Semantic Inheritance in the Lexical Paradigms of Old English Strong Verbs

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This work delves into the semantics of Old English lexical paradigms based on strong verbs. Its aim is to describe the patterns of semantic inheritance that exist in these paradigms, which present morphologically related words sharing the form and meaning of the base of derivation. The analysis undertaken enables semantic derivation in these Old English lexical paradigms to be categorized into the lexical entailment relations of troponymy, -troponymy, backward presupposition and cause, and the semantic relations of synonymy and opposition. The research data has been retrieved from the lexical database *Nerthus* (Martín Arista et al. 2016). On the theoretical side, this examination follows the English lexical database WordNet (Princeton 2010). This research unfolds a systematic methodology that is thoroughly described and illustrated by means of the paradigm *(ge)berstan*. It has not only been possible to circumscribe semantic derivation into the six semantic relations mentioned, but also to determine how frequently they occur in the paradigms under analysis, which indicates that synonymy and troponymy are the most recurrent semantic relations.

Keywords: Old English; verbs; lexical paradigm; lexical entailment; semantic inheritance

1. Introduction

This article presents a hitherto unseen examination of Old English lexical paradigms, which goes a step further with respect to the observation of lexical semantic relatedness. In this sense, it allows us to identify not only how new meanings of derived verbs diverge from the original meaning of a primitive verb, but also what the nature of the divergence is regarding meaning specification with respect to more basic verbs.

The corpus for analysis consists of all the 328 lexical paradigms of Old English strong verbs and, therefore, it focuses on the lexical category of the verb. The analysis data, which has been thoroughly revised and updated, has been obtained from the lexical database of Old English *Nerthus* (Martin Arista et. al 2016). A total of 1,509 verbs have been examined, to wit, 328 lexical primes and 1,181 derived verbs.

With respect to lexical entailment, this article follows WordNet (Princeton University 2010), a lexical database of the English language which is based on a defined number of conceptual-semantic and lexical relations, and links the grammatical categories of nouns, verbs, adjectives, and adverbs into semantic networks. In this sense, the conducted analysis reveals that together with the four lexical entailment relations of troponymy, -troponymy, backward presupposition and cause, the semantic relations of synonymy and opposition are also central and necessary to determine the processes of meaning derivation of these Old English lexical paradigms.

The concept of lexical paradigm is based on Martín Arista (2012, 2013), who describes the derivational paradigm as consisting of a primitive of derivation and its derivatives, that is, "all the lexical items that can be related to the primitive on the basis of both form and meaning" (Martín Arista 2019, 170). The steps of analysis and the methodology are described in detail and illustrated by means of the lexical paradigm *(ge)berstan*. The research produces a semantic network for each of the 328 lexical paradigms of Old English strong verbs where the semantic relations held in the lexical paradigms have been clearly identified and scrutinized. Accordingly, this research intends to be a contribution to the research avenue in the semantics and syntax of Old English pursued, to cite some recent works, by García García (2019), Lacalle Palacios (2021a, 2021b), Martín Arista (2019, 2020, 2022) and Ojanguren López (2020, 2021).

The article is organized as follows. After a review of previous literature on the architecture of WordNet (Section 2), the research methodology is described and completely illustrated in section 3. The results of the analysis are presented in Section 4. Then, Section 5 discusses the problems found in the development of the analysis as well as the solutions adopted. The main conclusions derived from this examination are presented in Section 6.

2. Semantic relations and WordNet

Semantic relations provide important contributions to meaning and need to be understood as conceptual units in themselves. As seen in Green et al. (2002), comprehension of the world depends on our natural capacity to recognize and describe the relationships that exist between concepts:

> Conceptual structuring relationships are thus an integral part of the very foundation on which we build and organise our knowledge and understanding of the world in which we live. If concepts are seen as the basic building blocks of conceptual structure, then relationships are the mortar that holds it together. (Green et al. 2002, viii)

A significant advance in this direction is the English lexical database WordNet, which constitutes "a network of meaningfully related words and concepts" (Princeton University, 2010). WordNet gathers nouns, verbs, adjectives and adverbs based on their meanings, and determines the conceptual and semantic relationships that link them together. It arranges these semantic categories into groups of unordered cognitive synonyms (synsets), each of which express a distinct concept.

WordNet displays a total of 117,000 synsets (Princeton University, 2010), including their corresponding definition and one or more sentences to illustrate their use. All of the members of a given synset refer to the same concept and are normally interchangeable in any context. Therefore, the main semantic relation established in WordNet is synonymy. According to Miller et al. (1993, 7), "synonymy is understood as one end of a continuum along which similarity of meaning can be graded. [...] [The synonymy] relation is symmetric: if x is similar to y, then y is equally similar to x". However, as Fellbaum (1990) indicates, few absolutely synonymous verbs such as *shut* and *close* are found in the lexicon.

Most of the relationships in WordNet are between words belonging to the same part of speech. Consequently, it comprises four sub-nets, from the four parts of speech considered in the lexical database. Focusing on the part of speech of the verb, which is

the target of this research, WordNet consists of 25,047 verb word-sense pairs, 11,529 of which are unique strings and 13,767 word meanings (synsets). Verbs are classified into fifteen files, mainly in terms of semantic criteria. Fourteen of these files correspond to semantic domains and denote events or actions: "verbs of bodily care and functions, change, cognition, communication, competition, consumption, contact, creation, emotion, motion, perception, possession, social interaction, and weather verbs" (Fellbaum 1990, 279). Another file comprises verbs denoting states. Verbs in this latter category refer to states which do not share semantic properties and do not conform to a semantic domain. This classification illustrates the division found in Jackendoff's (1983, 170) and Dowty's (1979, 55) analyses between the major conceptual categories EVENT and STATE.

In relational semantic analyses such as the one carried out by WordNet, lexical items (instead of the meaning atoms used in lexical decomposition) are the smallest unit of analysis. Verb synsets are arranged into hierarchies and organized according to several entailment relations: troponymy, backward entailment, presupposition, and cause (Fellbaum and Miller 1990; Fellbaum 1998).

Regarding entailment, "a proposition P entails a proposition Q if and only if there is no conceivable state of affairs that could make P true and Q false" (Fellbaum 1990, 283). The term can be generalized to deal with the relationship established between two verbs V_1 and V_2 "when the sentence Someone V_1 logically implies the sentence Someone V_2" (Fellbaum 1990, 283). Lexical entailment is a unilateral relation: "if a verb V_1 entails another verb V_2, then it cannot be that case that V_2 entails V_1". Nevertheless, there is an exception when the relationship established is one of synonymy, since both verbs share the same sense and, therefore, are mutually entailing.

Troponymy, the most prevalent of these entailment relations, represents a special case of entailment where pairs are temporally co-extensive. It links synset pairs in which one member denotes a particular manner of the other and conforms to the formula *"To V_1 is to V_2 in some particular manner"* (Fellbaum 1990, 285). Troponymy constructs hierarchies of different levels of specificity as in {communicate}-{talk}-{whisper}. As one goes down a verb hierarchy, the range of nouns that the verbs can take as potential arguments on a specific level decrease. "This seems to be a function of the increasing elaboration and meaning specificity of the verb" (Fellbaum 1990, 287).

Conversely, when verb pairs are related by a lexical entailment relationship in which there is proper temporal inclusion, as in *snore* and *sleep,* they are associated by -troponymy. In this sense, *snore* entails *sleep* and is included in *sleep*. However, it is not possible to say that *sleep* entails *snore.*

After synonymy and troponymy, opposition is the most frequent semantic relation coded in WordNet. As Fellbaum (1990) explains, numerous verb pairs in a relationship of opposition share an entailed verb. For instance, in the pair 'hit/miss', both verbs entail 'aim'. 'Aim' is a prerequisite to both 'hit' or 'miss'. Thus, these activities take place sequentially: the activity described by the entailed verb ('aim') precedes the activity described by the entailing verb ('hit' or 'miss'). This kind of entailment, which does not present temporal inclusion, is known as backward presupposition and also occurs between some verb pairs associated by a result or purpose relationship, like 'fatten-feed'. As Fellbaum (1990, 289) remarks, "a verb V_1 that is entailed by another verb V_2 via backward presupposition cannot be said to be a part of V_2. Part-whole statements between verbs are possible only when a temporal inclusion relation holds between these verbs".

Focusing on the causal relation, according to Fellbaum, one of the two verb concepts involved in a causative relation is the causative (such as 'give'), while the other is called the resultative (such as 'have'). The causative verb is naturally transitive and its subject differs from that of the resultative. The subject of the resultative verb is an object of the causative. This relation is inherited by the synonyms of the members in a pair and, therefore, it remains between the whole concept instead of between individual word forms. For instance, "the synonyms {teach, instruct, educate} [...] are all causatives of the concept {learn, acquire knowledge}" (1990, 291). Nevertheless, in contrast to entailment, the troponyms of each of these concepts do not inherit the causation relation. Fellbaum (1990, 291) remarks that "causative verbs have the sense of 'cause to be/ become/ happen/ have or cause to do'. That is to say, they relate transitive verbs to either states or actions". In this sense, the verb 'give' is connected to the stative verb 'have', while 'raise' is connected to the action described by 'rise'. In both examples, causation is seen as a sort of change. Numerous verbs have the semantics of a causative change like these; however, if they do not constitute lexicalized causative-resultative pairs, they are not recognized in WordNet. In English, many verbs present both a causative and an anticausative use. The great majority of them are verbs of change, which present both a transitive causative and intransitive anticausative form. Similarly, this causative relation appears systematically among the verbs of motion.

Causation is a particular kind of entailment: "if V_1 necessarily causes V_2, then V_1 also entails V_2" (Carter 1976 in Fellbaum 1990, 291). In this case, Carter notes that verbs such as 'bequeath' and 'own' display a kind of entailment also characterized by the lack of temporal inclusion. Moreover, it presents a unidirectional relation; that is, for somebody to 'have' something does not imply that he or she was 'given' it.

To recapitulate, the four different types of lexical entailment coded in WordNet can be classified in terms of temporal inclusion into two mutually exclusive categories. This is represented in Figure 1.
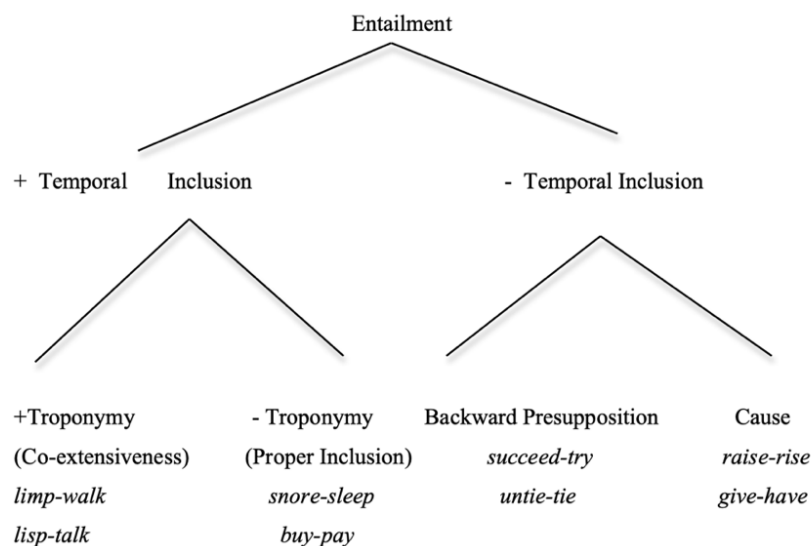

Figure 1. Types of verb entailment (Fellbaum 1990, 292).

A deeper examination of these lexicalized concepts brings to light systematic divergences which can be described in terms of similarities or contrasts. These differences among concepts are referred to as semantic relations. As explained above, WordNet depicts word meanings based on a limited number of conceptual-semantic and lexical relations. It clusters verbs into semantically linked groups, each of them denoting a variety of elaborations of one core concept. As Fellbaum puts it, "subsets of particular kinds of manners tend to cluster within a given semantic field, where the semantic feature is part of most verbs' semantic make-up, but is present to a varying degree in the related verbs" (2002, 26). Moreover, it has been observed that apart from being semantically linked, the members of each group tend to share syntactic properties and selectional restrictions.

3. Terminological remarks, data and steps of analysis

Although the relations discussed in this study are based on WordNet, their application to this research requires some explanation. As regards entailment, Fellbaum (1990, 283) notes that in strict implication "a proposition *P* entails a proposition *Q* if and only if there is no conceivable state of affairs that could make *P* true and *Q* false". However, this study has preferred a more general definition of entailment described as the relation found between two verbs V_1 and V_2 "when the sentence Someone V_1 logically entails the sentence Someone V_2" (Fellbaum 1990, 283). The reason for this choice has to do with the fact that neither mental associations nor semantic worlds can be described with such a confining or limited definition as the former.

The analysis data consist of 328 lexical paradigms of Old English strong verbs, including 328 lexical primes and 1,181 derived verbs. This information has been obtained from the lexical database of Old English *Nerthus* (Martín Arista et al. 2016). All in all, 1,509 verbs have been examined; this corresponds to all strong verb lexical primes of Old English and about 1/5 of the verbs contained in *Nerthus*. Most of the derived verbs are strong verbs derived from strong verbs, as in the group of derivatives of *drīfan* 'to drive', which covers the strong verbs *ādrīfan* 'to drive', *bedrīfan* 'to beat', *eftādrīfan* 'to reject', *eftfordrīfan* 'to drive away', *fordrīfan* 'to sweep away', *framādrīfan* 'to remove', *framādrȳfan* 'to drive away', *indrīfan* 'to ejaculate', *oferdrīfan* 'to overcome', *onwegādrīfan* 'to drive away', *tōdrīfan* 'to scatter', *ðurhdrīfan* 'to drive through', *ūtādrīfan* 'to drive out', *ūtdrīfan* 'to expel' and *wiðdrīfan* 'to repel'. On the other hand, weak verbs are derived from adjectives (*eald* 'old' > *ieldan* 'to delay') and nouns (as in *cuss* 'kiss' > *cyssan* 'to kiss') and, consequently, since they pertain to the lexical paradigms of these categories they are not considered in this analysis. Nevertheless, if there is the case that a weak verb comes from the strong verb itself or from adjectives or nouns based on strong verbs, they are included in the paradigms under examination. This can be illustrated by the group of class 1 weak verbs *ādrǣfan* 'to drive away', *fordrǣfan* 'to compel', *tōdrǣfan* 'to scatter', *ūtādrǣfan* 'to drive out', which derive from the class 1 weak verb *drǣfan* 'to drive', which, in turn, derives from the noun *drāf* 'action of driving' which, ultimately, derives from the strong verb *drīfan*.

After retrieving the data, all the 328 lexical paradigms have been revised and updated. First, members of non-verbal classes have been put aside for the analysis. Then, the verbal meanings rendered by *Nerthus* have been verified with the advantage of the revised meaning definitions of the Old English lexicon provided by Martín Arista and

Mateo Mendaza (2013) and the studies in homonymy by Vea Escarza and Tío Sáenz (2014) and Tío Sáenz and Vea Escarza (2015).

Once the paradigms have been reviewed and validated, the primitive verb for each paradigm has been selected along with all its different meanings. The various meanings have been organized into synsets or sets of cognitive synonyms (Cruse 1986). Next, the meanings of the derived verbs of every prime have been identified and equally organized into synsets. Finally, the resulting synsets of each lexical paradigm have been mapped by means of the previously described conceptual relationships of troponymy, -troponymy, backward presupposition, cause, synonymy and opposition.

Throughout the analysis, this study has come across a number of cases where a pair of synsets can be linked by means of opposition as well as backward presupposition, such as 'tie/untie', 'roll/unroll' or 'sleep/awake'. In this case, since it signals the direction of entailment, the more detailed relationship of backward presupposition has been adopted. The lexical paradigm *(GE)BERSTAN* illustrates this methodology. Table 1 presents the primitive and derived verbs belonging to this paradigm once the different meanings of every verb have been identified.

Table 1. The lexical paradigm *(ge)berstan*.

(GE)BERSTAN
(ge)berstan (primitive) 'to dash, crash; to burst; to resound; to escape; to fail; to fall; to break, crack'.
āberstan 'to burst; to burst out, break out; to be broken; to break away, escape'.
forberstan 'to break; to burst asunder; to vanish; to fail; to let go by default'.
forðberstan 'to burst; to break forth'.
tōberstan 'to go to pieces, shatter; to break in two; to be rent asunder; to burst apart; to cause to burst apart; to break out'.

In the table above, the distinct meanings of the verbs in the paradigm are separated by means of a semicolon. In order to proceed with the analysis, it has been necessary to organize the meanings of the verbs of the paradigm into sets of cognitive synonyms. In the first place, the synsets of the primitive verb have been identified. If any of the derived verbs includes an identical meaning, this is included into the synset of the primitive. Then, the synsets resulting from the meanings of the derivative verbs are sorted out. Table 2 shows the lexical paradigm *(ge)berstan* organized into synsets.

Table 2. The lexical paradigm *(ge)berstan* organized into synsets.

(ge)berstan (primitive) 'to dash, crash'.
(ge)berstan (primitive), *āberstan* 'to burst'.
(ge)berstan (primitive) 'to resound'.
(ge)berstan (primitive), *āberstan* 'to escape'.
(ge)berstan (primitive), *forberstan* 'to fail'.
(ge)berstan (primitive) 'to fall'.
(ge)berstan (primitive), *forberstan* 'to break, crack'.
āberstan, forðberstan, tōberstan 'to burst forth, break forth, burst out, break out'.
forberstan, tōberstan 'to burst apart, burst asunder'.
āberstan 'to break away'.
forberstan 'to let go by default'.
forberstan 'to vanish'.
tōberstan 'to break in two'.
tōberstan 'to go to pieces, shatter'.

> *āberstan* 'to be broken'.
> *tōberstan* 'to be rent asunder'.
> *tōberstan* 'to cause to burst apart; to break out'.

The analysis of the lexical paradigm *(ge)berstan* provides seventeen different synsets, seven of which belong to the primitive verb. The following step associates the synsets of the primitive verb with those of the derived verbs by means of the conceptual relationships of troponymy, -troponymy, backward presupposition, cause, synonymy and opposition. In the paradigm under analysis, all the synsets belonging to the derivative verbs except for *tōberstan* 'to cause to burst apart; to break out' are linked to a synset of the primitive verb. Then, the final step is to link the remaining synset to one of the synsets of the derivative verbs. The resulting paradigm can be seen in Table 3.

Table 3. Conceptual semantic relationships in the lexical paradigm of *(ge)berstan*.

(ge)berstan (primitive) 'to dash, crash'	
(ge)berstan (primitive), *āberstan* 'to burst'	← *āberstan, forðberstan, tōberstan* 'to burst forth, break forth, burst out, break out'
	← *forberstan, tōberstan* 'to burst apart, burst asunder'
	⬅ *tōberstan* 'to cause to burst apart; to break out'
(ge)berstan (primitive) 'to resound'	
(ge)berstan (primitive), *āberstan* 'to escape'	↔ *āberstan* 'to break away'
	⬅ *forberstan* 'to let go by default'
(ge)berstan (primitive), *forberstan* 'to fail'	↔ *forberstan* 'to vanish'
(ge)berstan (primitive) 'to fall'	
(ge)berstan (primitive), *forberstan* 'to break, crack'	← *tōberstan* 'to break in two'
	← *tōberstan* 'to go to pieces, shatter'
	⬅ *āberstan* 'to be broken'
	⬅ *tōberstan* 'to be rent asunder'

KEY
TROPONYMY: Entailing synset → Entailed synset
-TROPONYMY: Entailing synset ⇢ Entailed synset
BACKWARD PRESUPPOSITION: Entailing synset ⬌ Entailed synset
CAUSE: Entailing synset ⬅ Entailed synset
SYNONYMY: Entailing synset ↔ Entailed synset
OPPOSITION: Entailing synset ◆——◆ Entailing synset

The table above represents the conceptual semantic relationships that exist in the lexical paradigm *(ge)berstan*. These include the lexical entailment relations of troponymy, -troponymy, backward presupposition and cause, as well as the semantic relations of synonymy and opposition. As can be seen, all of the synsets of the derived verbs can be linked either to the synsets of the prime verb or to any of the synsets belonging to the derived verbs. Meaning derivation is perfectly cleared up. In this sense, the entailing synset *(ge)berstan* (primitive), *āberstan* 'to burst' entails by means of troponymy the synsets *āberstan, forðberstan, tōberstan* 'to burst forth, break forth, burst out, break out' and *forberstan, tōberstan* 'to burst apart, burst asunder'. The latter,

in turn, is entailed via the relationship of cause by the synset *tōberstan* 'to cause to burst apart; to break out'. Then, the synset *(ge)berstan* (primitive), *āberstan* 'to escape' is related by the mutually entailing relationship of synonymy to the synset *āberstan* 'to break away', as well as entailed through the relation of cause by *forberstan* 'to let go by default'. Then, the synset *(ge)berstan* (primitive), *forberstan* 'to fail', is related by means of synonymy to *forberstan* 'to vanish'. Finally, *(ge)berstan* (primitive), *forberstan* 'to break, crack' gives way to two different troponymy relations with *tōberstan* 'to break in two' and *tōberstan* 'to go to pieces, shatter' and two backward presupposition relations with *āberstan* 'to be broken' and *tōberstan* 'to be rent asunder'.

4. Results

In this section, the results of the analysis are presented, discussed by semantic relation (troponymy, -troponymy, backward presupposition, cause, synonymy, and opposition) and considered from the perspective of semantic inheritance.

The relationships resulting from this analysis produce a semantic network for each of the 328 lexical paradigms of Old English strong verbs. Morphologically related words pertaining to the same lexical paradigm share the form and meaning of the base of derivation and are semantically related. However, the type of semantic relations present in the lexical paradigms had not yet been identified. The analysis carried out in this research allows us to take a step further with respect to the observation of semantic relatedness in the lexical paradigms. It has made it possible to determine not only how new meanings deviate from the original meaning, but also the nature of the divergence as regards meaning specification with respect to more basic verbs.

To carry out this task, meanings have been assembled into synsets. A total of 2,239 relationships have been established among the synsets resulting from the 328 lexical paradigms. The lexical entailment relations established (troponymy, -troponymy, backward presupposition and cause) amount to 1,222. On the other hand, the semantic relations of synonymy and opposition present a total of 1,017 associations.

In the remainder of this section, the lexical entailment relations presenting temporal inclusion (troponymy and -troponymy) are considered first. Then, the results obtained in those lacking temporal inclusion (presupposition and cause) are discussed. Finally, the results of the analysis regarding the mutually entailing relations of synonymy and opposition are presented.

As far as troponymy is concerned, it constitutes a specific case of entailment where synsets are temporally co-extensive. Troponymy links synset pairs in which one refers to a particular manner of the other. That is, a synset S_1 denotes a specific manner of a more general synset S_2. The analysis shows that a total number of 739 pairs of synsets are associated via troponymy. The examples in (1) illustrate this point:

(1)
   ĀGAN: (ge)āgnian 'to inherit' → *āgan* 'to obtain';
   BIDDAN: ābǣdan 'to force out' → *ābǣdan, (ge)bǣdan* 'to force, compel, press, constrain';
   BIDDAN: ābǣdan, bādian 'to take by way of a pledge or fine, to take a toll'→ *ābiddan* 'to obtain';

BRŪCAN: ðurhbrūcan 'to enjoy thoroughly' → *brūcan, (ge)brȳcian, (ge)brȳcsian* 'to enjoy';

CWEÐAN: wiðercwiddian 'to murmur' → *(ge)cweðan, cwiddian* 'to speak';

ÐURFAN: (ge)ðearfan 'to starve' → *ðurfan* 'to want, be needy';

ÐWĒAN: āðwēan 'to baptise'→ *(ge)ðwēan, āðwēan* 'to cleanse';

(GE)LĪÐAN: (ge)lǣdan 'to lift'→ *(ge)lǣdan* 'to cause to move';

SWINGAN: sypian 1 'to scourge to death'→ *wingan, āswingan* 'to ship, scourge, swinge, flog'.

The complex structure of some of the Old English verbs found in the paradigms of the strong verbs results in atypical troponymy associations as in *BĒATAN: ofbēatan* 'to beat to death' → *(ge)bēatan, ābēatan* 'to beat, strike, pound, dash'; *BĪTAN: ābītan, forbītan* 'to bite to pieces, to bite in pieces, destroy by beating'→ *(ge)bītan* 'to bite;' *DELFAN: fordelfan* 'to destroy by digging'→ *delfan, ādelfan, fordelfan* 'to delve, dig, excavate, burrow'; *HNĪTAN: ofhnītan* 'to kill by butting, gore to death'→ *hnītan* 'to gore'; *RĪDAN: gerīdan* 'to seize, take possession of, reach or obtain by riding'→ *rīdan, ārīan, gerīdan* 'to ride'; and *WEORPAN: ofweorpan, ofworpian* 'to kill by casting (stones, missiles, etc.)' → *(ge)weorpan 1, āweorpan, forweorpan, worpian* 'to cast, throw, fling'. These pairs of synsets linked by troponymy do not represent archetypical cases of troponymy. Due to the complexity of certain Old English verbs, it is necessary to contextualize them before conducting the analysis. Furthermore, syntax may occasionally make the identification of a given semantic association more complicated. Whereas *BĒATAN: ofbēatan* 'to beat to death' is readily identifiable as a particular manner of *(ge)bēatan, ābēatan* 'to beat, strike, pound, dash', the recognition of *DELFAN: fordelfan* 'to destroy by digging' as a troponym of *delfan, ādelfan, fordelfan* 'to delve, dig, excavate, burrow' may be not so instantaneous. In effect, *fordelfan* 'to destroy by digging' is not so different from 'to dig to destruction'.

Throughout this research I have also come across three examples in which the semantic proximity both between active accomplishments of consumption and causative accomplishments of destruction, and between active accomplishments of creation and causative accomplishments of formation or configuration is noticeable. This can be seen in (2):

(2)

BRUCAN: forbrīcan 'to consume, use up'→ *forbrīcan* 'to destroy';

ÐICGAN: (ge)ðicgan, āðecgan, ðecgan 'to consume'→ *ofðecgan* 'to destroy';

SCIERPAN: (ge)scieppan 'to change, transform, deform'→ *(ge)scieppan, āscieppan* 'to make, create, form'.

In this sense, we can say that 'to consume something' is a particular manner of 'putting an end to, extinguish, or doing away with something'. Likewise, 'to change, transform, deform' is a particular manner of 'forming something'.

Finally, figurative meanings can also give rise to particular troponymic associations. The analysis shows two instances: *SĒON: ðurhsēon* 'to see into, penetrate with the sight'→ *ðurhsēon* 'to penetrate' and *LŪTAN: gelūtan* 'to entreat'→*(ge)lūtan* 'to stoop'. Not unlike troponymy, -troponymy involves temporal inclusion. However, pairs of synsets associated by -troponymy involve proper temporal inclusion rather than co-

extensiveness. Besides which, -troponymy permits entailment in either direction. This relation has turned out to be the second least frequent in the paradigms under analysis. The total number of pairs of synsets associated via -troponymy amounts to 73. Examples are presented in (3):

(3)
DRĒOSAN: ādrēogan 'to pass or spend time' ⇢ *(ge)drēogan* 'to pass life, lead (a certain) life';
FARAN: *offaran* 'to overtake (an enemy)' ⇢ *fyrdian* 'to be at war';
FĒOGAN: gefēogan 'to persecute'⇢ *figan* 'to be at enmity';
GIELDAN: *angildan* 1, *ongieldan* 'to atone for'⇢ *forgieldan* 'to make good'.
IERNAN: *ofirnan* 'to tire with the running' ⇢ *(ge)iernan* 1, *(ge)ærnan* 1 'to run';
PLEGAN: *plegan* 'to play'⇢ *plēon* 'to adventure oneself';
RǢDAN: radian 'to hasten'⇢ *radian 'to be quick'*;
SACAN: andsacian, forsacan, onsacan 'to object to, gainsay, contradict' ⇢ *sacan* 'to disagree';
SLǢPAN: āslǣpan 'to dream'⇢ *(ge)slǣpan, onslǣpan, slēpan* 'to sleep';
SWERIAN: *ofswerian* 'to abjure, deny an oath' ⇢ *swerian, āswerian* 'to swear, make or take an oath'.

Considering WordNet classification as well as Jackendoff's (1983) and Dowty's (1979) division between the categories event and state, it is noteworthy to mention that the relationship of -troponymy is predominantly established between two synsets displaying events. Only a 31% of the pairs of synsets associated by -troponymy present, at least, one state, and just a 2,7% of the pairs associated by -troponymy involve two states. Regarding the latter, two examples have been found in the analysis: *DRĒOSAN: ādrēogan* 'to pass or spend time' ⇢ *(ge)drēogan* 'to pass life, lead (a certain) life' and *SLĪDAN: āslīdan* 'to be hurt or destroyed' ⇢ *slīdan* 'to be transitory, unstable or perishable'.

Concerning backward presupposition, the verbs associated do not exhibit temporal inclusion. This relation presents a special type of association in which the entailed synset precedes the entailing synset in time. That is, two synsets (or rather the states or events that they refer to) occur sequentially. The total number of pairs of synsets associated by this conceptual-semantic relationship is 186. Regarding Jackendoff's (1983) and Dowty's (1979) division between the categories of event and state, the analysis has shown that this semantic relationship normally involves state or change of state types. It is important to note that, out of the 186 pairs of synsets associated by means of backward presupposition, 168 involve at least one state or change of state; that is a 90.32% of the total number. Some examples are shown in (4):

(4)
BRĒOÐAN: ābrēoðan 'to come to nought' ⇒ *ābrēoðan* 'to fall away, fail';
CUNNAN: (ge)cūðian 'to regard ⇒ *(ge)cunnan, oncunnan* 'to know, be acquainted with';
DRĒOGAN: (ge)drēogan 'to take part in'⇒ *drohtian* 'to dwell or keep company with, associate with';
FINDAN: āfandian, (ge)fandian, oferfindan 'to try, attempt, tempt, test, prove, put to the proof, make trial of' ⇒ *fundian* 'to desire, with for, aspire to';

HRĒOWAN: *(ge)hrēowsian* 'to do penance' ➡ *(ge)hrēowan, hrēowian* 'to rue, repent, be penitent';

SACAN: *wiðersacian* 'to be apostate' ➡ *wiðersacian* 'to become apostate';

STANDAN: *onstandan* 'to consist of or in' ➡ *(ge)standan* 'to be, exist';

(GE)TĒON 1[1]: *tīeman, (ge)tīeman* 'to call as witness, vouch to warranty' ➡ *(ge)tācnian* 'to witness'.

Regarding the lexical entailment relation of cause, one of the two synset concepts involved is the causative, while the other is called the resultative. As in backward presupposition, this conceptual-semantic relationship is unidirectional and characterized by the lack of temporal inclusion. 224 pairs of synsets are associated with this conceptual-semantic relationship. Examples can be found in (5):

(5)

BERSTAN: forberstan 'to let go by default' ➡ *(ge)berstan, āberstan* 'to escape';

BLĪCAN: *āblycgan* 'to make afraid' ➡ *āblycgan* 'to get affected by fear, get dismayed';

FINDAN: (ge)findan 'to inform, show' ➡ *onfindan 1* 'to be aware of';

FLĒOTAN tōflēotan 'to carry away by a flood' ➡ *floterian* 'to be carried or tossed by waves';

HLIMMAN: hlemman 'to cause to sound' ➡ *hlimman* 'to sound';

(GE)LIÐAN: *ālǣdan, (ge)lǣdan* 'to lead' ➡ *(ge)lǣdan* 'to lead (life)';

(GE)LĪÐAN: forðgelǣdan 'to cause to grow' ➡ *ālǣdan, (ge)lǣdan* 'to grow, spread';

RĪNAN: regnian 1 'to cause rain to fall' ➡ *rīnan, regnian 1* 'to rain';

SĒOÐAN: *(ge)sēoðan, āsēoðan* 'to boil, seethe' ➡ *āsēoðan* 'to refine, purify'.

Typically, this relationship is initiated by means of a causative synset; nevertheless, this study evinces six cases in which a spontaneous verb gives rise to a cause relationship. This represents a 2,67% of the total number of synsets associated by means of the semantic relationship of cause. All the instances are listed in (6):

(6)

ĒACAN: (ge)ēacnian 'to conceive, become pregnant' ➡ *ēacan, (ge)ēacnian* 'to be increased, enlarged, augmented';

RǢDAN: (ge)rǣdan 'to advice, counsel' ➡ *ārǣdan* 'to take counsel';

RĪNAN: gerīnan 'to rain on' ➡ *gerīnan* 'to wet with rain';

(GE)RĪSAN: ārǣran, rǣran 'to erect, set up, establish, build' ➡ *(ge)rīsan, ārīsan* 'to rise';

(GE)RĪSAN ārǣran, rǣran 'to create, do' ➡ *(ge)rīsan, ārīsan* 'to rise';

SEOÐAN: (ge)sēoðan 'to cook in a liquid' ➡ *āsēoðan* 'to whither, scorch'.

Turning to the mutually entailing relations, synonymy proves to be the most repeated relationship established between two pairs of synsets. The total amount of synsets related by synonymy is 948. Some instances are presented in (7):

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[1] In this study, as in the lexical database *Nerthus,* numbered predicates point to different morphological classes or variants for otherwise equal predicates.

(7)

BERAN: *(ge)beran* 'to extend' ↔ *tōberan* 'to swell';

BIDDAN: biddan, ābiddan 'to entreat, beseech' ↔ *bedecian, gebiddan* 'to beg';

DRǢDAN: drǣdan, ondrǣdan 'to fear, dread' ↔ *ondrǣdan* 'to be afraid';

DRĒOPAN: (ge)drēopan, ādrēopan, drēopian, drȳpan 'to drop' ↔ *drȳpan* 'to cause to fall in drops';

DWĪNAN: dwīnan 'to disappear' ↔ *ādwīnan, fordwīnan* 'to vanish, vanish away';

FINDAN: (ge)findan, onfindan 1 'to meet with, to come upon' ↔ *onfindan* 'to come across';

HNĪGAN: hnīgan, āhnīgan, (ge)hnǣgan 1 'to bow down' ↔ *onhnīgan, (ge)hnigian* 'to bow, bend down, bow or bend down (the head)';

LǢTAN: (ge)lettan 'to cause to be slow, impede' ↔ *(ge)lettan* 'to delay';

SWELGAN: swolgettan 'to gargle' ↔ *swolgettan* 'to wash the throat';

WEAXAN 'to prosper, flourish' ↔ *forweaxan* 'to progress'.

SWELGAN, in the example above, deserves special attention. It presents a case in which the syntactic structure of the meaning definition or the perspective of interpretation may blur the identification of the relationship. However, both meaning definitions refer to the same action.

As stated in WordNet (Princeton, 2010), opposition relations are psychologically salient for verbs. Followed by synonymy and troponymy, opposition is the most recurring relation in this lexical database. However, given that this work examines the semantic relationships established in the lexical paradigms of Old English verbs, the significance of the distinct semantic relationships is different. As a result, opposition is the least frequent of the six conceptual-semantic relationships under analysis. Thus, only 69 pairs of synsets are linked by means of opposition. Some examples can be seen in (8).

(8)

ĀGAN: *āgan* 'to give' ◆—◆ *āgnettan, (ge)āgnian* 'to arrogate, appropiate, usurp';

BĒODAN: (ge)bēodan, ābēodan 'to offer' ◆—◆ *forbēodan* 'to refuse';

CWEÐAN: (ge)cweðan 'to order, give orders' ◆—◆ *tōcweðan, wiðcweðan* 'to forbid, not allow, prohibit, interdict';

FARAN: (ge)faran, gefēran 'to obtain, succeed, get on' ◆—◆ *forfaran* 'to lose';

GANGAN: forgangan, forgān 1 'to lose' ◆—◆ *gegangan, gegān, ofgān* 'to acquire, obtain, get, gain, attain';

RINNAN: tōrinnan 'to disperse' ◆—◆ *gerinnan 1* 'to come together';

SPRECAN: (ge)sprecan, gesprecan 'to agree' ◆—◆ *forsprecan, wiðsprecan* 'to deny, contradict, gainsay';

SPRINGAN: *(ge)springan* 'to grow' ◆—◆ *āspringan* 'to diminish, dwindle, fail';

STANDAN: forstandan 'to be equal to' ◆—◆ *tōstandan* 'to differ, be different, be discordant';

SWEFAN: *swefian* 'to move' ◆—◆ *swefan* 'to cease';

WEORÐAN: (ge)unweorðian 'to slight, treat with contempt' ◆—◆ *(ge)weorðian* 'to praise, exalt, worship, adore, venerate, celebrate, treat with reverence or respect'.

In WordNet, most of the antonymous verbs refer to stative or change-of-state verbs. Similarly, this examination has evidenced that 79.71% of the 69 pairs of synsets linked by opposition involve at least one state or change-of-state type.

The statistics resulting from the analysis show that the most recurrent semantic relation is synonymy (43%), followed by troponymy (33%) and cause (10%). Backward presupposition (8%), -troponymy (3%) and opposition (3%) are the least frequent relations found in the analysis. This is pictured in Figure 2.
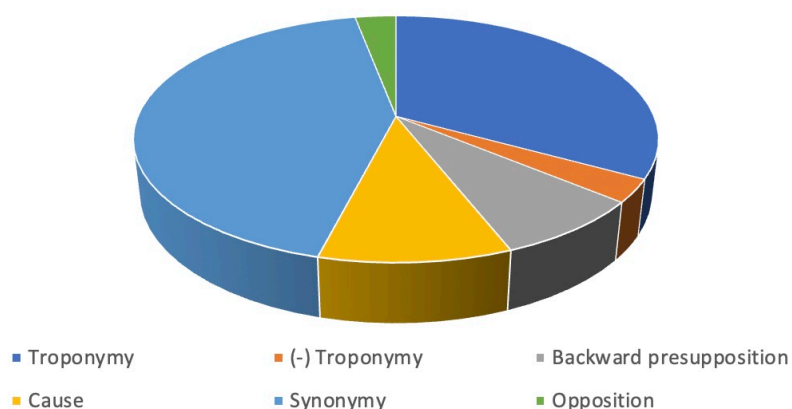

Figure 2. Percentage of occurrence of the semantic relationships in the lexical paradigms of Old English strong verbs.

5. Discussion

This study has carried out a detailed examination of all of the 328 lexical paradigms of Old English strong verbs, in which the nature and patterns of the underlying semantic relationships have been identified. Moreover, it has been proved that semantic inheritance in these paradigms can be classified by six conceptual semantic relationships, namely: troponymy, -troponymy, backward presupposition, cause, synonymy and opposition.

Nevertheless, several issues have arisen from this analysis. To begin with, the theoretical literature that has been reviewed focuses on Present Day English and, therefore, no provision is made for Old English. Likewise, the instances of semantic relations presented by the literature at our disposal do not cover the full range of the verbal lexicon selected as the analysis corpus for this research. For example, the Old English verbal lexicon includes verbs that express very complex meanings, which are far from the clear-cut instances contemplated in the literature: *ābannan* 'to summon to battle'; *ofbēatan* 'to beat to death'; *ofbēatan, tōbēatan* 'to destroy by beating'; *beorcan* 'to make a sharp and explosive sound'; *forberstan* 'to let go by default'; *abǣdan, bādian* 'to take by way of a pledge or fine, to take a toll'; *ābedecian, ābiddan* 'to get by asking'; *giftian* 'to give a woman in marriage'; *tōbrӯtan* 'crush with feelings of sorrow'; and *ābītan* 'to lacerate with the teeth'.

Also, verbs under analysis such as the above mentioned *giftian* 'to give a woman in marriage' need to be understood against the background of Old English. Similarly, the verbal paradigm *BLŌTAN* includes the verbs *onblōtan* 'to kill a victim'; *onblōtan* 'to offer'; *(ge)blētsian* 'to bless, consecrate, hallow, call holy' and *(ge)blētsian* 'to adore,

extol' and, therefore, the meaning of the verbs *blōtan, onblōtan* 'to sacrifice' need to be understood with respect to the framework of 'killing a person or animal in a religious ceremony as an offering to please a god' (Merriam-Webster definition). Likewise, obsolete meanings and variants need to be considered in order to classify the verbs in this corpus. For instance, *lesan* 'to lease' needs to be seen as 'to glean, gather, collect' and *āspēdan* 'to scape' as the archaic variant of 'to escape'.

Regarding the conceptual-semantic relations, the examination of the Old English verbal paradigms reveals that verbs such as *(ge)bēatan* 'to beat, strike, pound, dash' present derived verbs such as *ofbēatan* 'to beat to death' and *ofbēatan, tōbēatan* 'to beat to pieces, destroy by beating'; *(ge)berstan* 'to break, crack' derive in verbs such as *tōberstan* 'to break in two' and *(ge)feallan* 'to fall' derive in verbs such as *forfeallan* 'to destroy by falling' and *tōfeallan* 'to fall or break to pieces'. Due to the intrinsic complexity of the Old English vocabulary and especially of the verbs analyzed, these derivations need to be contemplated from the angle of troponymy.

It is important to note that it has been necessary to divide some of the synsets assembled in the lexical paradigms. This is due to the fact that relations are sometimes established with only some of the verbs in a given synset. To illustrate this point, *ārǣran, rǣran* 'to raise' belonging to the paradigm *RĪSAN*, may have been included in the synset *ārǣran, rǣran* 'to lift up, elevate, move from a lower to a higher position', but also in the synset *ārǣran, rǣran* 'to stir up, arouse, rouse, excite'. Nonetheless, these synsets cannot be semantically linked by the relations considered in this study. Conversely, the relation between them emerges from the polysemy of the verb *ārǣran, rǣran* 'to raise'. In order to account for this semantic derivation, a separate synset has been created for this verb, giving way to a synonymy relation with the other two synsets. Likewise, the verb *ongietan* 'to seize, grasp', belonging to the paradigm *GIETAN,* may have been incorporated into the synset *ongietan* 'to see, perceive, understand', but this would have excluded a troponymy relation between the synsets *gietan* 'to get, obtain, take' and *ongietan* 'to seize, grasp'. Another instance has been detected in the paradigm *HEBBAN*, where the verb *(ge)hefigian* 'to aggravate' may have been incorporated into *āhefegian, (ge)hefigian* 'to make sad or heavy, to make heavy, burden, weigh down, grieve, oppress, vex, afflict, weary', although this would have prevented a relationship of cause between the synsets *(ge)hefigian* 'to aggravate' and *(ge)hefigian* 'to grow worse'. In this manner, although synsets are unordered sets of cognitive synonyms, the intrinsic polysemy of some of the verbs permit an additional relation with a different synset.

Next, in order to overcome the ambiguities arising from polysemy and to attribute the correct meaning to each verb, it has been necessary to verify every verb meaning against the context of the paradigm it pertains to. In other words, the semantic analysis cannot be separated from the patterns of semantic inheritance issued from the lexical paradigm. To illustrate this point, the paradigm *RĒOTAN* includes the synsets *rēotan* 'to weep, shed tears'; *rēotan* 'to wail'; and *rēotan* 'to mourn, lament'. Whereas the latter means 'to feel or show sorrow or sadness' and makes reference to a state, the first two synsets point to activities. Consequently, the general pattern of semantic inheritance indicates what is preferable in case of doubt.

Furthermore, if it is not possible to disambiguate the meaning of a verb in the previous steps, the next move is to study the etymology of the word. The paradigm *LESAN* above illustrates this point. Eventually, this study follows Visser (1963–1973) in the cases in which it is not possible to determine if a given verb or lexical paradigm is transitive or intransitive. By way of illustration, the paradigm *GREOSAN* only includes the verb

grēosan 'to frighten' and, therefore, it can be defined as 'to become afraid' or 'to cause someone to become afraid'. Similarly, the paradigm *HRIMPAN* only consists of the verb *hrimpan* 'to wrinkle, rumple; to twist, coil; to contract'. In this sense, since Visser highlights the process of transitivization by which intransitive verbs go on the diachronic axis, from Old to Present Day English, when a meaning has been in doubt, the intransitive has been preferred over the transitive.

6. Conclusion

This work has analyzed all of the 328 lexical paradigms of Old English primitive strong verbs and determined the semantic relationships underlying their configuration. This study has demonstrated that meaning derivation in these paradigms basically consists of six conceptual semantic relationships: on the one hand, the lexical entailment relations of troponymy, -troponymy, backward presupposition and cause; on the other hand, the mutually entailing relations of synonymy and opposition.

After reviewing the architecture of WordNet, Section 3 has addressed the question of the implementation of the theory considered into the 328 lexical paradigms of Old English. The starting point of the analysis has been the identification and updating of the lexical paradigms under study; then, the analytical model has been applied to the lexical paradigms of Old English strong verbs. Section 3 has included a complete description of the lexical paradigm *(ge)berstan* to illustrate the methodology adopted in this study. Section 4 has offered the results of the study, which have been discussed with regard to semantic relation and considered from the semantic inheritance perspective. Section 5 has also presented the problems found in the analysis. The main issues that have arisen were the recurrent polysemy detected in most of the verbs as well as the complexity of the Old English verbs. The solutions adopted include the design and implementation of a systematic and homogeneous methodology which allows us to track the meaning of each of the verbs under analysis.

This study has revealed the semantic relations that exist in the lexical paradigm, giving way to a network of semantic inheritance, in which it is possible to distinguish how derived meanings deviate from the original meaning as well as what sort of meaning specification is originated with regard to more basic verbs. In this sense, the synsets deriving from the primitive have been regarded as the base of each paradigm. The synsets resulting from the different meanings of the derived verbs have been linked to those of the primitive and among them, by means of the conceptual-semantic relations of troponymy, -troponymy, synonymy, backward presupposition, cause and opposition.

The results have shown that, followed by troponymy and cause, synonymy is the most recurrent semantic relation in the Old English lexical paradigms based on strong verbs. Backward presupposition, -troponymy and opposition are shown to be the least frequent relations. Similarly, the highest semantic similarity was found in verbs related by synonymy and troponymy, whereas pairs linked by backward presupposition, opposition and -troponymy present a higher semantic divergence as regards meaning specification.

The lesson that can be learned in this respect is that there is a higher semantic divergence in pairs of backward presupposition, opposition and -troponymy than in pairs linked by synonymy and troponymy. In this analysis, such semantic divergence has been couched in terms of meaning specification. It is also worth remarking that state or change-of-state types correlate with pairs of synsets related by the relation of opposition. This probably means that opposition tends to hold between static verbs. Similarly, the

results indicate that semantic relatedness may imply syntactic closeness. Nevertheless, more research is needed in these two questions.

References

Cruse, David A. 1986. *Lexical Semantics*. Cambridge: Cambridge University Press.

Dowty, David. 1979. *Word Meaning and Montague Grammar*. Dordrecht: Reidel.

Fellbaum, Christiane. 1990. "English Verbs as a Semantic Net." *International Journal of Lexicography* 3 (4): 278–301.

Fellbaum, Christiane, and George A. Miller. 1990. "Folk Psychology or Semantic Entailment?: A Reply to Rips and Conrad." *Psychological Review* 97: 565–70.

Fellbaum, Christiane. 1998. "A Semantic Network of English Verbs." In *WordNet: An Electronic Lexical Database*, edited by Christiane Fellbaum, 69–104. Cambridge: MIT Press.

García García, Luisa. 2019. "The Basic Valency Orientation of Old English and the Causative ja-Formation: A Synchronic and Diachronic Approach." *English Language and Linguistics* 24 (1): 153–77.

Green, Rebecca, Carol. A. Bean, and Sung. H. Myaeng. 2002. *The Semantics of Relationships. An Interdisciplinary Perspective*. Vol. 3. Dordrecht: Kluwer Academic Publishers.

Jackendoff, Ray. S. 1983. *Semantics and Cognition*. Cambridge: MIT Press.

Lacalle Palacios, Miguel. 2021a. "Old English Verbs of Depriving: The Semantics and Syntax of Possession Transfer." *Studia Neophilologica* 94 (1): 1–27.

Lacalle Palacios, Miguel. 2021b. "Old English Verbs of Learning: Information and Knowledge Acquisition." *SELIM. Journal of the Spanish Society for Medieval English Language and Literature* 26 (1): 25–56.

Martín Arista, Javier. 2012. "Lexical Database, Derivational Map and 3D Representation." *RESLA-Revista Española de Lingüística Aplicada* 1: 119–44.

Martín Arista, Javier. 2013. "Recursivity, Derivational Depth and the Search for Old English Lexical Primes." *Studia Neophilologica* 85 (1): 1–21.

Martín Arista, Javier. 2019. "Another Look at Old English Zero Derivation and Alternations." *Atlantis* 41 (1): 163–82.

Martín Arista, Javier. 2020. "Old English Rejoice Verbs. Derivation, Grammatical Behaviour and Class Membership." *POETICA* 93: 133–53.

Martín Arista, Javier. 2022. "The Syntax and Semantics of the Old English Predicative Construction." In *Language Change and Linguistic Theory in the 21st Century*, edited by Nikolaos Lavidas, and Kiki Nikiforidou, 102–132. Amsterdam: Brill.

Martín Arista, Javier, and Raquel Mateo Mendaza. 2013. "Outline of a Lexicon of Old English." *Working Papers in Early English Lexicology and Lexicography* 3: 1–1996.

Martín Arista, Javier. ed., Laura García Fernández, Miguel Lacalle Palacios, Ana E. Ojanguren López, and Esaúl Ruiz Narbona. 2016. "*NerthusV3. Online Lexical Database of Old English*. Nerthus Project. Universidad de La Rioja." Accessed January 1, 2021. https://nerthusproject.com.

Merriam Webster. 2022. "An Encyclopaedia Britannica Company." Accessed January 1, 2021. https://www.merriam-webster.com/.

Miller, George A., Richard Beckwith, Christiane Fellbaum, Derek Gross, and Katherine Miller. 1993. "Introduction to WordNet: An On-line Lexical Database." Accessed July 1, 2015. https://wordnetcode.princeton.edu/5papers.pdf.

Ojanguren López, Ana E. 2020. "The Semantics and Syntax of Old English End Verbs." *Atlantis* 42 (1): 163–88.

Ojanguren López, Ana E. 2021. "Interclausal Relations with Old English Verbs of Inaction. Synchronic Variation and Diachronic Change." *RESLA-Revista Española de Lingüística Aplicada* 34 (2): 555–84.

Princeton University. 2010. "About WordNet." Accessed January 1, 2021. http://wordnet.princeton.edu.

Tío Sáenz, Marta, and Raquel Vea Escarza. 2015. "Intercategorial Homonymy in Old English." *Working Papers in Early English Lexicology and Lexicography* 5: 1–61.

Vea Escarza, Raquel, and Marta Tío Sáenz. 2014. "Intracategorial Homonymy in Old English." *Working Papers in Early English Lexicology and Lexicography* 4: 1–46.

Visser, Fredericus T. 1963–1973. *An Historical Syntax of the English Language. Vol. I: Syntactical Units with One Verb*. Leiden: E. J. Brill.

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