- **with A1:** concept type shifts in French and German; hypotheses on the grammatical integration of concept types (especially argument linked to deverbal nouns)
- **with A5:** strategies for FC-extraction from French corpora by means of standardized queries
- **with B2:** state-of-the-art of studies on neural instantiation of concepts
- **with B2:** concept transitions from everyday language to scientific language like *substance, masse, énergie, force*

## 5 Publications and activities

Geisler, Hans: Die historische Ausbildung von Funktionalbegriffen. *Tag der Forschung der Heinrich-Heine-Universität Düsseldorf*, 05.11.2006.

- Geisler, Hans: Sensory-motor foundation of functional concepts. *Concept Types and Frames in Language, Cognition and Science*, Düsseldorf, 20.-22. August 2007.
- Gerland, Doris: Möglichkeiten der Dimensionsangabe im Französischen und Deutschen. *Tag der Forschung der Heinrich-Heine-Universität Düsseldorf*, 05. November 2006.
- Gerland, Doris: Diachronic perspectives on functional nouns in French. *Concept Types and Frames in Language, Cognition and Science*, Düsseldorf, 20.-22. August 2007.
- Terhalle, Anselm (2007). „Prendre une longueur de“. *Abstrakte Funktionalbegriffe und Verben im Französischen*. Magisterarbeit. Heinrich-Heine-Universität Düsseldorf.

## 6 Research perspectives

### 6.1 For the second phase of the research unit

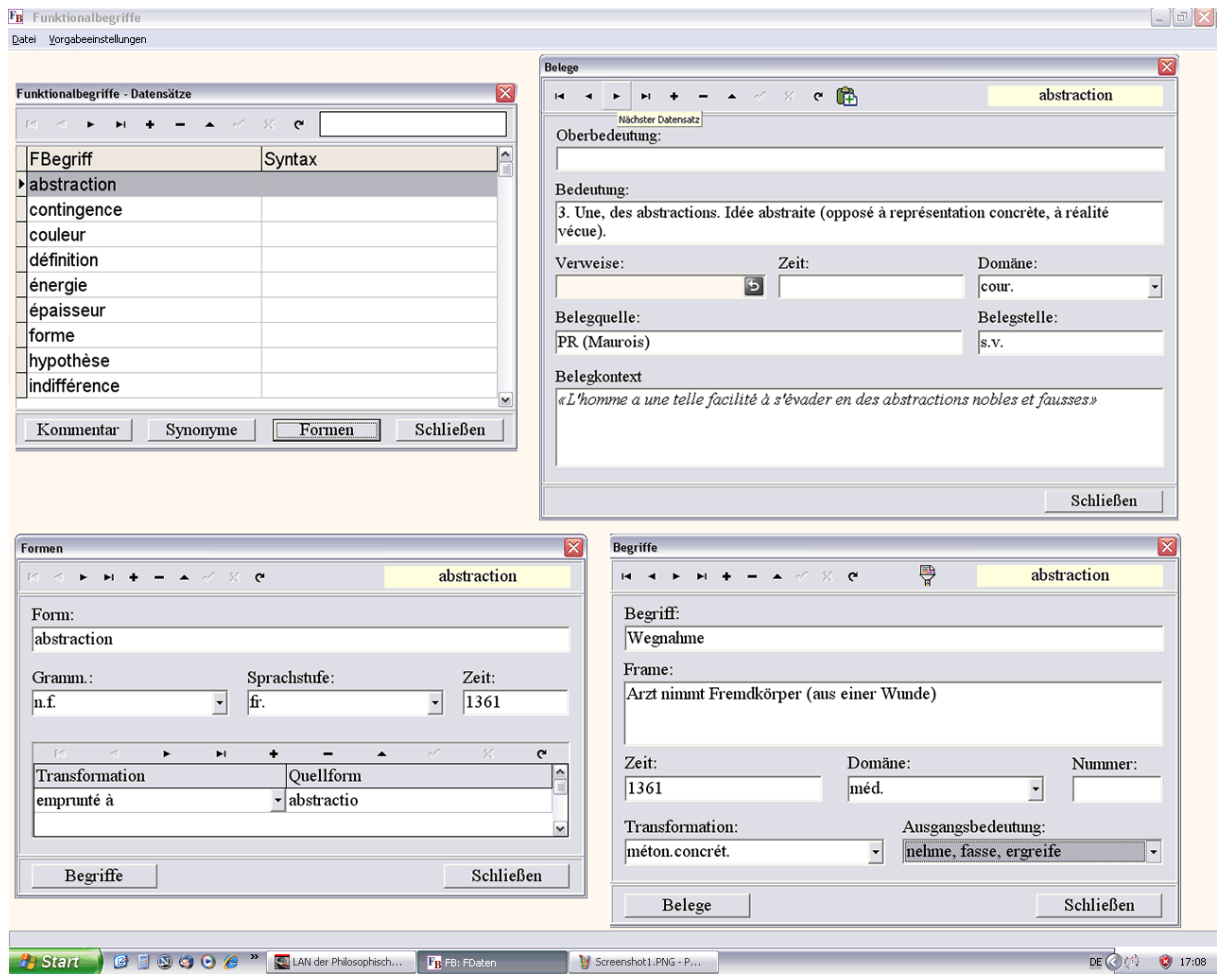
In the next project phase, it will be necessary

- 1) to define morpho-syntactic context features precisely, which can be used for a more fine-grained account of FCs in corpora (in collaboration with A5)
- 2) to concentrate on deverbal nouns to fix exact transition points from event readings to functional readings
- 3) to delimitate the sensory-motor bases for concept development, e.g. to ground FCs in perceptual and motor schemata and to confirm the embodiment theory
- 4) to trace development of FCs by metaphoric mapping using frames
- 5) to identify culture-specific differences in concept formation (in collaboration with van Valin) between SAE-languages (French, Latin, Greek) and an indigenous language of North America (Lakhota)
- 6) to refine the software tool *FBegriffe* to be able to manage and coordinate large amounts of data and to trace domain mappings exactly (see appendix 1 for a prototype)

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## Appendix 1: Software tool *FBegriffe*



Screen dump of software tool *FBegriffe*

The software tool *FBegriffe* is designed for student assistants to collect and input data for an FC from different sources in accordance with a structured methodology (see window *Belege* in the print screen above). Based on this data the concept development can be traced etymologically: Each diachronic stage is linked to a preceding and a subsequent stage by predefined formal and semantic transformations (cf. *emprunté a*, *adapté de*, *dérivé de*, *traduit d'après*, etc. and *méton.résult.*, *métaph.*, *continuation*, etc.). The screen print below identifies OFr. *abstraction* as a loan from Lt. *abstractio* ‘taking away, removal’ (see window *Formen*). References to the year 1361 can be traced to Guy de Chauliac’s famous medical text *La grande chirurgie*. As indicated, the OFr. ‘attestation’ shows a domain specific semantic narrowing to the ‘action of extracting (a foreign body from a wound)’ based on a typical event frame, such as ‘a physician removes a foreign body from a wound’ (see window *Begriffe*). The domain specific philosophical meaning ‘abstraction’ is attested in Voltaire’s *Lettres philosophiques* of 1734 and represents a second loan from Lt. *abstractio* ‘abstraction’, dating back to Boëthius’ 5<sup>th</sup> c. translation of Aristotle’s philosophical concept *aphairesis*, ‘taking away (mathematical

forms from matter<sup>3</sup>). Both deverbal nouns are derived from prefixed verbs with nearly identical concrete meanings denoting motor actions: Gr. *aphairesis* ← *aphairéō* [1P.Pres.Act] ‘I take away’ ← Gr. *hairéō* ‘I take’, Lt. *abstractio* ← *abstraho* ‘I draw away, remove’ ← *traho* ‘I draw, drag’. Thus, the concept shows a typical evolution pattern from an event frame (indicating motor action with object manipulation: ‘A person draws away an object from a place’) via participle and supine stages to a concept frame spanned by deverbal nouns like *abstractio*.

With the help of a consistent arrangement of transformation processes, concept development can be visualized by simply scrolling back and forth along the different stages (see tool bar functions ◀ and ▶)<sup>4</sup>. In addition, this strict transformation linking technique makes it possible to trace complex filiations spreading out from a single base concept, as is the case with Fr. *aphérèse* ‘aphaeresis’ which appeared in 1701 in Furetière’s *Dictionnaire universel* as a direct domain specific loan from MLt. *Aphæresis* and dates back to Gr. *aphairesis* ‘taking away (one or more sounds from the beginning of a word)’. Regularizing concept development according to similar methods should provide more precise generalizations about abstract concept formation during future project phases.

We are attempting to refine this tool. The next step will include establishing ordering conditions for all formal and semantic processes and arranging these by data input without strict classification, so that filiations can be easily reordered if necessary after new material has been inputted.

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<sup>3</sup> Cf. Aristotle’s definition of mathematical forms as *ta ex aphaireseōs*, where ‘mathematical’ stands for all abstract forms.

<sup>4</sup> Other tool bar functions allow for insertion (+) or deletion (–) of stages.