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Framework Proposal:

A Semantic Feature Analysis of Kennings to Support Their Role in Aiding Word Retrieval in Oral Old English Poetry

Abstract: The purpose of this paper is to explore the role of the use of kennings in Old English poetry beyond their rhetorical power, more specifically, their role as mnemonic devices. Generally, kennings are used to refer to a certain entity using a more complex and descriptive way, more than one individual tag. This way of encoding referents seems to carry more than aesthetic value for poets and bards. Since Old English poetry is believed to be oral in nature, an argument could be made for the use of specific structures that can aid word and context retrieval, especially in longer-form content. As such, kennings would function as anchors; this function is permitted because kennings contain semantic information that supports word retrieval. The framework for analysing this type of word-formation is based on Semantic Feature Analysis, which is a therapy line for aphasia and anomia to improve word retrieval in post-stroke patients. Beyond this analysis, this paper will argue for the importance of considering alternate, novel techniques and methodologies for the study of Old English and for the diachronic study of language altogether, hoping to help bridge the gap between different areas of research.

Keywords: kennings; Semantic Feature Analysis; Old English; word-formation; word retrieval

1. Introduction

The rhetorical devices of Old English (OE) poetry have been the subject of many studies over the decades, each with a different framework for interpretation. Although many scholars focus on the stylistics and formal reasons for the implementation of these devices, a relatively new research enterprise is being considered, with researchers looking into the cognitive processes that underlie the interpretation and justify the use of rhetorical devices. The current study presents just such a proposal, grounded in cognitive linguistics. The object of analysis chosen for this study is the kenning, a very productive word-formation tool in Old English. The theoretical framework is centred around lexical and semantic

processing as they are explored in Semantic Feature Analysis (SFA), a therapy line for anomia, a language impairment primarily affecting the retrieval of nominals.

The specific SFA structure selected for this paper is the chart-based one, as initially developed by Ylvisaker & Szekeres (1985). All the kennings interpreted in this study are taken from the epic poem *Beowulf*, as found in Fulk et al. (2008) fourth edition; from the Old English *Genesis* (Krapp 1931); and from the Old English *Andreas* (Krapp 1932). The contexts for the interpretation of the *Beowulf* kennings are selected from Fulk's (2010) Modern English translation. The choice of these sources for kenning selection for this particular paper is justified because of the poems' long form, which implies a cognitive load on the person reciting them, especially considering different contexts for different episodes. The role of kennings is considered here not for what it offers to the listener (interpretation of perception), but for what it offers to the one reciting the poem (usefulness of the mechanism). To foreshadow the answer to this question, the different kennings used for the same concept will provide a key to a semantic network built around said concept by the tags used in the kennings, therefore allowing the poet or the bard elegant word- and context-retrieval solutions.

The structure of the present paper includes a very brief overview of the two main concepts – kennings and SFA – before moving on to the proposal itself and the presentation of an initial analysis. Further recommendations for analysis and limitations are given towards the end of the paper.

2. Kennings

Kennings are nominal compounds that consist of at least two parts, one representing the base word and the other representing a modifier. Implicitly, they also have referents in the entities or concepts that are replaced by the kenning. Kennings have long been studied within Old Norse literature, as has the role they play in Old English poetry.¹ There is some debate over what constitutes a kenning, including not only their function but their nature as well. The distinction between kenning and *kend heiti*, for instance, is one such example, with some authors arguing that a *kend heiti* is simply a grouping of words or a compound

¹ On Old English, see, e.g., Marquardt (1938), Klaeber (1950), Gardner (1969), and, most recently, Fulk (2021).

that describes the referent as something expected, whereas a kenning implies a metaphor, a comparison with something the referent is not (Lee 1998; Mitchell & Robinson 1998). In this view, the distinction is one similar to that between metaphor and metonymy, as Gvarishvili (2016: 351) explains: “The dividing line between the kenning and *kend heiti* is [the] difference between a metaphor and metonymy, kennings having the underlying driving force of the former and *kend heitis* of the latter.” However, Fulk et al. (2008: lxiv) and others name any compound that contains a circumlocutory word a kenning. This debate is justified, as researchers seek to create a comprehensive anatomy of Old English poetry with an appropriate taxonomy.

Summaries of the various definitions and complexities of kennings can be found in Fulk (2021: 70–74) and Marold (2012). The latter notes two main positions: the kenning as a circumlocution, and the kenning as a metaphor. Metaphorical kennings are, of course, very important to distinguish for stylistic studies and research that analyse the poetic force of these compounds. However, for the purpose of this study, the broadest definition for kennings fits better, as circumlocutions represent complex enough compounds for the creation of semantic networks. As such, the appropriate definition of kenning for the present study is one selected from Marold (2012: lxx), as identified in Meissner (1921): “a kenning replaces a noun of ordinary discourse, consists of at least two parts and follows typical circumlocutionary patterns”.

3. Cognitive Linguistics Used for Interpreting Kennings

The proposal put forth in this paper is novel in the selection of framework, but not in the conceptualisation of the approach. Cognitive linguistics has a rich tradition, arguably starting with Ronald Langacker who posits that our language is inherently symbolic in all aspects, across grammatical units, which he explores in his article “An Introduction to Cognitive Grammar” (1986). Other researchers have linked the study of metaphors and metonymies with cognitive linguistics, including the already established traditions started by Lakoff or Turner, and the important work “Metaphors We Live By” by Lakoff & Johnson (1980). In that work, the authors note that there exist “automatic direct links between form and content, based on general metaphors in our conceptual system. Such links make the

relationship between form and content anything but arbitrary” (Lakoff & Johnson 1980: 126). In this interpretation, the idea of a justified, specifically chosen form for a word comprising a metaphor is explained as being integral to human perception. However, “relatively little work has focused on figurative language in diachrony” (Broz 2011: 165). For example, the work of Broz (2011) focussed on using the cognitive linguistics framework of “blends and prisms” to help interpret the semantic composition of a kenning. Additionally, Holland (2005) proposed that for the interpretation of kennings, one can employ semantic frames as put forth in the work of Fillmore (1982).

The present proposal revolves around the function of kennings, less so around their stylistic power. Also, the person of interest for this analysis is not the one listening to the poem, but the one reciting it. The cognitive processes underlying the interpretation of a kenning are less important for the proposed framework than are the semantic associations made by the person who is supposed to easily navigate the cognitive load of a long poem. Kennings create associations between concepts and features in a more imaginative way, but their function seems nevertheless to involve this type of matching and association between one core feature of the concept they represent and the context in which that particular concept appears. Understanding kennings as a result of a semantic feature association would explain that through the usage of this device, the arbitrariness of word-formation would be replaced by an inherently motivated and deliberate naming process. In this way, kennings would seem to support an active type of recall.

4. Semantic Feature Analysis

Semantic Feature Analysis (SFA) is a framework used in the treatment of disorders that involve word retrieval deficiencies such as the treatment of anomia, a naming impairment associated with aphasia, among others. It is a technique based on creating a matrix of defining features for a target concept. First developed by Ylvisaker & Szekeres (1985), SFA as a treatment method employs a chart (Fig. 1) that guides the patient in identifying key features that are semantically linked to the target word, in hope of eliciting a response. Although other researchers have used the name SFA to refer to various adaptations to the treatment, the one variant that is employed for the present study is the original, chart-based

one. The basis of the technique lays in theories of semantic processing and lexical access, as well as the interaction between the two processes.

Because it is suggested that anomia results from an impaired semantic network, the goal of therapy is to alter the semantic network connectivity through refinement of the damaged network. Hypothetically, SFA improves the retrieval of conceptual information by accessing and refining semantic networks (Maddy, Capilouto & McComas 2014: 255).

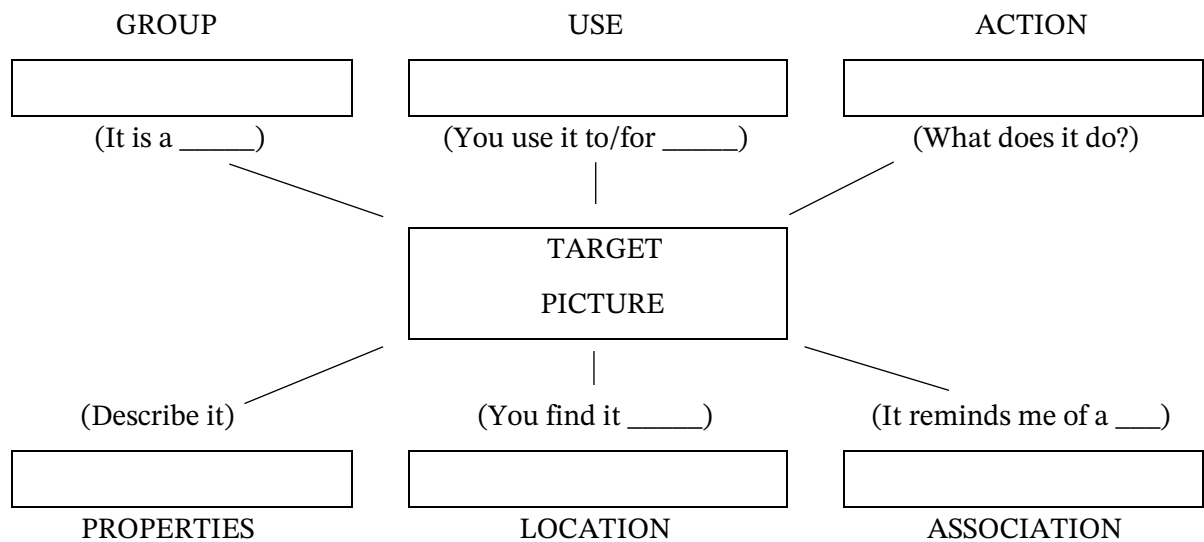


Fig. 1: Semantic Feature Analysis chart (Boyle 2010: 413)

A concept can be imagined as being the target of naming, and its various semantic features as doors of access. To get to a tree, we can take the route of its location, i.e. “it is found in forests”, or of its properties, i.e. “it has leaves, a root, a trunk”, its action, i.e. “it gives fruit” etc. By extension, the present analysis argues for a similar effectiveness in SFA’s reverse use, meaning that if we start from the concept (the referent of the kenning), we can use different doors of access that consist of various semantic features of the concept (the components of the kenning), to reach a related context.

The effectiveness of SFA has been studied in relation to anomic aphasia, and the rates of success in word retrieval improvement indicate that constructing such a (mental) map to navigate the concepts and their features is helpful in naming and remembering. Results of a systematic review “indicate that SFA is an effective intervention for improving confrontational naming of items trained in therapy for individuals with non-degenerative aphasia” (Maddy, Capilouto & McComas 2014: 259).

Anomia is believed to be the result of an impairment to semantic networks. SFA used for treatment would then theoretically help reconstruct a broken network. In the framework proposed here, kennings would be interpreted as a result of semantic feature association, and they would function as a basis for building semantic networks and offering clues for the specific contexts in which they appear. To make matters more concrete, the reader could exercise this approach with an imagined example. Consider the idea of the body and its duality. A kenning for the body such as ‘house of bones’ would signal to the reader/listener (and the user of language) the idea of the corporality and physicality of the body. These semantic features then activate a network that builds on these aspects, offering a contextualisation that relies on such concepts. Thus, it is expected to find such kennings in fighting scenes, battles, feasts, etc. Contrastively, a kenning that would name the body the ‘house of the soul’ would signal a semantic network that reflects the spiritual side of humans, building up to a context such as a funeral, death, etc.

If we take this idea as our starting point, the use of different kennings for the same concept would be justified then – besides the requirements for the alliterative form of a poem – through the creation of different semantic networks that would characterise the contexts in which the different kennings are to be used. The paper continues with an example of the framework in use and proposals for other possible analyses.

5. Examples of Framework in Use

One of the concepts frequently described through kennings in Old English poetry is that of the sea. In this section, two instances of kennings for ‘sea’ as they appear in *Beowulf*, *Genesis*, and *Andreas* are selected, along with their immediate contexts. In these passages, the framework then recommends checking for semantically related items that could be prompted by the use of a particular kenning and its embedded semantic concepts.

The first example of a kenning for the concept of ‘sea’ appears at the very start of the poem, in line 10a, as *hronrade* (‘whale-road’) or ‘the way of the whale’. In this context, the sea is not a central concept; it appears when the poet explains the extent of the renown of the king, Scyld Scefing. A semantic network that can be inferred here is related to the feature ‘property’, even more specifically related to the size of the associated concept, the

whale. Being a very large creature, it lends this quality to its home as well, which is the sea. As the renown of the king spreads over the sea, the poet emphasises the far-reaching reputation of Scyld Scefing, as can be seen in the prose translation of lines 7a–11: ‘He lived to see remedy for that: grew up under the heavens, prospered in marks of distinction, until every neighbour across **the whale-road** had to answer to him, pay tribute. That was a good king’ (Fulk 2010: 87; emphasis added). However, another interpretation can be related to the fact that this is the first mention of the sea in the poem, in which sea voyages and sea fights are central. With this first image, the poet establishes the grandeur of this element and its importance to the peoples featured in the poem.

Another instance of this kenning can be found in the Old English *Genesis A*, in line 205a:

Brucað blæddaga and brimhlæste
and heofonfugla. Inc is halig feoh
and wilde deor on geweald geseald,
and lifigende, ða ðe land tredað,
feorheaceno cynn, ða ðe flod wecceð
geond **hronrade**. Inc hyrað eall.
(Krapp 1931: 8; *Genesis A*, l. 200–206,
emphasis added).

‘Brook these blessed days and the ocean’s bounty
and the birds of heaven. You are given dominion
over the wild beasts and the clean cattle
and all things living, those that tread upon the land,
imbued with life, and those that the flood rouses
throughout **the whale-road** – all shall heed you.’
(Hostetter 2018, emphasis added)

In this passage we find the instructions given to Adam and Eve, who are given dominion over all of Earth and the life in the sea. Once again, the grandeur of the sea as recalled via the specific kenning is related to the context in which the reader finds it, namely mentioning the abundance of life and territory represented by the sea.

This specific kenning is found in the Old English poem *Andreas* as well, in line 821a:

þus Andreas ondlangne dæg
herede hleoðorcwidum haliges lare,
oððæt hine semninga slæp ofereode
on **hronrade** heofoncynge neh.
(Krapp 1932: 25; *Andreas*, l. 818–821,
emphasis added)

‘Thus the whole long day Andrew
praised the teaching of the Holy One in utterances
until sleep overcame him suddenly
on the **whale-road**, beside the King of Heaven.’
(Hostetter 2017, emphasis added)

This section describes Andreas falling asleep while at sea, after a long day of spreading the word of God and the knowledge of God’s might and miracles, slumbering *heofoncynge neh* ‘near the King of Heaven’. This passage, although not referring directly to the size of the sea itself or the length of the journey, still relates to a grandeur of the work done by Andreas and the beliefs being spread.

Another kenning for ‘sea’ is *swanrade* (‘swan-road’), which appears in line 200a of *Beowulf*. This name for the sea, which can be translated as ‘the way of the swan’, is present before a passage in which the ship’s image is central. The common shape of a ship was similar to that of a swan, so the feature ‘association’ is selected here (i.e. ‘the ship reminds me of a swan’). Building further, the kenning showcases the feature ‘use’ or ‘property’ in describing the sea as the navigation channel for ships. In this sequence, the image of the ship appears multiple times:

Higelāces þegn	‘At home, Hygelac’s man,
gōd mid Ġeatum, Grendles dǣda;	good among the Geats, heard about that,
sē wæs moncynnes mægenes strengest	Grendel’s doings
on þǣm dæge þysses līfes,	of humans he was the mightiest in strength
æpele ond ēacen. Hēt him yðlidan	in that day of this mortal existence
gōdne ġegyrwan; cwæð, hē gūðcynig	noble and prodigious. He directed that
ofer swanrāde sēcean wolde,	a good wave-wanderer be readied for him;
mǣrne þēoden, þā him wæs manna þearf.	he said he intended to go see that war-king
Ðone sīðfæt him snotere ceorlas	over the swan-road , that famous lord
lýthwōn lōgon, þēah hē him lēof wære;	now that he had need of men.
hwetton hiġe(r)ōfne, hæl scēawedon.	Wise men blamed him little for that undertaking
Hæfde se gōda Ġēata lēoda	though he was dear to them;
cempan ġecorone, þāra þe hē cēnoste	they urged on the valiant one, read the auguries.
findan mihte. Fīftȳna sum	The good one had selected fighters
sundwudu sōhte; secg wīsade,	from among the men of the Geats, the boldest
lagucræftig mon landġemyrcu.	he could find. One of fifteen
Fyrst forð ġewāt; flota wæs on yðum	he went to the sailing-wood the champion,
bāt under beorge. Beornas ġearwe	that sea-crafty man, showed the way to the land’s
on stefn stigon. Strēamas wundon,	end.
sund wið sande. Secgas bæron	The time arrived; the vessel was on the waves,
on bearm nacan beorhte frætwe,	the boat under the headland. Ready men
gūðsearo ġeatoliċ; guman ūt scufon,	climbed onto the prow. Currents eddied,
weras on wilsīð wudu bundenne.	sea against sand. Champions hauled
Ġewāt þā ofer wæġholm winde ġefȳsed	into the bosom of the craft gleaming equipment
	stately battle-gear; the heroes,
	men on a mission, pushed off the vessel of joined
	planks.
	Driven by the wind, the foamy-necked ship then

flota fāmiheals fugle ġelicost,

oð þæt ymb āntid ōpres dōgores

wundenstefna ġewaden hæfde,

þæt ða liðende land ġesāwon,

brimclifu blīcan, beorgas stēape,

side sēnæssas; þā wæs sund liden,

ēoteles æt ende.

(Fulk et al. 2008: 9–10; *Beowulf*, l. 194b–224a, emphasis added)

passed over the sea-waves **most like a bird**

until after the lapse of a normal space of time, on the following day

the ring-prowed craft had reached the point

where the travelers saw land,

ocean-cliffs standing out, steep headlands

broad sea-scarps; then the journey had concluded at the far end of the voyage.’

(Fulk 2010: 100–101, emphasis added)²

In the same sequence, in line 218b, the poet even comments on the ship that it is ‘remarkably bird-like’. The kenning *swanrad* then can be interpreted as a keyword that creates the semantic network of the concept ‘sea’ by relating it heavily to the concept of ‘ship’ or ‘boat’, the shape of the object, and the journey taken by people who embark on boats to traverse seas.

The same kenning appears in the *Andreas* text as well, in line 196b:

Hu mæg ic, dryhten min, ofer deop gelad
fore gefremman on feorne weg
swa hrædlīce, heofona scyppend,
wuldres waldend, swa ðu worde becwist?
ðæt mæg engel þin eað geferan,
halig of heofenum con him holma begang,

sealte sæstreamas ond **swanrade**,
waroðfaruða gewinn ond wæterbrogan,
wegas ofer widland.

(Krapp 1932: 8; *Andreas*, l. 190–198a, emphasis added)

‘How can I, my Lord, across the deep waters
accomplish this journey upon the far-flung wave
so hastily, O Heaven-shaper
and Wielder of Glory, as your word instructs?
That your angel can easily travel,
holy from the heavens, the course of waters
known to him,

the salty sea-streams and the **swan-road**,
the struggle of surf and the water-terrors,
the ways over the wide-lands.’

(Hostetter 2017, emphasis added)

In this section, Andreas asks God how he can embark on this journey over the sea, i.e. the swan-road, for later in the text to receive the answer of setting out on this journey swiftly, aboard a ship, at dawn. Again, this kenning appears in a context where the image of the ship immediately follows.

Other Old English poems can provide a corpus for this type of analysis. When selecting a kenning, the context is very important, as it will offer clues and means of interpretation.

² The lines are not one-to-one matches, but rather they are aligned artificially for ease of reading.

For example, the concept of ‘sword’ is also re-expressed in Old English poetry through kennings. A good question to ask is related to the duality of interpretation of a sword: when is it a ‘life-taker’, which is a negative sense, and likely to occur when an important or good character dies; and when is it a ‘foe biter’, which is a positive sense, likely occurring in scenes of combat and referring to the swords of central or good characters?

Similarly, the concept of the body picked for illustrative purposes earlier in the article is frequently referred to through kennings. To reiterate briefly, sometimes the body is referred to as ‘the house of the soul’, which is likely to appear in a context such as a funeral, when the spirit is evoked, and the role of spirituality takes centre stage. Other times, the body is called ‘the house of the bones’, bringing to the forefront the corporality of humans, and it is likely that we see this in contexts of battles or when de-emphasising the spiritual side of entities.

All these interpretations should be considered in context, from the perspective of the bard or the narrator, as a sort of clue or checkpoint that would allow them to position themselves well and precisely in the story they are telling.

Apart from intra-poem analyses, inter-poem ones could also prove fruitful, i.e. looking at different uses of kennings across works and authors. These inquiries could allow us to check whether there are arguments for considering these kennings as cognitive mechanisms used by the bards of the specific time period and whether they only appear with this purpose in long-form content.

6. Limitations

The present paper is first and foremost a proposal, and it is not meant to be interpreted as a definitive answer for the cognitive interpretation of kennings, but rather as an idea whose goal it is to look beyond the aesthetic power of the kenning and to take the focus off of the listener and place it onto the storyteller. Of course, such proposals always have limitations, as Broz (2011: 174) mentioned as well referring to Niles’ caveat:

It should be noted that it may be a futile task to search out nuances in meaning in the use of one alternative expression in place of another, because, as Niles (1981: 497) pointed out, the poet’s ‘chief concern was not to develop subtle shades of meaning but simply to compose in alliterative form’.

However, such proposals are meant to extend a challenge not through the analysis itself, but through the encouragement towards different ways of thinking about texts and cultures that we have studied for such a long time now.

7. Conclusions

Applying more novel approaches to the diachronic study of language can help us reframe the questions and see a new side of something familiar. As cognitive linguistics is constantly evolving, it is fairly certain that uncovered insights into the way our minds work can be applied to our recent ancestors who spoke and wrote Old English. These explorations would allow us to see their techniques and their choices for using language as very much intentional, tools meant for memorisation and performance-enhancing in a time when there were no smart tools or internet, no electricity, and not even wide-spread knowledge of reading and writing as we understand those terms today. We are very distanced from such a time, so going in the analysis with a better understanding of the human mind can help bridge the gap between us and our *Beowulf*-reciting relatives.

References

- Boyle, Mary. 2010. Semantic Feature Analysis Treatment for Aphasic Word Retrieval Impairments: What's in a Name? *Topics in Stroke Rehabilitation* 17(6). 411–422.
- Broz, Vlatko. 2011. Kennings as Blends and Prisms. *Jezikoslovlje* 12. 165–186.
- Fulk, Robert D., Robert Bjork, John D. Niles et al. (eds.). 2008. *Klaeber's Beowulf and the Fight at Finnsburg*. 4th edition. Toronto: University of Toronto Press.
- Fulk, Robert D. (ed. & transl.). 2010. *The Beowulf Manuscript: Complete Texts and The Fight at Finnsburg*. Cambridge: Harvard University Press.
- Fulk, Robert D. 2021. Kennings in Old English Verse and in the Poetic Edda. *European Journal of Scandinavian Studies* 51(1). 69–91.
- Gardner, Thomas. 1969. The Old English Kenning: A Characteristic Feature of Germanic Poetical Diction? *Modern Philology* 67(2). 109–117.
- Gvarishvili, Zeinab & Tsira Chkonia. 2016. Kenning and Kend Heiti as the Base Model of the Modern Cognitive Metaphor. In International Black Sea University, Faculty of Education and Humanities (editorial board), *6th International Research Conference on Education, Language & Literature: Conference Proceedings*, 350–356. Tbilisi: International Black Sea University.
- Holland, Gary. 2005. Kennings, Metaphors, and Semantic Formulae in Norse *dróttkvætt*. *Arkiv för nordisk filologi* 120. 123–147.

- Hostetter, Ophelia Eryn (transl.). 2017–2024. Old English Poetry Project: Andreas.
<https://oldenglishpoetry.camden.rutgers.edu/andreas/> (accessed 29 July 2024).
- Hostetter, Ophelia Eryn (transl.). 2018–2024. Old English Poetry Project: Genesis A & B.
<https://oldenglishpoetry.camden.rutgers.edu/andreas/> (accessed 29 July 2024).
- Klaeber, Frederick (ed.). [1922] 1950. *Beowulf and the Fight at Finnsburg*. 3rd edition with supplements. Boston: D. C. Heath.
- Krapp, George Philip (ed.). 1931. *The Junius Manuscript*. The Anglo-Saxon Poetic Records 1: A Collective Edition. New York: Columbia University Press.
- Krapp, George Philip (ed.). 1932. *The Vercelli Book*. The Anglo-Saxon Poetic Records 2: A Collective Edition. New York: Columbia University Press.
- Lakoff, George & Mark Johnson. 1980. *Metaphors We Live By*. Chicago & London: University of Chicago Press.
- Langacker, Ronald W. 1986. An Introduction to Cognitive Grammar. *Cognitive Science* 10(1). 1–40.
- Lee, Alvin A. 1998. *Gold-Hall and Earth-Dragon: Beowulf as a Metaphor*. Toronto: University of Toronto Press.
- Maddy, Katie M., Gilson J. Capilouto & Karen L. McComas. 2014. The Effectiveness of Semantic Feature Analysis: An Evidence-Based Systematic Review. *Annals of Physical and Rehabilitation Medicine* 57. 254–267.
- Marold, Edith. 2012. A Modern Definition of the Kenning. In Diana Whaley (ed.), *Poetry from the Kings' Sagas 1: From Mythical Times to c. 1035* (Skaldic Poetry of the Scandinavian Middle Ages 1), lxx–lxxiii. Turnhout: Brepols.
- Marquardt, Hertha. 1983. *Die altenglischen Kenningar. Ein Beitrag zur Stilkunde altgermanischer Dichtung* (Schriften der Königsberger Gelehrten Gesellschaft. Geisteswissenschaftliche Klasse. 14. Jahr, Heft 3). Halle: Niemeyer.
- Meissner, Rudolf. 1921. *Die Kenningar der Skalden: Ein Beitrag zur skaldischen Poetik*. Bonn & Leipzig: Schroeder.
- Mitchell, Bruce & Fred C. Robinson (eds.). 1998. *Beowulf: An Edition*. Oxford: Wiley-Blackwell.
- Slade, Benjamin. 2002–2022. *Beowulf on Steorarume (Beowulf in Cyberspace)*. <https://heorot.dk> (accessed 2 February 2023).
- Ylvisaker, Mark & Shirley Szekeres. 1985. Cognitive-Language Intervention with Brain-Injured Adolescents and Adults. *Annual Convention of the Illinois Speech- Language-Hearing Association*. Mini-seminar presented at the annual convention of the Illinois Speech-Language-Hearing Association.

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