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A STYLOMETRIC ANALYSIS OF *LJÓSVETNINGA SAGA**

Introduction

LJÓSVETNINGA SAGA is a medieval text grouped with the so-called *Íslendingasögur*, the Sagas of Early Icelanders. It concerns the exploits of the northern Icelandic *goði* Guðmundr inn ríki in tenth to eleventh century Iceland and his family's feud with the vigorous *Ljósvetningar*. The saga has two medieval redactions that in certain segments are quite similar (though not identical) and in others tell a significantly different story. If in the past this text garnered attention for its elusive composition, it is exactly this issue that now deters many scholars from dealing with this chimerical saga. It is a text which reveals that, despite scholarship having moved on from debates about the oral vs. literary nature of *Íslendingasögur* composition, the effects of this disagreement are still evident in the very fabric of the saga. Editorial decisions made a century ago (or more) have a continued influence on our distorted understanding of how the two redactions of *Ljósvetninga saga* differ from each other, and have thus far prevented our complete re-evaluation of their relationship.

The advent of stylometry, the computer-assisted analysis of style, has scholars revisiting old debates with new tools. That is the purpose of this article. In particular, we address debates surrounding *Ljósvetninga saga*'s two redactions (A and C) which have remained dormant for quite some time after twentieth-century engagement with the subject resulted in no scholarly consensus. First, we will introduce the problems of the saga's transmission and identify the differences between its two main redactions. Next, we will address the scholarly debates on the subject and then discuss

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how editors approached them. Finally, we offer our contribution to the debate: a stylometric analysis of the two redactions which supports the primacy of the C-redaction and rehabilitates the notion that the unique section of the A-redaction is a retelling. This opens the way for future research into the saga's redactions and, in particular, stresses the need for a new edition.

Understanding *Ljósvetninga saga's* Transmission and Redactions

Ljósvetninga saga has a famously complex transmission. One version of the saga, the A-redaction, is only preserved in lacuna-filled form in the late fourteenth or early fifteenth-century manuscript AM 561 4to (561) and in a nineteenth century copy of it produced by Guðbrandur Vigfússon, Bodleian MS Icelandic c. 9. The other version, designated the C-redaction, is preserved in 3 leaves of the fragmentary AM 162 C fol. (162), and in more than 50 paper copies which are all likely derived from it.¹ The two medieval manuscripts and their copies garnered much attention due to the fact that, while in certain parts they contain similar (though not entirely the same) wording and order of events, other parts are completely omitted from 561 (the A-redaction), or are executed with significantly different details, wording, and narrative in 561 and 162 (the C-redaction).

As illustrated in Figure 1, the A- and C-redactions differ in three major ways:

1. Following the highly similar chapters 1–4,² the C-redaction features three episodes traditionally designated as *þáttir*: *Sörla þáttir*,

1 See Yoav Tirosh, "On the Receiving End: The Role of Scholarship, Memory, and Genre in Constructing *Ljósvetninga saga*" (Doctoral thesis, University of Iceland, Reykjavík, 2019), 36; *Origines Islandicae, A Collection of the More Important Sagas and Other Native Writings Relating to the Settlement and Early History of Iceland*, Vol. 2, ed. and trans. Guðbrandur Vigfússon and F. York Powell (Oxford: Clarendon Press, 1905), 344, 346; *Glúma og Ljósvetninga saga*, xix–xx, xxv, xxviii; *Ljósvetninga saga*, ed. Björn Sigfússon, Íslenzk fornrit 10 (Reykjavík: Hið íslenska fornritafélag, 1940), lvii; and Guðvarður Már Gunnlaugsson, "AM 561 4to og *Ljósvetninga saga*," *Gripla* 18 (2007): 70. Analyses of the B-redaction point to it being derived from the C-redaction; see Tirosh, "On the Receiving End," 43–45.

2 Chapter numbers follow the C-redaction. The C-redaction chapters 5–12 were probably never a part of the A-redaction, but we refer to A chapters 13–18 so that the numbers are aligned with C. We are aware that this is an "editorial" choice that prioritizes the organization of material in the C-redaction, but this accords with our main conclusions.

Ófeigs þáttr and *Vöðu-Brands þáttr*. Scholarly consensus is that these never appeared in 561.³

2. When 561 picks up the narrative after a lacuna between 34v and 35r,⁴ the story is very similar to that of the corresponding chapters 13–18 of the C-redaction. However, the narrative structure, wording, and sometimes even the character names are dramatically different between these two segments.⁵ Near the end of chapter 18, the two narratives converge again with similar text.
3. Towards the end of chapter 21, the A-redaction manuscript breaks off (at the words “gekk til”). A codicological analysis of the manuscript quires conducted by Guðvarður Már Gunnlaugsson shows that it is unlikely that 561 would have continued beyond this point,⁶ meaning that the C-redaction’s chapters 22–32 are unique to that redaction. The final C-redaction chapter 32 is a tale about Þórarinn *ofsi*, his killing of Þorgeirr Hávarsson, and Eyjólfur Guðmundsson’s prosecution of the affair. The story is a variant of *Fóstbræðra saga*’s account of the affair and ends in a lacuna.⁷

3 Guðvarður Már Gunnlaugsson, “AM 561,” 78–79. See also Adolfine Erichsen, *Untersuchungen zur Liósvetninga Saga* (Berlin: Verlag von Emil Evering, 1919), 10, and *Origines Islandicae*, ed. and trans. Guðbrandur Vigfússon and F. York Powell, 347–348.

4 Folio 34v ends abruptly in the middle of chapter 4. When 35v begins, it is in the middle of chapter 13.

5 The medieval text on folio 37v was worn down to such an extent that even in the seventeenth century only small parts of it were intelligible. A hitherto-unidentified seventeenth-century hand attempted to recreate the text with partial success, creating a narrative bridge to compensate for the lacuna. According to Guðvarður Már Gunnlaugsson’s codicological analysis, one leaf is missing between 37v and 38r, which means that the 210 word summary could not possibly have entirely recreated the ca. 1200 missing words (Guðvarður Már Gunnlaugsson, “AM 561 4to,” 76 ft. 20). See also *Origines Islandicae*, ed. and trans. Guðbrandur Vigfússon and F. York Powell, 430.

6 Guðvarður Már Gunnlaugsson, “AM 561,” 79–81. See also *Sturlunga Saga including the Islendinga Saga of Lawman Sturla Thordarson and Other Works*, ed. Guðbrandur Vigfússon (Oxford: Clarendon Press, 1878), lvi, *Origines Islandicae*, ed. and trans. Guðbrandur Vigfússon and F. York Powell, 348, and Tirosch, “On the Receiving End,” 22–26.

7 This tale is commonly referred to as *Þórarins þáttr ofsa*, though there is no indication in the text that it is in any way separate from the main *Ljósvetninga saga* narrative, despite its clear deviation from its main chronological and plot trajectory. For a view of how this segment is in fact consistent with *Ljósvetninga saga*’s C-redaction as a whole, see Yoav Tirosch, “On the Receiving End”, 165–166. For an untraditional interpretation of this episode see the epilogue of Yoav Tirosch, “Trolling Guðmundr: Paranormal Defamation in *Ljósvetninga saga*,” *Paranormal Encounters in Iceland 1150–1400*, ed. Ármann Jakobsson and Miriam

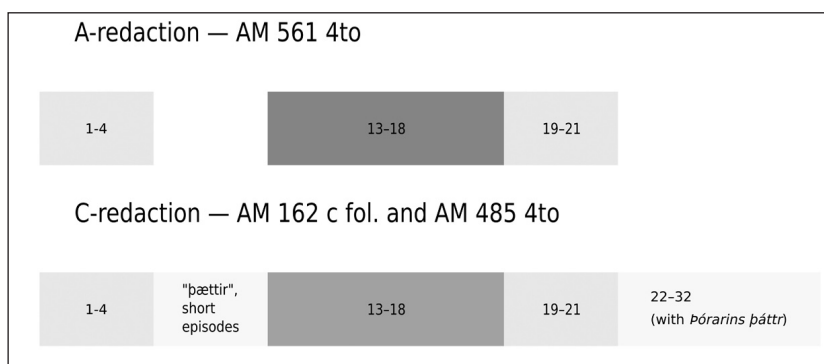


Figure 1 — Comparison of the A- and C-redactions⁸

Some examples will illustrate the differences in the redactions. We should be careful not to overstate the parallel correspondence between chapters 1–4 and 19–21 of the redactions. The texts are somewhat different, as this example illustrates:

A-Redaction, ch. 4⁹

Þá mælti Höskuldur: “Hér horfist til málaferla, og horfir mjög í móti **með** oss frændum. **Er** þér vandi á báðar hendur. Og kalla þeir oss **ómaga, er í kviðinum eru**. Nú **höfum** vér þriðjung **goðorðs**, en faðir vor annan. En **þú** ræður, hvar þú **snýr** að, og þeir hafa meira hlut, **er þú vill fylgja**.”

C-Redaction, ch. 4¹⁰

Þá mælti Höskuldur: “Hér horfist til málaferla, og horfir mjög í móti oss frændum, **en** þér vandi á báðar hendur. Og kalla þeir oss **ómæta í kviðinum**. En nú **eigum** vér þriðjung **í goðorði**, en faðir

Mayburd, *The Northern Medieval World: On the Margins of Europe* (Kalamazoo, MI: Medieval Institute Publications, 2020), 407–409.

⁸ Chapters 1–4 and 19–21 are the same shade due to their similarities while chapters 13–18 in both redactions reflect two divergent traditions. The C-redaction’s “þættir” as well as chapters 22–32 do not have a parallel in the A-redaction.

⁹ *Íslendingasögur og þættir*, II, ed. Bragi Halldórsson et al. (Reykjavík: Svart á hvítu, 1986), 1720, confirmed with AM 561 4to, 34v.

¹⁰ *Íslendingasögur og þættir*, II, ed. Bragi Halldórsson et al., 1658, amended according to AM 485 4to, 5v. Notice that the Svart á hvítu edition does not take into account all of these deviations and therefore misrepresents the textual variance between these two redactions. For more on our treatment of the text of the C-redaction, see the discussion below and n. 45.

vor annan. En þar ræður, hvar þú snýst að, og þeir hafa meira hlut ef þú snýst að með.”

As is clear, while the textual correspondence is similar, certain word choices and clauses are different in style. Nevertheless, these are the kinds of variations we would expect from the normal process of saga transmission.¹¹

When we reach chapters 13–18, however, it is difficult to identify such a strong textual correspondence:

A-redaction ch. 14¹²

En er á leið **ríður Guðmundur** með **tuttuganda** mann út á Laugaland að stefna Þóri um sauðalaunin. Nú var leitað um sættir. Guðmundur vill ekki sættast og lést nú reyna skyldu hvor þeirra röskaði. Hann ríður nú heim á leið.

C-redaction ch. 14¹³

Síðan **reið Guðmundur** í braut. En Einar skipaði sauðamanni sínum að hann skyldi snemma upp rísa hvern dag og fylgja sólu meðan hæst væri sumars. Og þegar er út hallaði á kveldum skyldi hann halda til stjörnu og vera úti með sólsetrum og skynja alla hluti “þá er þér ber fyrir augu og eyru,” og segja sér öll nýnæmi, stór og smá. Einar var árvakur og ósvefnugur. Gekk hann út oft um nætur, og sá himintungl og hugði að vandlega, og kunni þá alls þess góð skyn.

Þetta var snemma morguns. Einar bróðir hans var því vanur að rísa upp snemma og hitta sauðamann sinn. Þetta var enn í það mund er Guðmundur hafði heiman farið.

Það var einn morgun að sauðamaður hafði út gengið. Hann litaðist um, þá sá hann reið **tuttugu** manna ofan með Eyjafjarðará hvatlega. Hann gekk inn til rúms

11 But see Tirosh, “On the Receiving End,” 101–169 for a literary analysis that takes these minute differences into account in the construction of meaning in the saga.

12 *Íslendingasögur og þættir*, II, ed. Bragi Halldórsson et al., 1724, confirmed with AM 561 4to, 36v.

13 *Íslendingasögur og þættir*, II, ed. Bragi Halldórsson et al., 1677–1678, amended according to AM 485 4to, 25r.

Einar mælti að

hann skyldi **vís verða** þess er þeir færu heim aftur. En er á líður daginn kom sauðamaður og sagði Einari að þá voru þeir utan á leið. Einar **mælti að hann skyldi** taka hest hans og leggja á söðul og svo gerir hann.

Einars og sagði honum hvað hann hafði séð. Hann stóð upp þegar og gekk út, hugði að reið manna og starði á um hrið. Einar var skyggn og heyrður vel og glöggþekkin. En er sólin rann upp og skein um héraðið þá mælti Einar: “Með skjöldu ríða þessir menn. Mun það annaðhvort að þeir eru utan-héraðsmenn, er virðing er að, og munu þeir hafa farið að sækja heim Guðmund bróður minn þó vér höfum það eigi spurt eða Guðmundur mun þar ríða sjálfur og þykir mér það miklu líkara. En eigi mun örvænt hvert hann stefnir eða hvert erindið mun vera. En skammt mun til að vér munum **þess vísir verða.**”

Einar **bað að húskarlar skyldu** gefa geymdir að er hann ríði aftur “og látið hesta vora vera nærri túni.”

As this example illustrates, while there are some textual parallels (marked in bold) the prevailing impression is that two versions of the same story are being told in different words. Nevertheless, scholars have disagreed on the connection between the divergent sections of redactions A and C, as well as the sections which show close correspondence between the versions, and it is to these debates we now turn.

Ljósvetninga saga's Redactions in Scholarship

This situation where a part of the text is similar and a part is significantly different has been the source of much disagreement, in particular in the

context of the twentieth-century Freeprose-Bookprose debate.¹⁴ The debate between these theories reflected opposing stances on the origins of the *Íslendingasögur*. Freeprose theory argued that these sagas were composed orally as unities before being written down. Bookprose theory, on the other hand, supposed that, while the *Íslendingasögur* could have originated from oral traditions to one degree or another, they were effectively literary compositions.¹⁵ Both schools of thought saw *Ljósvetninga saga* as an important test case where their own view of saga composition would triumph. Despite scholarship having moved on from these debates to a more nuanced understanding of the sagas' oral origins,¹⁶ their importance lies in the way that they shaped the editions that outlived them and the general debate surrounding *Ljósvetninga saga*.

The issue of *Ljósvetninga saga*'s redactions was first highlighted by Adolfine Erichsen's stylistic examination of the saga: she prioritized the C-redaction variant as the more logical version and stylistically closer to the parallel parts of the saga, arguing that the redactor of the A-redaction had rewritten the text, possibly due to a lacuna in the exemplar that was filled by recourse to oral tradition.¹⁷ These results were emphasized by Freeprose scholar Knut Liestøl, who framed *Ljósvetninga saga* as providing us with the "only reliable example" of two separate oral traditions for

- 14 "Freiprosa" and "Buchprosa." Andreas Heusler, *Die Anfänge der isländischen Saga*, Abhandlungen Der Königl. Preuss. Akademie Der Wissenschaften. Phil-hist. Classe 1913: 9 (Berlin: Königliche Akademie der Wissenschaften, 1914), 53–55.
- 15 See Theodore M. Andersson, *The Problem of Icelandic Saga Origins: A Historical Survey* (London: Yale University Press, 1964), 65–81.
- 16 See e.g. Gísli Sigurðsson, *The Medieval Icelandic Saga and Oral Tradition, a Discourse on Method*, Translated by Nicholas Jones, Publications of the Milman Parry Collection of Oral Literature 2, Cambridge, MA: Milman Parry Collection Distributed by Harvard University Press, 2004; and Slavica Ranković, "Who Is Speaking in Traditional Texts? On the Distributed Author of the Sagas of Icelanders and Serbian Epic Poetry," *New Literary History* 38.2 (2007): 293–307.
- 17 Erichsen, *Untersuchungen*, 58–60. Erichsen's stylistic arguments are explored in greater detail below. See also Andersson, *Problem of Saga Origins*, 151. Björn M. Ólsen argued similarly in his posthumously published lecture series on the *Íslendingasögur*, though he prioritized the A-redaction over the C-redaction, Björn Magnússon Ólsen, "Íslenzkar fornsögur gefnar út af hinu íslenzka bókmenntafélagi: I. Glúma- og Ljósvetningasaga. Khöfn 1880," *Tímarit Hins íslenzka Bókmenntafélags* (1880): 374–375. Guðbrandur Vigfússon and F. York Powell stated that "It almost seems as if the story of Acre-Thore [in the A redaction] has been retold imperfectly from memory" (*Origines Islandicae*, ed. and trans.

a saga.¹⁸ Liestøl attributed the differences in narrative structure and information – such as character names – to the relative lack of importance of these, which allowed for a change in detail.¹⁹

Bookprose scholars, in particular Björn Sigfússon, saw a challenge in Erichsen and Liestøl's arguments that the redactions could be seen as oral variants. Instead, Björn frames the C-redaction as a historical novelization of *Ljósvetninga saga's* A-redaction,²⁰ arguing for the A-redaction's linguistic and stylistic consistency with the rest of the saga – while Erichsen argues the opposite.²¹ In his subsequent Íslenzk fornrit edition of *Ljósvetninga saga*, Björn stressed the awkward style of the C-redaction and argued that chapters 13–18 function more as an individual *þáttir* in the C-redaction than in the A-redaction, where they are more connected to the main narrative.²² Björn argues that the irregularities and clunky style found in the C-redaction are proof that it was not transmitted orally: in oral transmission, one would expect these kinds of illogicalities to be smoothed over by the storytellers.²³

Following Anne Holtmark's review of Björn Sigfússon's *Um Ljósvetninga sögu*, in which she questions Björn's dismissal of oral transmission as an explanation for the redactions' variance,²⁴ Hallvard Magerøy argued that the differences between these texts stem from a textual connection.²⁵ Magerøy goes through the divergent parts of the A- and C-redactions

Guðbrandur Vigfússon and F. York Powell, 348), but they do not expand their argument beyond this.

18 Knut Liestøl, *The Origin of the Icelandic Family Sagas*, trans. Arthur Garland Jayne. Instituttet for Sammenlignende Kulturforskning. Serie A: Forelesninger, 10 (Oslo: Aschehoug, 1930), 48, translated from Norwegian "einaste trygge dømet" (Knut Liestøl, *Upphavet til den Isländske attesaga*, Instituttet for Sammenlignende Kulturforskning. Serie A, Forelesninger 9a (Oslo: Aschehoug, 1929), 50).

19 Liestøl, *Origin of the Icelandic Family Sagas*, 49–51.

20 Björn Sigfússon. *Um Ljósvetninga sögu, With a Summary in English*, *Studia Islandica* 3 (Reykjavík: Ísafoldarprentsmiðja h.f., 1937), 38, 42 (English summary).

21 Björn Sigfússon, *Um Ljósvetninga sögu*, 11–19.

22 *Ljósvetninga saga*, xxv.

23 *Ljósvetninga saga*, xxxix. On Björn's Íslenzk fornrit edition see more below.

24 Anne Holtmark, "Anmälan av 'Studia Islandica. Íslenzk fræði 1–4, p. 15'" *Arkiv för Nordisk Filologi* 55 (1940): 138–139.

25 Hallvard Magerøy, *Sertekstproblemet i Ljósvetninga saga*, *Afhandlinger utg. av det Norske videnskaps-akademi i Oslo. 2 Hist.-filos. Klasse 1956, 2* (Oslo: Aschehoug, 1957), 16–17. See also Andersson, *Problem of Saga Origins*, 155, 158–159.

thoroughly, stressing the A-redaction's closeness in almost all cases to what he deems the original saga²⁶ and arguing for a consistent and intentional tendency of the C-redaction towards expansion of the plot.²⁷ Finally, Magerøy accounts for the deviations in certain character names as a systematic misreading made by the C-redaction's original scribe.²⁸

Andersson responds to Björn Sigfússon and Magerøy's studies by refuting most of their claims regarding the C-redaction's corruption, pointing out that many of the logical mishaps that the Íslenzk fornrit editor argued for were in fact literary technique in practice, and that the inconsistencies that remain are not unique within the *Íslendingasögur* corpus.²⁹ Andersson dismisses Magerøy's argument for a systematic misreading of names that caused the variations in detail in the A and C-redaction, stating that the nature of these variations as well as their "sheer number" prove that these cannot be attributed to a fault in the scribe's practice.³⁰ Andersson agrees with Magerøy that the most logical explanation for the redactions' relationship is a textual one, with priority instead given to the C-redaction, declaring the A-redaction a rushed abbreviation.³¹ In what could be seen as a compromise between the Bookprose and the Freeprose approaches, he argues for an authorial agency behind the two redactions, with the difference in details as stemming from local oral variants.³² As Andersson later points out, there is a consensus in subsequent *Ljósvetninga saga* scholarship

26 The C-redaction portrayal of Rindill's discussion with Þorkell hákr is a noteworthy exception, Hallvard Magerøy, *Sertekstproblemet*, 78.

27 Magerøy, *Sertekstproblemet*, 64, 89. Haakon Hamre finds this explanation of the C-redaction being written "in order to 'increase the dimensions' in content and narration ... not so convincing." "Reviewed Work: *Sertekstproblemet i Ljósvetninga Saga* by Hallvard Magerøy," *The Journal of English and Germanic Philology* 58.3 (1959): 469.

28 Magerøy, *Sertekstproblemet*, 86–87.

29 Andersson, *Problem of Saga Origins*, 153, 156. In addition, Andersson claims that the Íslenzk fornrit editor is too invested in the fallacy that "older is better," which sees a text's quality as an indication of age.

30 Andersson, *Problem of Saga Origins*, 158.

31 Andersson, *Problem of Saga Origins*, 159–165.

32 Andersson, *Problem of Saga Origins*, 165. The fact that this is a compromise between the two schools of thought finds support in the words of Bookprose scholar Einar Ól. Sveinsson and Freeprose scholar Knut Liestøl. As Einar states: "If the author of a saga had succeeded in getting all the material from the best-informed people, it might well be that he had included everything with which the story was concerned, and there was then no good reason to add anything. But if much of the material had been left unused, there might

that the connections between the different parts of the saga are textual rather than oral.³³

The debate has been largely dormant until now.³⁴ Nevertheless, our modern understanding of the saga is heavily dependent upon the editions produced while this debate was in full swing, as will now be explored.

On *Ljósvetninga saga*'s Editorial History

It is important to note how the scholarly editions of *Ljósvetninga saga* have influenced the way that this saga has been received; at the end of the day, the ways that these texts have been presented inform much of our thinking about them.³⁵ The first edition of the saga from 1830 was edited by Þorgeir Guðmundsson and Þorsteinn Helgason and stuck almost exclusively to the post-medieval C-redaction manuscript AM 485 4to, to the point of sometimes preferring its readings even when equally-viable ones were available in the medieval 162.³⁶ Furthermore, Þorgeir and Þorsteinn's

then be good reason to make additions, or a new version." Einar Ól. Sveinsson, *Dating the Icelandic Sagas, An Essay in Method*, Viking Society for Northern Research Text Series 3 (London: Viking Society for Northern Research, 1958), 33. Liestøl, on the other hand, points out that "A manuscript of a saga may have been used for reading aloud or as a sort of prompt-book when reciting, and its contents may have become oral tradition again through the medium of the hearers." *Origin of the Icelandic Family Sagas*, 43.

- 33 *Law and Literature in Medieval Iceland: Ljósvetninga Saga and Valla-Ljóts Saga*, trans. Theodore Mordock Andersson and William Ian Miller (Stanford, CA: Stanford University Press, 1989), 70. Cecilia Borggreve offered an interesting reversal of the "older is better" premise, proposing that the C-redaction is indeed the older of the two versions, with the younger A-redaction introducing more structure and order into its retelling of the plot. Cecilia Borggreve, "Der Handlungs Aufbau in den zwei Versionen der Ljósvetninga saga," *Arkiv for nordisk filologi* 85 (1970): 238–246.
- 34 The most recent contribution to the debate is Yoav Tirosch "On the Receiving End", though there he emphasizes the narratological consistency and intrinsic value of both versions rather than attempting to trace the compositional origins of the text.
- 35 See, for example, Ármann Jakobsson, "Sögurnar hans Guðna: Um "lýðveldisútgáfu" Íslendingasagnanna, hugmyndafræði hennar og áhrif," *Skírnir* 192 (2018): 116. On the Icelandic *Alþingi*'s reaction to Halldór Laxness's mere intention of creating an edition of *Brennu-Njáls saga*, see Jón Karl Helgason, *Hetjan og höfundurinn. Brot úr íslenskri menningar sögu* (Reykjavík: Heimskringla — háskólaforlag Máls og menningar, 1998), 135–168 as well as Jón Karl Helgason, *The Rewriting of Njáls Saga. Translation, Ideology and Icelandic Sagas*, Topics in Translation 16 (Clevedon: Multilingual Matters, 1999), 119–136.
- 36 *Ljósvetninga saga: Eptir gömlum hár. útg. at tilhlutun hins konúngliga Norræna fornfræða félags*, ed. Þorgeir Guðmundsson and Þorsteinn Helgason, Sérprent úr Íslendinga sögum, 2

edition gave only brief mention to the divergence between 561 and the C-redaction, stating that the former narrates chapters 13–18 “með öllum öðrum orðum.”³⁷ In what could be seen as a controversial decision (though not by the present authors), their edition also prefers AM 485 4to and AM 514 4to’s readings over those of the medieval 561 in the common segments of the saga (chapters 1–4 and 19–21), thus again preferring the younger reading over an older one.

Guðmundur Þorláksson’s 1880 *Glúma og Ljósvetninga saga*, which was edited with the assistance of Finnur Jónsson, is probably the best critical edition of the saga to date and is still of great utility, mostly due to its marking of most of the variants between the major manuscripts.³⁸ In the parallel chapters (i.e. chapters 1–4 and 19–21), Guðmundur usually opts for the readings offered in the A-redaction, while in the divergent chapters he prefers the C-redaction rendering of events, with the A-redaction text added as an appendix. In what seems to be his most influential decision, Guðmundur decided to split the saga into two parts: *Guðmundar saga* and *Eyjólfs saga*. He further split *Guðmundar saga* into six parts:

1. *Deilur Þorgeirs goða ok sona hans*
2. *Kvánfang Sörla Brodd-Helgasonar* (commonly referred to as *Sörla þáttur*)
3. *Reykðæla þáttur* (commonly referred to as *Ófeigs þáttur*)
4. *Vöðu-Brands þáttur*
5. *Þóris þáttur Helgasonar ok Þorkels háks*
6. *Draumr ok dauði Guðmundar ens ríka*

bindi (Copenhagen: S.L. Möller, 1830). For example, in chapter 7 of the saga Þorgeir and Þorsteinn prefer the AM 485 4to reading “eyrði allvel” (11r) over AM 162 c fol.’s reading “dygdi alluel” (1v), “Syv Sagablade (AM 162 C fol., bl. 1–7),” ed. Jón Helgason, *Opuscula 5, Bibliotheca Arnarnæana*: 31 (1975): 47, or preferring AM 485 4to’s “Bæsa” (21r) over “[b]ægis á” (2v), Jón Helgason, “Syv Sagablade,” 53.

37 *Ljósvetninga saga: Eptir gömlum hdr.*, ed. Þorgeir Guðmundsson and Þorsteinn Helgason, unnumbered introduction.

38 *Glúma og Ljósvetninga saga.*, ed. Guðmundur Þorláksson and indexed by Finnur Jónsson, Íslenzkar fornsögur. Vol. 1 (Copenhagen: Hið íslenska bókmenntafélag, 1880). Not everyone shares this opinion. Guðbrandur Vigfússon and F. York Powell criticized the edition, stating that “there are too many worthless various readings, the text is based on a second-rate MS., and important clauses are skipped,” 348. They then add, in a display of admirable generosity, that “one would not be too severe on this work, for to edit this Saga is no task for a prentice hand, and the state of the text demands exceptionally delicate treatment,” 348.

In the case of *Eyjólfs saga*, he added a splitting line before chapter 32 (which is commonly referred to as *Þórarins þáttur ofsa*), to indicate that it is out of place in the saga.³⁹ The decision to separate the saga into various episodes through the added headings and the creation of a composite text that incorporated segments from both redactions had a profound effect on the saga's reception as highly episodic, and has been heavily criticized.⁴⁰

Guðbrandur Vigfússon and F. York Powell edited and translated *Ljósvetninga saga* in their posthumous *Origines Islandicae* compilation of historical texts. In their edition they decided to not include the chapters following Guðmundr's death (that is, chapters 22 and onwards). This decision was both due to the irrelevance of the period after Guðmundr inn ríki's death to their project, as well as their assertion that this segment is "much inferior" to the part focused on Guðmundr.⁴¹ Like Guðmundur Þorláksson, Guðbrandur and Powell also prefer the A-redaction readings for the common chapters but the C-redaction readings for the divergent part, and therefore use 561 for chapters 1–4 and 19–21, but the C-redaction 162 and its paper copies for chapters 5–18, as well as the end of chapter 21.

In his Íslensk fornrit edition of *Ljósvetninga saga*, Björn Sigfússon prioritized the A-redaction over the C-redaction, both in terms of preferring 561's readings over the C-redaction paper copies in the common sections of the saga, but also in the printing of the A-redaction text above the C-redaction text and in larger letters in the divergent chapters. Björn contends that Guðmundur Þorláksson's edition and its dividing of the saga into two parts and *Guðmundar saga* into *þættir* interfered with the understanding of the saga and led to fallacious interpretations.⁴² Björn

39 See n. 7.

40 See, for instance, Albert Ulrich Bååth, *Studier öfver Kompositionen i Några Isländska ätt-sagor* (Lund: [Gleerup], 1885), 1–2; Erichsen, *Untersuchungen*, 70; Björn Sigfússon, *Um Ljósvetninga sögu*, 4–5. Björn Magnússon Ólsen, "Íslenzkar fornsögur gefnar út af hinu íslenzka bókmenntafélagi: I. Glúma- og Ljósvetningasaga. Khöfn 1880," *Tímarit Hins íslenzka Bókmenntafélags* (1880): 266–7. See also Magerøy, *Sertekstproblemet*, 10, 13, and n. 38 regarding Guðbrandur and Powell's criticism. On Björn Sigfússon's further criticisms see below. Guðmundur would most likely have responded thusly: "Ljósvetninga saga er svo auðsjáanlega safn af smáþáttum, að eg hefi ekki hikað mér við að skipta henni niður," *Glúma og Ljósvetninga saga*, iii.

41 *Origines Islandicae*, ed. and transl. Guðbrandur Vigfússon and F. York Powell, 350.

42 *Ljósvetninga saga*, ed. Björn Sigfússon, xxiii, ft. 1. In *Um Ljósvetninga sögu* Björn stresses that Erichsen's misunderstanding of the text's flow stems from Guðmundur's forced division into parts and interpolated episode titles (8).

emphasized what he read as the fragmentary nature of the C-redaction by removing the three *þættir* and printing them after the saga's main text, as well as by printing *Þóraríns þáttir ofsa* as a text entirely separate from *Ljósvetninga saga*.⁴³ In addition, his critical apparatus and overall argumentation gives the impression that chapters 22–31, which can only be found in the C-redaction, were a part of the A-redaction' – despite the fact that, as discussed above, codicological evidence indicates that this part would not have been included in 561.

The Svart á hvítu edition of the saga from 1986 was used as the basis of our stylometric analysis.⁴⁴ This edition published the A- and C-redactions separately, by which – unlike Björn Sigfússon's Íslenzk fornrit edition – it highlighted the A-redaction's fragmented nature. In the Svart á hvítu edition segment that is titled "Ljósvetninga saga (C-gerð)," i.e. the C-redaction, there are several readings where the C-redaction manuscript readings are indeed preferred, but in most places the edition keeps the unamended A-redaction reading over that of the C-redaction, thereby underplaying the differences in phrasing throughout the parallel text. From the viewpoint of a stylometric analysis where the choice of words is key, we have therefore opted to revise their reading of the parallel chapters in the C-redaction, based on the readings in AM 485 4to.⁴⁵ We also confirmed their version of the A-redaction against the manuscript.

All of these editors of *Ljósvetninga saga* made decisions that influenced the text's reception: Þorgeir Guðmundsson and Þorsteinn Helgason ignored the significant variance evident in the A-redaction; Guðmundur Þorláksson created a composite text, providing misleading episode titles

43 *Ljósvetninga saga*, ed. Björn Sigfússon, 143. Despite this, the three first *þættir* still influence Björn's chapter count of the C-redaction but not that of the A-redaction, creating a somewhat disorienting effect which further strengthens his representation of an 'eclectic C-redaction'.

44 *Íslendingasögur og þættir*, II, ed. Bragi Halldórsson et al.

45 The choice of AM 485 4to as the basis for our revisions of the Svart á hvítu text is justified in Tirosh, "On the Receiving End," 36–50. There it is argued that of the earliest extant paper manuscripts, AM 485 4to reflects the most faithful (though certainly not perfect) transmission of AM 162 c fol. In a text-sensitive study like the one conducted here, the manuscript chosen by Björn Sigfússon for his Íslenzk fornrit edition JS 624 4to is problematic due to its addition of too many words and clauses for the purpose of clarification and creating a more streamlined narrative.

that influenced readers into receiving the text as fragmentary; Guðbrandur Vigfússon and Powell also created a composite text, as well as removing Eyjólfur's entire segment from the saga; Björn Sigfússon presented a flowery picture of the extant A-redaction material that inaccurately reflects the manuscript transmission, dismissing the importance of the *þættir* for the wholeness of the C-redaction in the process; and finally, the Svart á hvítu editors present an incomplete picture of the full variance between the A-redaction and the C-redaction. With the exception of Guðmundur Þorláksson, all these editions fail to point out the significant variations found in the parts shared between both redactions, preferring 561's rendering of the events without properly acknowledging the noticeable differences even in these parallel parts.

Bridging the Stylistic Gap

One thing that is clear from the above discussion is that scholars and editors of *Ljósvetninga saga* disagree about the relationship between the A- and C-redactions of the text. These opinions were colored by the Freeprose-Bookprose debate which was at its height when the two central stylistic studies of *Ljósvetninga saga* were conducted. We now turn to the specific stylistic arguments put forward by these scholars to frame our stylometric analysis. In the following, we refer to the divergent chapters in A and C (chapters 13–18) as “A-divergent” and “C-divergent.”

Above we have mentioned the work of Erichsen and Magerøy who offer opposing stances on the redaction problem, the former arguing for the primacy of the C-redaction and the latter for the A-redaction. While both authors employed various methods which were based on their ideas of saga narrative and aesthetic, overall their studies can be situated in the field of stylistics. It is relevant then to take a closer look at the specific stylistic arguments of these two studies.

Erichsen stresses that A-divergent tends towards the repetition of words in similar situations, while C-divergent has a somewhat more diverse vocabulary;⁴⁶ A-divergent tends syntactically more towards simpler

46 Notice that here she takes care to note that this characterizes A-divergent specifically and not the A-redaction as a whole.

parataxis, while C-divergent tends towards more complex hypotaxis, and chapters 1–4 do somewhat as well.⁴⁷ Having compared the style of these divergent chapters to the parallel chapters, she concludes:

Here one must accept a mix of sources within the written text transmission. One scribe – be it that of 162 or an exemplar or that of 561 or an exemplar – took the middle section [chapters 13–18] from a secondary source (either written or oral), presumably because the main exemplar had a lacuna here, or because there was a source for this part which he liked better... In other words, A is the result of a mix of sources and C follows one consistent exemplar, or vice versa.

Of these two options, the first is preferable. After all the vocabulary and style of AX [A13–18, A-divergent] have some features that differ from I [1–4] and II [19–21] (in A and in C [the parallel chapters]),

47 Erichsen, *Untersuchungen*, 56–58. She also provides an argument based on an analysis of the narrative, stating that chapters 1–4 (in both redactions) are a summary of a lost, longer rendering, pointing to, for example, Guðmundr inn ríki entering the saga without any introduction, as well as the vagueness of the *nið* against Guðmundr that was circulated by Þórir Helgason and Þorkell hákr. Erichsen, *Untersuchungen*, 66–70. Björn Sigfússon firmly disagreed with Erichsen's assertion that chapters 1–4 are an abbreviation, providing several examples of characters entering a saga without an introduction (*Um Ljósvetninga sögu*, 8–9, n. 2). He also responds to her opinion that the *nið* is unclear, arguing that she failed to understand the art of the saga (*Um Ljósvetninga sögu*, 10). In the context of Þórir and Þorkell's *nið* see Tirosh, "On the Receiving End", 120–122 as well as Yoav Tirosh, "Argg Management: Vilifying Guðmundr inn ríki in *Ljósvetninga saga*," *Bad Boys and Wicked Women. Antagonists and Troublemakers in Old Norse Literature*, ed. Daniela Hahn and Andreas Schmidt. Münchner Nordistische Studien 27 (Munich: Herbert Utz Verlag, 2016) 240–72. She further argued that the *þættir* stand out stylistically and from a narrative perspective, but this is beyond the scope of the present research. Magerøy responded to Adolfin Erichsen's argument that chapters 1–4 were an abbreviated version of a lost text, supporting this with a literary and linguistic analysis that shows a consistency between the different parts of the A-redaction. "Den indre sammenhengen i *Ljósvetninga saga*," *Norroena Et Islandica: Festschrift til Hallvard Magerøy På 75-årsdagen Den 15. Januar 1991, Utvalde Artiklar* (Øvre Ervik: Alvheim & Eide, Akademisk Forlag, 1991) 63–91. This analysis includes ch. 22–31 which, as mentioned above in reference to Guðvarður Már Gunnlaugsson's research, probably could not have been part of the A-redaction manuscript 561, which puts a question mark on Magerøy's arguments.

whereas no differences were noticeable between CX [C 13–18, C-divergent] and I–II [C 1–4, 19–21, the parallel chapters].⁴⁸

Thus Erichsen argues that the A-redaction is likely a result of the mixing of sources, whereas the C-redaction is more internally consistent. In the stylometric analysis that follows, we agree with this conclusion.

Magerøy, on the other hand, argues that the primacy of the A-redaction is reflected syntactically when compared to C-divergent, but also with the C-redaction's *þættir* standing out in particular. For example, he finds a higher use of “ok” in chapters 1–4 and A-divergent compared with C-divergent;⁴⁹ he repeats Björn Sigfússon's assertion that there are more dependent clauses in C-divergent than in A-divergent and chapters 1–4, noting an exceptionally high number of these clauses in the C-redaction *þættir*; also, like Erichsen, he agrees that C-divergent is characterized by hypotaxis and A-divergent by parataxis, but unlike her he suggests that chapters 1–4 are characterized more by hypotaxis than parataxis.⁵⁰

At this point the stylistic discussion largely ended with the matter remaining unsettled. With the Freeprose-Bookprose debate losing steam as the twentieth century went on, so too did the *Ljósvetninga saga* redaction problem drift away from scholarly attention. The task of this study is to engage with the problem once again, leveraging the advent of stylometrics.

48 “Hier muss man eine Quellenmischung, innerhalb der schriftlichen Textüberlieferung annehmen: ein Schreiber — sei es der von 162 oder einer Vorlage, sei es der von 561 oder einer Vorlage — hat dieses Mittelstück aus einer Nebenquelle (einer mündlichen oder einer schriftlichen) geschöpft, vermutlich weil die Hauptvorlage hier eine Lücke hatte, oder auch weil ihm gerade für diese Strecke eine Quelle zu Gebot stand, die ihm besser gefiel... Mit anderen Worten: A ist das Ergebnis einer Mischung, und C folgt einer zusammenhängenden Vorlage, oder umgekehrt. Von diesen zwei Möglichkeiten ist die erste vorzuziehen; denn Wortschatz und Stil von AX weisen immerhin einige Züge auf, die von I und II (in A wie C) abweichen wogegen zwischen CX und I–II keine Unterschiede bemerkbar [sind] ...” Erichsen, *Untersuchungen*, 59–60.

49 Magerøy here uses the 561 readings for the parallel chapters 1–4 and 19–21 for comparison with both A-divergent and C-divergent. This assumption does not take into account manuscript transmission. If Magerøy had counted the use of ‘ok’ in C chapters 1–4 and 19–21, he would have found that ‘ok’ is a scribal tendency in 561 and not necessarily a stylistic feature of A-redaction, discussed further below.

50 Note that he frequently reveals that the gap between C-divergent and A-parallel widens when the parts of chapters 13–18 that are not extant in A-divergent are taken into account. However, it could very well be that dependent clauses are a stylistic characteristic enforced by the plot itself, for example due to the introductory nature of these chapters.

That said, when we break the problem down to address it with a stylometric method, it turns out that, in fact, we are dealing with at least three separate problems each requiring a dedicated approach to a solution. First, there is the problem of whether A or C's divergent text in chapters 13–18 contains greater stylistic consistency with the text of the parallel chapters. This is a problem which stylometry is well-positioned to address, as will be discussed. Second is the problem of whether the sections unique to the C-redaction — the three *þættir* in chapters 5–12, the post-Guðmundur section in chapters 22–31, and finally *Þórarins þáttur ofsa* (chapter 32) — are stylistically related to the canonical Guðmundur chapters. This is a more complex problem from a stylometric point of view. To date, our attempts to test this second problem have been inconclusive.⁵¹ The third problem is whether chapters 1–4 in both redactions should indeed be considered an abbreviation of a now-lost text. This is also a difficult problem to approach stylometrically, since chapters 1–4 are very short.⁵² In light of these matters, this article focuses on the first problem: is A-divergent more consistent with the parallel chapters of both versions, as Magerøy argued? Or is C-divergent more consistent, as Erichsen argued? As will be shown, the stylometric evidence is sufficient to accept Erichsen's conclusion and reject Magerøy's: C-divergent is more consistent with the style of the parallel chapters in both A and C, while A-divergent is likely a retelling.

From stylistics to stylometry

Before we proceed, let us discuss stylometry in general. What is stylometry and what distinguishes it from stylistics? From the point of view of its fundamental premise, there is little separating the former from the

51 In particular, we applied Multidimensional Scaling to these different parts of the C-redaction to determine their stylometric relationships. The results supported neither the hypothesis that these sections are interpolations nor the hypothesis that they are straightforwardly consistent with the remaining texts. As such, further research will be required to address this problem.

52 The word counts for these chapters alone falls well below the acceptable thresholds discussed below. As with the previous problem, we performed some initial tests which were inconclusive. Namely, the calculated cosine distances were highly dependent upon parameterization (for more on these terms, see below), indicating a high likelihood that the results could be explained as random chance.

latter: both methods are premised on the notion that writers, consciously or unconsciously, employ patterns in their use of language. For a given document, then, it should be possible to identify these patterns and compare them with other documents to determine how tendencies appear across the corpus. While it is certainly possible to do this sort of investigation manually, as Erichsen and Magerøy did, the stylometric method allows us to perform this sort of analysis in a statistically-robust, computer-assisted manner.⁵³ Stylometric methodologies are supported by a growing body of research conducted by scholars operating in an interdisciplinary manner at the intersection of language, literature, statistics, machine learning, and corpus linguistics. When done correctly, it also allows us to reduce bias, since the selection of features is generally not conducted by the human investigator (though the human investigator can still very well introduce bias into the research design, as discussed below).

The advent of stylometry has not changed the fact that the original premise of stylistics (that writers have particular habits) is not without its complications. While it is mostly uncontroversial to talk about the existence of style, scholars undertaking the analysis of style must constantly interrogate whether identified “patterns of language use” should be explained by style, or by something else entirely. There are, in fact, a large range of possible explanations for a given pattern. It may be that a particular pattern emerges because of circumstances arising due to a text’s manuscript transmission, thematic content, genre, setting, narration, editorial practice, or something else. Stylometry has provided us with powerful methods for identifying patterns in our texts and measuring the similarity between documents based on the frequencies of these patterns. But we must be careful not to get carried away by these advancements and neglect to inter-

53 At least four published studies in the Old Norse field have applied stylometry to illuminate old debates surrounding mainly questions of authorship. These studies are: Rosetta M. Berger and Michael D.C. Drout, “The relationship between *Víga-Glúms saga* and *Reykðæla saga*: Evidence from new lexomic methods,” *Viking and Medieval Scandinavia* 11 (2015): 1–32; Jón Karl Helgason et al., “Fingraför fornsagnahöfunda: Fráleiðsla í anda Holmes og stilmæling í anda Burrows,” *Skírnir* 191 (2017): 273–309; Haukur Þorgeirsson, “How Similar are *Heimskringla* and *Egils saga*? An Application of Burrows’ delta to Icelandic Texts,” *European Journal of Scandinavian Studies* 48.1 (2018): 1–18; and Michael MacPherson, “Samdi Bjarni biskup Málsháttakvæði? Glímt við dróttkvæði með stilmælingu,” *Són* 16 (2018): 35–58.

rogate the underlying premise at the center of both traditional stylistics and stylometry.

The need for caution can be illustrated with a recent exchange. In a 2018 article, Hartmut Ilseman applies a stylometric method to the works of Christopher Marlowe and concludes to strip him of around 5/7th of the texts traditionally attributed to him, justifying this bold move on stylometric grounds.⁵⁴ In a response to this article in 2019, Ros Barber takes Ilseman to task, arguing (convincingly) that Ilseman's study is flawed in its implementation and overreaching in its interpretation.⁵⁵ Barber's contention is mainly that Ilseman's results are predetermined by bias introduced into the test environment by the investigator. A number of lessons can be learned from this exchange:

- 1) Great care should be taken in the preparation of the documents. Critical engagement with the texts before any stylometry occurs is paramount.
- 2) The ideal test environment should be designed in a way which eliminates bias towards a particular document or class of documents.
 - a) Proper handling of texts of variable length is particularly crucial.
- 3) Investigators must always interrogate whether their documents are meaningfully comparable in terms of "style."

In keeping with these points, the present study will first address the preparation of the texts in light of the textual and editorial context discussed in the first part of this article (in keeping with point 1 above). For the stylometric investigation proper, we offer a series of iterative test environments, each iteration designed to improve upon the previous and communicate how the manipulation of the input documents and the adjustment of parameters affects the results. We emphasize an understanding of how and why these iterative modifications result in slightly different

54 Hartmut Ilseman, "Christopher Marlowe: Hype and Hoax," *Digital Scholarship in the Humanities* 33 (2018): 788–820.

55 Ros Barber, "Marlowe and Overreaching: A Misuse of Stylometry," *Digital Scholarship in the Humanities* 34.1 (2019): 1–12.

figures. It is our hope that this will make the investigation both accessible and transparent. It is also our hope that this iterative process will assist the reader in assessing whether, indeed, we are successful in removing bias from the test environments (in keeping with point 2). Between each iteration, we attempt to determine whether the results can be explained by style rather than something else (in keeping with point 3).

Preparing the documents

The basic precondition for stylometry is to have the texts in machine-readable format and split into different documents. Given the reconstructive editorial history of *Ljósvetninga saga* discussed above, we could not rely on a particular edition at the outset. We opted instead to produce new texts of the A- and C-redactions according to a best-text approach. As mentioned above, the texts of the redactions from the Svart á hvítu *Íslendingasögur* edition were used as a beginning text⁵⁶ and were updated to be closer to the manuscript readings of 561 for A and 162 and 485 for C,⁵⁷ applying consistent normalization practices between the two versions.

Once this was achieved, the texts of each version were split into the following documents:

Document 1: *Ljósvetninga saga* A chapters 1–4, 19–21 (hereafter “A-parallel”)

Document 2: *Ljósvetninga saga* C chapters 1–4, 19–21 (hereafter “C-parallel”)

Document 3: *Ljósvetninga saga* A chapters 13–18 (“A-divergent”).

Document 4: *Ljósvetninga saga* C chapters 13–18. (“C-divergent”)⁵⁸

⁵⁶ *Íslendingasögur og þættir*, II, ed. Bragi Halldórsson et al.

⁵⁷ On the selection of 485, see n. 45.

⁵⁸ A- and C-parallel also include the last part of chapter 18 in A and C, which is where the versions converge. The A-divergent document omits the seventeenth-century summary on 37v of 561 mentioned in n. 5.

Table 1 — Document sizes

Document	Word count	Distinct terms
A-parallel	4002	1151
A-divergent	3277	913
C-parallel	4013	1159
C-divergent	4641	1280

Since we are specifically interested in determining whether A or C's divergent text is closer to the rest of the parallel text, this test environment is indifferent towards the question of whether A and C chapters 1–4 are, as Erichsen suggested, abbreviations of a lost text. It is more important for this stylometric setup that we have the two versions of the parallel text of substantial length. Once the documents are split in this manner, we arrive at the word counts in Table 1.

Are these documents of sufficient length for stylometric purposes? A-divergent in particular is quite short, possibly so short that any results would not be able to be explained by anything other than random chance. Maciej Eder has studied the matter for a range of poetic and prose corpora, attempting to arrive at a shortest acceptable length for reliable stylometric authorship attribution.⁵⁹ He observes that some corpora, such as English novels, require documents to be at least 5000 words in length before they provide acceptable results in stylometric authorship attribution. Meanwhile, results on Latin prose samples become acceptable at 2500 words.⁶⁰

It remains unclear where, precisely, we should place Old Norse saga prose on this spectrum. From literature on the vocabulary of the *Íslendingasögur*, we can confidently state that saga texts have a rather small vocabulary when compared to modern Icelandic texts.⁶¹

59 Maciej Eder, "Does Size Matter? Authorship Attribution, Small Samples, Big Problem," *Digital Scholarship in the Humanities* 30:2 (2015): 167–182.

60 Maciej Eder, "Does Size Matter?" 180.

61 The narrowness of saga vocabulary relative to, for instance, modern Icelandic texts was proved quantitatively in the latter part of the 1980s and early 1990s, as is discussed in Örnólfur Thorsson, "Orð af orði: hefð og nýmæli í Grettlu" (Doctoral thesis, University of Iceland, 1994): 35–36.

Since this is the case, we could certainly argue *a priori* that, when comparing *Íslendingasögur* documents, our word frequencies are more significant since the total range of possible words is narrower (effectively reducing the dimensionality of the feature space). But proving such a claim would require a methodological study extending Eder's research into the Old Norse field, and such a study still remains to be conducted (and is much desired). Nevertheless, it is important to note that Eder's goal, and the goal of many stylometricists to whom Eder was responding, was unequivocal authorship attribution. In order to appear as a correct attribution in his study, the stylometric classifier would have to determine the correct author. In practice, textual researchers are (or perhaps should be) seldom after such strong classifications. Rather, in situations where antiquity has afforded us with a limited set of evidence, we must resort to fuzzier probabilities. Given this, it is worthwhile to point out a similar experiment conducted by Burrows which found that stylometry could rank the correct author among a list of top candidates with documents as short as 150 words.⁶²

Various factors lead us to believe that the results of our investigation are not based on random chance, but rather genuinely speak to the relationship between *Ljósvetninga saga* A and C. First, the investigation is rather simple, targeting a small number of texts, two of which are almost the same. This means that the dimensionality of the problem is low, which is helpful. If we were exploring a corpus of hundreds of small texts (as Eder was), the dimensionality of the problem would be much larger, increasing the likelihood that the significance of word frequencies would get lost in the void of an excessive feature space. The documents have also been heavily reviewed by the authors for consistency, which is not the case for many textual corpora in stylometric literature. Finally and most importantly, in what follows we conduct a series of tests with different setups and at every stage the overall pattern of the results is always the same. This is a good sign, since it indicates that the overall relationship between the documents (that the C-redaction is most internally consistent with the parallel

62 See in particular Table 3 in John Burrows, "Delta": A Measure of Stylistic Difference and a Guide to Likely Authorship," *Literary and Linguistic computing* 17:3 (2002): 275. In this article John Burrows was working with the original delta metric which he devised here, and it should further be pointed out that metrics have improved since that time.

chapters of both A and C) is stable even through multiple test designs. Nevertheless, in the absence of benchmarking studies establishing the minimum document size for acceptable stylometric results in Old Norse saga prose, caution dictates that the present study should remain qualified by the possibility that our observations be explained merely as the result of random chance. As with any study, trust in the results ultimately rests in the reader's hands.

Measuring similarity

Having arranged the documents in the above manner, let us now begin with an initial stylometric experiment. Here we are chiefly interested in probing the stylometric similarity between A- and C-parallel and -divergent. As an initial hypothesis based on what we know about the manuscripts, we might expect that A-divergent should be more similar to A-parallel than it is to C-parallel, whereas C-divergent should be more similar to C-parallel than it is to A-parallel. Additionally, A-divergent should be more similar to A-parallel than C-divergent is to A-parallel, and C-divergent should be more similar to C-parallel than A-divergent is to C-parallel. This is a neutral hypothesis which assumes that documents of the same version are coherent stylistic units and can be summarized as follows: documents of the same version should be closer to documents of that version. This would be the case if nothing particularly special is going on.

The stylometric method we employ here is to calculate the stylometric distance between the documents. Having divided the texts in the manner described above, we scrub the documents of punctuation so that only individual word-forms remain. These individual words are then tokenized, each word being one token. We then tally the word frequencies for each word in each document, so that each document has a list of word frequencies. Next, we apply two parameters to this list of frequencies. First, in order to eliminate the randomness of less-frequent words, we only want to factor in a list of Most Frequent Words (MFWs). With the MFW parameter set to 100, we would only consider the top 100 most frequent words in each document. This has the effect of reducing the dimensionality of the problem and removing a great deal of noise, but it is also conceivable that it eliminates marginal data points which might contribute meaningfully to

a different result. We begin in the first test with MFW set to 100. Second, we may wish to only consider words which appear in a certain number of documents and remove the other words from the list of frequencies. This prevents words which are unique to one or more documents from contributing to the result. This is known as the “culling” parameter. With culling set to 100%, a word must be present in every single document to be included. This would allow us to remove the influence of anomalous words which appear in one redaction but not the other, focusing instead on more general patterns. But it has the possible downside of eliminating words which may be truly characteristic of a redaction. We begin with culling set to 100%. After applying these two parameters, the resulting list of frequencies are then normalized as z-scores and the distances between the documents are computed with these matrices using the cosine distance metric.⁶³ This results in a number between 0 and 2, with 0 indicating that two documents are exactly the same and 2 indicating that two documents have nothing in common.

In Figure 2, we observe the distances between A-divergent (in dark gray) and C-divergent (in light gray) to A-parallel (on the left-hand side) and C-parallel (on the right-hand side). As a reminder, the smaller the number, the more related the documents are stylometrically. Thus, the two closest documents are C-parallel and C-divergent, which have a cosine distance of 1.383, while the least similar documents are A-parallel and A-divergent with a cosine distance of 1.534. In this experiment, it turns out that C-divergent is closer to A-parallel than A-divergent is with a cosine distance of 1.497. Meanwhile, A-divergent is slightly closer to C-parallel than it is to A-parallel with a similarity of 1.519. As it turns out, our hypothesis does not accurately capture the results of this initial investigation. Instead of texts of the same version being more similar to one another, we observe that C-divergent is more similar to everything than A-divergent is. Taken at face value, this means that the C-redaction would be the most

63 See Jannidis et al., “Improving Burrows’ Delta – An empirical evaluation of text distance measures,” *Book of Abstracts of the Digital Humanities Conference 2015, ADHO, UWS* (2015) for a full description. In this work, the authors demonstrate that this metric outperforms other nearest-neighbor methods, making it a good fit for our present study. The stylometry is implemented in R, leveraging the Stylo package, M. Eder, J. Rybicki, and M. Kestemont. “Stylometry with R: a package for computational text analysis,” *R Journal* 8.1 (2016): 107–21. <https://journal.r-project.org/archive/2016/RJ-2016-007/index.html>.

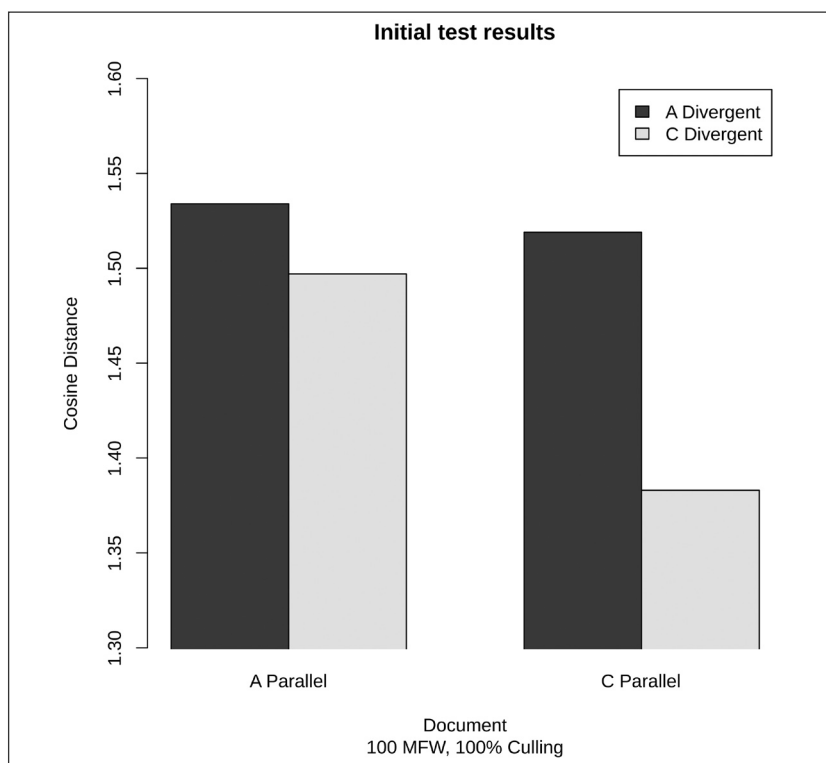


Figure 2 – Initial Cosine Distance.

stylistically-consistent text, whereas A-divergent is less similar not only to the entirety of the C-redaction, but also to A-parallel. A-parallel, it seems, has more to do with C than it does with A.

That said, we have a problem. Perhaps C-divergent is dominant simply because it is the longest document at 4641 words, compared to the 3277 words of A-divergent. To address this, we will run the test again having randomly sampled each document down to the length of our shortest document. For texts longer than 3277 words, we grab 3277 words at random and use the frequencies for the randomly sampled words to calculate our distance scores. This “bag-of-words” method is known to outperform other random sampling methods.⁶⁴ To prevent a single anomalous sampling

64 Eder, “Does Size Matter?” 169.

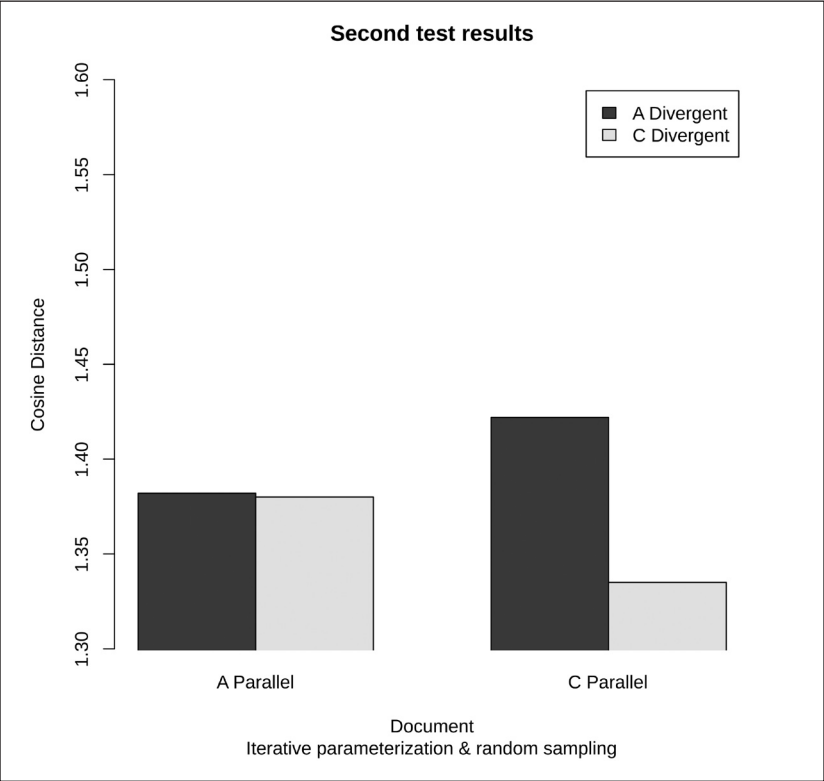


Figure 3 – Test 2

from having an undue influence, though, we take ten random samples and average out the results.

Another problem is that we may be placing too much weight on an *a priori* selection of our MFW and culling parameters. It may be that our assumption to use 100 MFWs at 100% culling is simply too strict to allow us to accurately assess the relationship between the documents. As such, in addition to implementing random sampling, we will also run a series of iterative tests with different parameters and average out the results. To do this, we run the first test at 100 MFWs and 0% culling and then run successive tests, increasing the culling by 25% each test, resulting in 5 tests in total. We then increase the MFWs by 100 and repeat the process so that the parameters are as high a value the tallied word lists allow. For instance,

we are not able to cull 800 MFWs at 50%, since the documents do not have 800 words total in common with at least 50% of them. This results in 24 different tests and the average cosine distances of each are calculated to arrive at a sort of consensus between many parameterization scenarios.

Having done this, we obtain the results in Figure 3. This time around the distances to A-parallel for A- and C-divergent are virtually identical (1.382 in dark gray and 1.380 in light gray respectively), but we can still clearly see that C-divergent is closer to C-parallel than A-divergent is (on the right-hand side). Having brought the word counts of our documents in line with A-divergent, it would appear that A-divergent has more opportunity to compete with the similarity scores over other documents. Nevertheless, our observation remains that C appears to be the most internally-coherent redaction.

But is this result explained by style, or by something else? For instance, one of the words which the above tests always take into account is “Guðmundur.” On the whole, the appearance of certain characters or, generally, proper nouns, in one document versus the other does not have much to say about “style.” It has more to do with thematic content and narrative. To be safe, for our third and final test, we remove all proper nouns.⁶⁵

Another class of words have more to do with the circumstances of manuscript transmission rather than style. We are particularly concerned about the highly-frequent discourse verbs which may appear either in present or preterite: *svaraði* instead of *svarar* or *sagði* instead of *segir*. While the usage of one over the other may very well be stylistic, these words are simply too volatile in manuscript transmission to be considered here. Moreover, these words are often abbreviated such that it is impossible to tell which word form is being used. Thus, these finite verbs were collapsed into their present forms. Other word forms to consider would be other frequently occurring words such as *en* and *og* which display volatility in manuscript transmission. The frequencies of these words were inspected individually and it was concluded that there was no need to remove them. Though 561 has a tendency to use *og* more than the C manuscripts, its only result is bringing A-parallel and A-divergent closer together, and in the results that

65 That said, the substitution of a proper name for a pronoun may indeed be a stylistic tendency which we want to address. But this would be caught by an increase in frequency of those pronouns, meaning this is still accounted for.

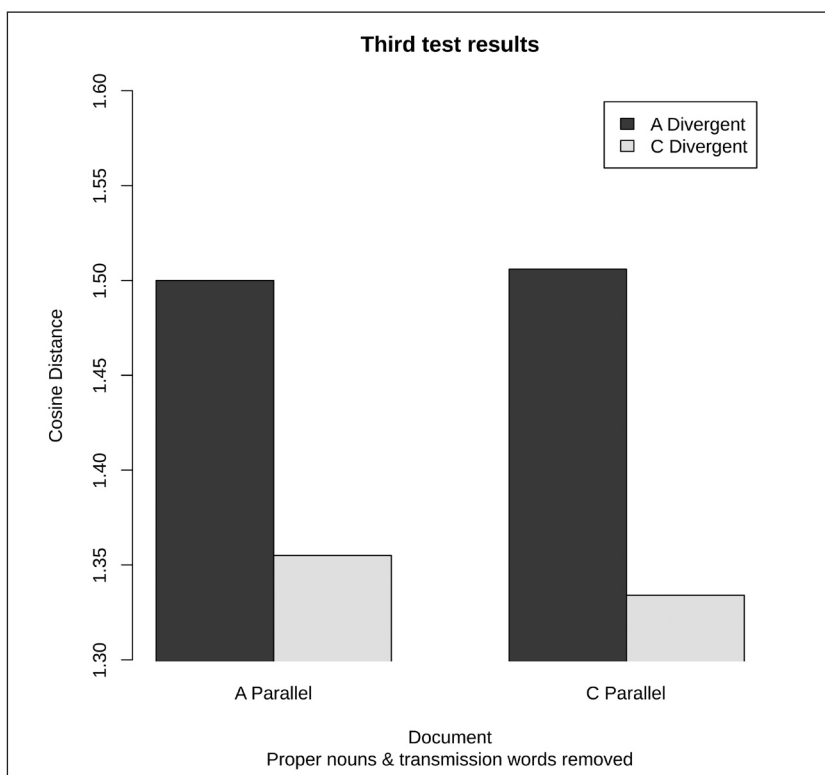


Figure 4 – Test 3

follow the internal consistency of the A-redaction are not at all supported by stylometry anyhow, even with this word included.⁶⁶

Having performed the above emendations to the text of the documents, we run a third and final experiment implementing everything as in the second experiment with regard to random sampling (taking into account the slightly adjusted word counts) and iterative parameterization. The results of this experiment can be found in Figure 4. This time around, we observe

⁶⁶ See Magerøy's comments discussed above regarding the usage of *ok* in chapters 1–4 and in A-divergent. This is a clear case where not taking manuscript variance into account led the scholar to a problematic philological conclusion. It could also be argued that choosing to leave *og* in the documents could create bias favoring the C-redaction by moving A further from C-parallel. As a measure of additional caution, a separate test was conducted with *og* and *en* removed which resulted in virtually the same result as in Figure 4 below.

that C-divergent (in light gray) is again more similar to both parallel documents than A-divergent is. A-divergent (in dark gray) is slightly more similar to A-parallel (1.500) than it is to C-parallel (1.506) and C-divergent is slightly more similar to C-parallel (1.334) than it is to A-parallel (1.355), but the fact that these values are so close indicates to us that we have removed most of the interfering noise. Meanwhile, C-divergent is once again more similar to A-parallel and C-parallel than A-divergent is, indicating that C-divergent is more stylometrically similar to both parallel documents than A-divergent is. Having eliminated most of the words which could have contributed to statistical noise or otherwise were not stylistic, we get what is probably our clearest result yet. C-divergent is again closer to the other documents than A-divergent is, supporting Erichsen's argument for the internal consistency of the C-redaction.

The fact that the overall trend remains consistent makes us doubtful that further manipulation of the text or of the test environment would affect the result significantly. We are therefore confident enough in the results to argue that stylometry firmly supports the internal consistency of the C-redaction over the A-redaction.

The results support Erichsen's understanding of A-redaction: it is a result of a mix of sources. It is important to note that she remains ambivalent regarding whether the "secondary source" of A-divergent is written or oral. She also does not explain why this alternative source was sought. It could have been due to an exemplar, personal choice, or something else. All told, this explanation is cautious but sufficiently captures the various possibilities. Furthermore, this explanation best fits our results: stylometry agrees that the A-redaction is indeed the result of a mix of sources when compared with the C-redaction. On the other hand, we can safely dismiss, as Andersson did, Magerøy's attempt to demonstrate a stronger stylistic affinity between A-divergent with the parallel chapters than C-divergent. Nevertheless, we cannot necessarily dismiss Magerøy's attempt to demonstrate a textual connection between A- and C-divergent, as this was not tested. Overall, it is our impression that A- and C-divergent's textual relationship is minor, such that Erichsen's argument has much greater explanatory power than Magerøy's argument that the two are textually related.⁶⁷

67 Our impression is based on the fact that there is not even a single clause which is exactly the same in A and C in these chapters.

Conclusion

Through a stylometric analysis, we have shown that C-redaction chapters 13–18 are more similar in their use of language to the common chapters 1–4 and 19–21 (in both A and C) than the divergent A-redaction chapters 13–18 are. The importance of this conclusion is that it affirms the primacy of *Ljósvetninga saga*'s C-redaction. On the other hand, it also rehabilitates the notion that chapters 13–18 in the A-redaction can be safely studied from the point of view of orality. It does, indeed, seem to be a retelling.

What this article also makes clear is that a new critical edition of *Ljósvetninga saga* is required. Following the groundbreaking codicological analysis conducted by Guðvarður Már Gunnlaugsson, as well as the present analysis, it becomes clear that the picture that Björn Sigfússon's Íslenzk fornrit edition of the saga portrays is not tenable.

Nevertheless, further work is required to fully demonstrate the role of the additional sections in the C-redaction. It seems clear, though, that the C-redaction has been somewhat misunderstood by Bookprose editors who preferred the succinctness of the A-redaction. This resulted in a misrepresentation of the C-redaction narrative, at the same time obfuscating the true nature of the A-redaction.

This cannot be the final word on the issues that arise from *Ljósvetninga saga*'s problematic transmission. Further research into the structure and composition of this saga is required: attempts to recover the palimpsest readings on 37v of 561, in particular, would be incredibly valuable;⁶⁸ a stylometric analysis of the *þættir* as well as chapters 22–31 could help to understand their role within the composition history of the C-redaction; we might ask how establishing the primacy of the C-redaction influences the issue of dating the saga, and saga dating in general; finally, we might return to an understanding of A-divergent as a retelling informed by oral tradition, armed with improved granularity and terminology offered by advances in the study of cultural memory.

68 The authors wish to thank Þorgeir Sigurðsson and Haukur Þorgeirsson for their initial efforts in creating multi-spectral images of the leaf, though it seems that with more funding dedicated to this more could be achieved.

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ABSTRACT

Keywords: *Ljósvetninga saga*, Íslendingasögur, stylometry, philology

Ljósvetninga saga is preserved in two primary versions, the A-redaction and C-redaction. These two redactions feature parallel (though not identical) sections as well as a section (chapters 13–18) which is entirely divergent. Scholars and editors have long disagreed over the question of which version of the saga is more internally consistent. Two stylistic studies by Adolfine Erichsen in 1919 and Hallvard Magerøy in 1956 arrived at opposite conclusions: the former preferring the stylistic coherence of the C-redaction and the latter preferring the A-redaction. The conclusions of these scholars reflected opposing stances on the Freeprose-Bookprose origin of the *Íslendingasögur*. Proponents of the Freeprose school including Knut Liestøl leveraged Erichsen’s stylistic investigation to argue that the divergent section in A-redaction should be considered a genuine oral variant, whereas proponents of the Bookprose school (including the editor of the saga’s *Íslensk fornrit* edition, Björn Sigfússon) criticized the oral understanding and instead framed the divergent C-redaction section as a historical novelization of what was originally the A-redaction. The development of stylometry in recent years has provided us with a statistically-robust set of methods to interrogate the style of texts. In this article, the authors revisit the debate and present stylometric evidence to support Erichsen’s conclusion and reject Magerøy’s: the divergent section of the C-redaction has more in common with the parallel chapters and the A-redaction is likely an independent version of the text retold, possibly with recourse to oral tradition.

ÁGRIP

Lykilorð: *Ljósvetninga saga*, Íslendingasögur, stílmælingar, textafræði

Ljósvetninga saga er varðveitt í tveimur gerðum, A-gerð og C-gerð. Að mestu leyti er textinn í köflum 1–4 og 19–21 í báðum gerðum hinn sami, en í köflum 13–18 eru textarnir mjög ólíkir. Fræðimenn og útgefendur hafa lengi verið ósammála um þetta gerðarmál og þá sérstaklega um spurninguna hvort A-gerð eða C-gerð sé samkvæmari sjálfri sér. Stílfraðingarnir Adolfine Erichsen (í 1919) og Hallvard Magerøy (í 1956) komust að andstæðum niðurstöðum: Erichsen taldi að C-gerð

væri samkvæmari sjálfri sér og Magerøy A-gerð. Niðurstöður þeirra tengjast þeirri umræðu um hvort Íslendingasögurnar væru byggðar á munnlegri hefð eða á rithefð ('Freiprosa-Bochprosa'). Til dæmis taldi Knut Liestøl að kaflar 13–18 í A-gerðinni eigi í raun uppruna sinn í munnmælahefð. Hins vegar taldi Björn Sigfússon (ritstjóri útgáfu Íslenskra fornrita) að C-gerðin væri sagnfræðileg útfærsla A-gerðarinnar. Stílmælingar hafa veitt okkur tækifæri til að rannsaka stílfræðileg vafaatriði að nýju með sterkum tölfræðilegum aðferðum. Þessi grein fjallar um álitamál hinna ólíku gerða Ljósvetninga sögu og notar stílmælingar til þess að sýna að C-gerðin er samkvæmari sjálfri sér; A-gerð er hins vegar endursögn sem byggir mögulega á munnmælahefð.

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