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# Language and Thought in Hildegard of Bingen's Visionary Trilogy: Close and Distant Readings of a Thinker's Development

Jeroen De Gussem and Dinah Wouters\*

*By combining the methods of distant reading (computational stylistics) and close reading, the authors discuss the development of language and thought in Hildegard of Bingen's visionary works (Sciuias, Liber uite meritorum and Liber diuinorum operum). The visionary trilogy, although written over the course of three decades, raises the impression of a monolithic and seemingly unchanging voice. Moving beyond this impression, the interdisciplinary analysis presented here reveals that the trilogy exhibits interesting differences at the word level which cannot simply be explained through external historical circumstances (e.g. manuscript transmission or different secretaries). Instead, the results raise pertinent questions regarding the trilogy's internal development in didactic method, style, and philosophy.*

## I. The Authorship of Hildegard of Bingen

Hildegard of Bingen's (1098–1179) major visionary works *Sciuias* (c. 1141–51), *Liber uite meritorum* (c. 1159–64) and *Liber diuinorum operum* (finished c. 1174) have been said to form an 'organic unity',<sup>1</sup> a tripartite *magnum opus* bound by strong conceptual, generic, and formal ties.<sup>2</sup> This is emphasized by the structure

\* This article is the result of a close collaboration between the Henri Pirenne Institute for Medieval Studies at Ghent University, the CLiPS Computational Linguistics Group at the University of Antwerp, and the Centre Traditio Litterarum Occidentalium division for computer-assisted research into Latin language and literature housed in the Corpus Christianorum Library and Knowledge Centre of Brepols Publishers in Turnhout (Belgium). Brepols Publishers has generously provided the digitized text files of the editions Hildegardis Bingensis, *Sciuias*, ed. by Adelgundis Führkötter and Angela Carlevaris, Corpus Christianorum Continuatio Mediaevalis (hereafter cited as CC CM), 43 (Turnhout: Brepols, 1978); *Liber uite meritorum*, ed. by Angela Carlevaris, CC CM, 90 (Turnhout: Brepols, 1995); and *Liber diuinorum operum*, ed. by Albert Derolez and Peter Dronke, CC CM, 92 (Turnhout: Brepols, 1996), which are used in the experiments described in this article. For Brepols's online Library of Latin Texts, see <www.brepols.net>. The authors would like to thank their colleagues from the Latin curriculum at Ghent University for their advice and helpful comments to improve this article. This research has been realized thanks to financial support from the Special Research Fund at Ghent University and the Research Foundation Flanders (FWO).

<sup>1</sup> Beverly M. Kienzle and Travis A. Stevens, 'Intertextuality in Hildegard's Works: Ezekiel and the Claim to Prophetic Authority', in *A Companion to Hildegard of Bingen*, ed. by Beverly M. Kienzle and Debra L. Stoudt (Leiden: Brill, 2014), p. 137.

<sup>2</sup> A handful of studies that have approached Hildegard's three major works rather holistically are (from more recent to older): Maura Zátanyi, *Vidi et intellexi: Die*

the treatises share: each of them follows a similar pattern where series of visions are complemented by allegorical explanations. The formal similarities of the visionary works invoke an unchanging, biblical, factual style that strives to align form and meaning, and it is often difficult to pin down where such a carefully aligned construction shows deviations. Hildegard clearly intended these works to be sequels. This is perhaps best exemplified by how she placed them jointly at the heading of her allegedly self-redacted *opera omnia*, the monumental Wiesbaden *Riesencodex*.<sup>3</sup>

Simultaneously, scholars have been aware that adopting a unified approach to the trilogy carries some risks. Anne H. King-Lenzmeier, for instance, notes that ‘it has been customary to combine [Hildegard’s] three theological-visionary treatises into one chapter, facilitating analysis of the three of them in combination’, but also that such approaches have sometimes come at the cost of ‘the evolution in her thought’.<sup>4</sup> Constant Mews also noted that ‘insufficient account has been taken of the evolution of her thought between the writing of *Sciuias* and [...] her last great composition, the *Book of Divine Works* (1163–74)’.<sup>5</sup>

Although a few thematic developments in Hildegard’s visionary *oeuvre* have been noted,<sup>6</sup> discussing the differences between the prophet’s works—especially

*Schrifthermeneutik in der Visionstrilogie Hildegards von Bingen* (Münster: Aschendorff, 2012); Viki Ranff, *Wege zu Wissen und Weisheit: eine verborgene Philosophie bei Hildegard von Bingen* (Stuttgart-Bad Cannstatt: Frommann-Holzboog, 2001); Fabio Chávez Alvarez, ‘Die brennende Vernunft’: Studien zur Semantik der ‘rationalitas’ bei Hildegard von Bingen (Stuttgart-Bad Cannstatt: Frommann-Holzboog, 1991); Hans Liebeschütz, *Das allegorische Weltbild der Heiligen Hildegard von Bingen* (Leipzig: Teubner, 1930).

<sup>3</sup> Michael Embach, *Die Schriften Hildegards von Bingen. Studien zu ihrer Überlieferung und Rezeption im Mittelalter und in der Frühen Neuzeit*, in *Erudiri Sapientia*, 4 (Berlin: Akademie Verlag, 2003), pp. 36–65. The manuscript can nowadays be consulted in the Hessische Landesbibliothek in Wiesbaden and is a nearly complete collection of Hildegard’s *oeuvre*. The bulk of the codex must have been finished during her lifetime, before 1179, and most certainly is a product of the Rupertsberg scriptorium, the monastery where Hildegard resided from 1150 onwards.

<sup>4</sup> Anne H. King-Lenzmeier, *Hildegard of Bingen: An Integrated Vision* (Collegeville: The Liturgical Press 2001), p. 25.

<sup>5</sup> Constant Mews, ‘From *Scivias* to the *Liber Divinorum Operum*: Hildegard’s Apocalyptic Imagination and the Call to Reform’, *Journal of Religious History*, 24 (2000), 44–56 (p. 46).

<sup>6</sup> Despite the fact that Hildegard’s last work, the *Liber diuinorum operum*, might read as a reworking of her first, the *Sciuias*, the differences in thematic choices are undeniably present in the shift of focus from sacramental theology and the role of the church in salvation history to creation and the natural world. Secondly, the differences between these respective works’ literary form has been more and more re-evaluated, with specific attention for her usage of allegorical forms and exegetical principles. After the personification narratives of *Liber uite meritum*, Hildegard again harks back in *Liber diuinorum operum* to the kind of allegory that she also used in *Sciuias*: non-narrative, abstract and difficult, perhaps even more abstract and difficult than before. At the same time, allegory is playing a smaller role, because the exegetical character of the work is made more explicit. In the second vision of *Liber diuinorum operum*, for instance, the allegory receives several interpretations at different levels of meaning (pertaining to the cosmos, to the divine, to the human body, and to the soul), while *Sciuias* only ever offered one interpretation. Furthermore, biblical interpretation no longer serves an ancillary role in *Liber*

when it comes to formulation and phraseology—has been difficult to detach from the prophetess's authorship and the influence of her collaborators. It is well known that Hildegard collaborated with assistants in composing her works, monks such as her provost Volmar of Disibodenberg or Guibert of Gembloux, but possibly also female scribes, amongst them Richardis of Stade.<sup>7</sup> Hildegard presented her collaboration with secretaries as necessary to her readership due to her limited schooling. Although these 'autobiographical' assertions in which Hildegard stressed her weaker sex ('pauperula forma') and lack of education ('indocta') likely reflect a self-conscious construction of a persona,<sup>8</sup> it is indeed careless to express full confidence that the thought found in Hildegard's texts unanimously coincides with that of the author. Then again, Hildegard stressed that her secretaries were not to change the sense of her visions and were to focus on formal aspects of the language such as grammar and spelling.<sup>9</sup> These teams were subject to change throughout her life (as is emphasized in figure 1).

Each of Hildegard's treatises must have presented a very different undertaking from the outset. The three visionary works were produced over a considerable time span of around thirty-three years (from 1141 until 1174). In this stretch of time, Hildegard changed her working environment from Disibodenberg to the Rupertsberg. The collaborators around her who assisted her in her writing of Latin and understanding of Scripture came and went.<sup>10</sup> These material changes and

*diuinorum operum*; whole commentaries are inserted into the visions. Bernard McGinn argued that in *Sciuias* and *Liber uite meritum* 'the Bible appears in a supporting role, that is, as providing selected and we might say "atomized" proof-texts to back up points revealed in the visiones mysticae'. In the *Liber diuinorum operum*, however, 'rather than using the bible in a piecemeal fashion and restricting herself to short passages, Hildegard now began to exegete lengthy and traditionally difficult sections of scripture and to integrate them in a structural way into her visionary narratives'. See Bernard McGinn, 'Hildegard of Bingen as Visionary and Exegete', in *Hildegard von Bingen in ihrem historischen Umfeld. Internationaler Kongress zum 900jährigen Jubiläum*, ed. by Alfred Haverkamp (Bingen am Rhein: Verlag Philipp von Zabern, 2000), pp. 351–71 (p. 343).

<sup>7</sup> See especially the tripartite article of Hildephonse Herwegen, 'Les Collaborateurs de sainte Hildegarde', *Revue bénédictine*, 21.1 (1904), 192–204; 302–15; 381–403.

<sup>8</sup> Morgan Powell, 'Vox ex negativo. Hildegard of Bingen, Rupert of Deutz and Authorial Identity in the Twelfth Century', in *Unverwechselbarkeit. Persönliche Identität und Identifikation in der vormodernen Gesellschaft*, ed. by Peter von Moos, Norm und Struktur, 23 (Cologne: Böhlau, 2004), pp. 267–95.

<sup>9</sup> Joan Ferrante, 'Scribe quae vides et audis : Hildegard, Her Language, and Her Secretaries', in *The Tongue of the Fathers: Gender and Ideology in Twelfth-Century Latin*, ed. by Townsend David and Taylor Andrew, The Middle Ages Series (Philadelphia: University of Pennsylvania Press, 1998), pp. 102–35 (p. 103).

<sup>10</sup> For instance, Richardis of Stade's departure from Disibodenberg (c. 1151) and Volmar of Disibodenberg's death (c. 1173) proved to have sensitive repercussions in Hildegard's life. Richardis left Hildegard's side shortly after the completion of *Sciuias: Vita Sanctae Hildegardis*, ed. by Monika Klaes, CC CM, 126 (Turnhout: Brepols, 1995) 2.5.82–86, p. 29: 'Nam, cum librum Sciuias scriberem, quendam nobilem puellam—supradicte marchionisse filiam—in plena karitate habebam, sicut Paulus Thimotheum; que in diligenti amicitia in omnibus his se michi coniunxerat et in passionibus meis michi condoluit, donec ipsum librum compleui'. The epilogue to the *Liber diuinorum operum* likewise testifies to the fact that Volmar's decease meant a

relocations introduced her to new sources of knowledge: the libraries' contents differed,<sup>11</sup> she allegedly travelled to preach at other locations such as Cologne or Trier c. 1160–70,<sup>12</sup> the liturgical ceremonies changed in nature,<sup>13</sup> and so on. By the time Hildegard wrote the first sentence of the *Liber diuinorum operum*, virtually no condition would have been the same as when she first sat down to write *Sciuias*.

The synergetic character of Hildegard's compositions could lead one to believe that observable lexical differences (which we will come to discuss soon), especially those that are hard to explain, are merely accidental imports by secretaries, and not a result of conscious writing strategies. In this rationale, the linguistic alterations within the trilogy are mere idiosyncrasies to the text. They are unintentionally slipped in by someone other than an original author. Although this observation is vital, it follows a logic that relies on some presumptions that are difficult to defend. The distinction between 'collaborative' and 'individual', for instance, is not a constructive approach to give meaning to Hildegard's texts.<sup>14</sup> After all, collaborative writing is a common phenomenon from Roman times to the twelfth century and beyond, both for the learned and the unlearned, for male and female authorship.<sup>15</sup> There are hundreds and thousands of art pieces in history that are collectively established and still the product of a singular vision. In that light, it would be an underestimation of a writer so versatile as Hildegard to presume that any differences between her treatises are aberrations.

substantial changeover in her assistance, as Ludwig of St Eucharius and her cousin Wescelin of St Andrew came to help her in the final throes of finishing the last part of her trilogy.

<sup>11</sup> According to the chronicler of the *Annales Sancti Disibodi*, Disibodenberg housed a considerable number of books on the flourishing liberal arts. Likewise, Johannes Trithemius, historian and abbot of Sponheim, claimed that Disibodenberg was active in book production in the twelfth century. See Constant Mews, 'Hildegard and the Schools', in *Hildegard of Bingen: The Context of her Thought and Art*, ed. by Charles Burnett and Peter Dronke (London: Warburg Institute, 1998), pp. 89–110 (pp. 97–98). Rupertsberg would have been a new convent, possibly without any books at all in the early beginning. The convent might have exchanged books with Disibodenberg, but it likely provided a different and especially more modest supply of books.

<sup>12</sup> These have often been named 'preaching tours', of which there were allegedly four. However, the idea that Hildegard made four 'discrete' preaching tours is a conjectured itinerary, not a fact. See Beverley Mayne Kienzle, *Hildegard of Bingen and her Gospel Homilies: Speaking New Mysteries* (Turnhout: Brepols, 2009), p. 55; and Franz J. Felten, 'Hildegard von Bingen 1198–1998 oder: Was bringen Jubiläen für die Wissenschaft?', *Deutsches Archiv für Erforschung des Mittelalters*, 59.1 (2003), 165–93 (see pp. 169, 184–86).

<sup>13</sup> Presumably Hildegard had a far more upfront participation to the liturgical ceremony in the Rupertsberg, where the ceremony would have taken place in the company of women only (excluding the priest).

<sup>14</sup> Here, the insights of the New Philology of the 1990s have been indispensable. See Bernard Cerquiglini, *In Praise of the Variant: A Critical History of Philology*, trans. by Betsy Wing, Parallax: Re-Visions of Culture and Society, 2nd edn (1989; repr. Baltimore: Johns Hopkins University Press, 1999); and Stephen G. Nichols, 'Introduction: Philology in a Manuscript Culture', *Speculum*, 65.1 (1990), 1–10.

<sup>15</sup> See Elizabeth J. Bryan, *Collaborative Meaning in Medieval Scribal Culture: The Otho Lazamon, Editorial Theory and Literary Criticism* (Ann Arbor: University of Michigan Press, 1999), pp. 3–60.

The article's structure is as follows: we depart from a machine-driven 'distant reading' of Hildegard's trilogy in order to speak about the strategies of these texts (to be explained in Part II). The aim is to lay bare a trail of statistically detectable patterns of difference that reveal a great deal about how Hildegard (which will always mean: Hildegard and her team) subtly yet structurally developed her style of writing. Hildegard's preferences for certain words in each of the trilogy's works is understood as an indicative direction from which interpretation can proceed. The act of qualitative interpretation that follows, then, means to bridge the gap between Hildegard's language and her thought through a close reading, thereby taking into account that language and thought in development is a much more complex given than merely quantitative difference. Throughout, we have decided to maintain an emphasis on what essentially constitutes the text and what are its formal characteristics. We do not wish to place emphasis here on historically contextualizing the origin of these particular textual differences, that is, which historical actors or events caused the textual changes to occur. Rather, we focus on exploring the ultimate effect of this variety as a textual strategy.

## II. Distant Reading

A major critique voiced within the humanities' computational turn<sup>16</sup> has been the intersubjective aspect of 'traditional' philology. Too often—these critics argue—traditional philology's interpretations are supported by anecdotal arguments and so-called cherry-picking. For example, when it comes to the subject at hand, discussing what constitutes the difference between one text and another is susceptible to bias on behalf of the researcher and often presents too broad a question to be answered objectively. The reader runs the risk of choosing passages or words that suit his or her argument best. Practitioners of computational methods, such as computational stylistics (stylometry), digital palaeography, or digital stemmatology, have often strengthened their position by stating that, in such debates, they can provide the common ground. In addition, their methods are presented as more powerful and mathematically more exact than the human mind in a reading task of high complexity. From a mathematical perspective, measuring difference is easy and requires at most a few seconds. 'Distant reading', first coined by Moretti, has been a popular term for conceptualizing this statistical approach to textual material.<sup>17</sup> Obviously, there has been a good deal of scepticism raised against such claims.<sup>18</sup>

<sup>16</sup> David M. Berry, 'The Computational Turn: Thinking about the Digital Humanities', *Culture Machine*, 12 (2011), 1–22.

<sup>17</sup> A collection of Moretti's most seminal papers, which arguably form the manifestos of 'distant reading', can now be found in Franco Moretti, *Distant Reading* (London: Verso, 2013); but Moretti introduced the approach as early as 2000, in Franco Moretti, 'Conjectures on World Literature', *New Left Review*, 1 (2000), 54–68.

<sup>18</sup> Computational methods, as well, are never unsupervised: they are steered in a direction. In addition, computational methods either seem to raise more questions than they answer, or confirm what we already knew, both of which make qualitative readings indispensable and place into question the computational turn's claims to objectivity. For a critical stance

Initially, the concept of distant reading can strike one as rather abstract. Figure 2 provides an exemplary graph, containing a network of words showing the highest variation in frequency in Hildegard's trilogy, that serves as an intuitive illustration of its rationale.

Before we proceed to explain the network graph in figure 2, a few words on the texts and the way in which they were preprocessed are in order. The analyses, carried out both here and below, relied on the digitized texts of Hildegard of Bingen's *Sciuias*, *Liber uite meritorum* and *Liber diuinorum operum* as they appear in the scholarly editions included in the online Brepols Library of Latin Texts.<sup>19</sup> Since we have contemporary manuscripts by Hildegard, the critical editions have always based themselves quite transparently on the oldest available versions (importantly, all of which stem from the final years of her life).<sup>20</sup> Manuscript transmission and its reliability is, of course, an inherent problem, and equally so the reliability of the editions. On this basis, one might conclude that the entire problem of Hildegard's variety is rendered irrelevant or unreliable as the underlying data are flawed. However, this is not a constructive mindset in order to say anything meaningful about medieval history at all.<sup>21</sup>

Next, the editions' texts have been slightly amended to make them suitable for comparison, a procedure which is called 'preprocessing' in the field of computational stylistics. Preprocessing entails minor interventions in the text such as the deletion of irrelevant textual material, the normalization of divergent orthographical forms, and the lemmatization of texts with annotation software.<sup>22</sup>

towards the confrontation of close and distant reading in medieval studies, see Julie Orlemanski, 'Scales of Reading', *Exemplaria*, 26.2–3 (2014), 215–33.

<sup>19</sup> The digitized text files of these editions have been generously provided by our project partner Brepols Publishers (see n. \* above).

<sup>20</sup> See n. \* above for the editions.

<sup>21</sup> Aside from the advantage that editions are already digitized, and therefore save us the time of transcribing all manuscript variants, the first and foremost advantage is that they are recent and critical publications which were carefully scrutinized by experts in the field. We have carefully studied the variety of the existent branches in the critical apparatuses, and we argue that—based on the available evidence—editorial principles or manuscript variety will not have caused Hildegard's semantics to change or her lexical variety to drop as significantly as it does in the data that we present. Nevertheless, we will take care that at those instances where troublesome distortion by editorial principles should be located, they are presented as openly as possible.

<sup>22</sup> The lengthy *Capitula* and other chapter titles were excluded, because their succinct and formulaic character is not representative of Hildegard's writing style. The divergent orthographical conventions between the editions were normalized towards a classicized norm as maintained in Charlton T. Lewis and Charles Short, *A Latin Dictionary* (Oxford: Clarendon Press, 1879) (e.g. <e> to <ae>, <v> to <u> or vice versa, *tanquam* to *tamquam*, *incipium* to *initium*) by lemmatizing the texts with annotation software, so that each of the inflected or conjugated words in the main text (these are called 'tokens') is referred to a dictionary lemma or headword, as illustrated in table 1. Mike Kestemont and Jeroen De Gussem, 'Integrated Sequence Tagging for Medieval Latin Using Deep Representation Learning', ed. by Marco Büchler and Laurence Mellerin, *Journal of Data Mining and Digital Humanities*, Special Issue on Computer-Aided Processing of Intertextuality in Ancient Languages (2017), 1–17.

Table 1. Intuition of lemmatization

token	lemma	PoS-tag
uisioni	visio	NN
magno	magnus	ADJ

Each word cloud coloured in blue, red or green within the network graph in figure 2 corresponds to a work of Hildegard's trilogy and is tied together by lemmas (sixty in total) that typify that work, in the sense that the lemma is conspicuously frequent in one work and then becomes proportionally uncommon in the other two works. We will not elaborate here upon the technical details of network theory, which are better documented elsewhere.<sup>23</sup> In essence, these networks put on display the affiliations between the frequencies (the *edges*) of 60 lemmas (the *nodes*) that were initially generated by means of a coefficient of variation. This coefficient is a simple, normalized percentage that informs us on whether a certain lemma shows conspicuously unpredictable behaviour in terms of its average frequency across the trilogy. Table 2 shows both positive and negative examples of words that have a high or a low variation coefficient. Note that the average frequency was weighted by taking into account the length of the text by dividing the raw frequency by text length (hence the float numbers<sup>24</sup> in the table).

Table 2. Word frequencies per work normalized by text length, and their coefficient of variation

lemma	<i>Sciuias</i>	<i>LVM</i>	<i>LDO</i>	coefficient of variation
sacerdos	<b>164</b>	8.5	15.4	1.15
vermis	14	<b>151.8</b>	14.5	1.08
firamentum	12	15.4	<b>262.1</b>	1.21
contritio	22	21.1	20.5	0.02

The network in figure 2, which maps out the lemmas (*nodes*) by their frequencies (*edges*), for the larger part visualizes what seem to be the main thematic developments between the three works in the trilogy through distant reading. Interestingly, the graph thereby provides a perfect illustration of earlier interpretations of Hildegard's work. For example, Constant Mews argued that the author's increased independence from ecclesiastic institutions is reflected in her writing,<sup>25</sup> and this observation corresponds to our data. The word cloud of

<sup>23</sup> Mark E. J. Newman, *Networks: An Introduction* (Oxford: Oxford University Press, 2010), p. 1: 'A network is, in its simplest form, a collection of points joined together in pairs by lines. In the jargon of the field the points are referred to as *vertices* or *nodes* and the lines are referred to as *edges*'.

<sup>24</sup> Floats are numbers with digits behind the comma.

<sup>25</sup> Mews, 'From *Sciuias* to the *Liber Divinorum Operum*', p. 53: 'When Hildegard moved with her nuns to the new community at Rupertsberg c. 1150, a new phase in her intellectual development begins. Having obtained ecclesiastical approval, she turned her attention away from ecclesia to reflection on the natural world'.



*Sciuias* is filled with lemmas that relate to *Ecclesia* and the sacraments (*altar, baptizo, habitus, magisterium, oblatio, panis, sacerdos, sanctificatio, sponsa*). Likewise, *Liber uite meritorum*'s specific focus on sin and the hardships of life is omnipresent (*impietas, ingluvies, malignus, patio, torqueo, vermis*), as is the *Liber diuinorum operum*'s preoccupation with the cosmos and its undisturbed balance (*aequalis, aquosus, firmamentum, medietas, planeta*).

Immediately, the network illustrates both the advantages and disadvantages of distant reading acutely. On the one hand, very little is learned. We did not need a computer to repeat Mews's findings. On the other hand, the result is still significant from a theoretical perspective, and in the margins some new discoveries rise to the surface. Mews's reading of difference gains in authority because it is democratized. Whatever impression Mews gathered from his qualitative reading process is objectively traceable, and we can all participate in its discovery because it now proves to be a text-inherent, replicable trait. The opposite movement, that is, a qualitative reading that could elucidate quantitative findings, is less self-evident. Newer directions of difference and development within the network do not so easily allow for interpretation.

Why, exactly, does Hildegard use the indefinite pronoun *quilibet* ten times more often in *Liber diuinorum operum*? Why does she use adverbs *itaque* and *etenim* more often in *Liber diuinorum operum*, words that rarely occur in *Sciuias* or *Liber uite meritorum*? Why does the interrogative conjunction *an* practically only occur in *Sciuias*? Here again, the difficulty of Hildegard's secretaries arises. Words such as *quilibet, itaque, or an*, seemingly meaningless function words such as adverbs, pronouns, conjunctions, particles, or prepositions, seem to be examples of the kinds of syntactic or grammatical markers that secretaries would have adjusted.

A matter that further complicates this observation, is that in computational authorship attribution, such function words are the statistically measurable (i.e., numerous) items of a text that gain meaning because of their frequency. These are words such as *et, in, quod*. They are variable and all over the text: salient, easy to count, easy to spot, structural, scalable, highly informative and—allegedly—immune to conscious control. All of these aspects have rendered function words extremely robust discriminators in attributing authorship, or in discovering an author's stylistic fingerprint.<sup>26</sup> Kestemont, Deploige, and Moens have applied stylometry to reveal stylistic deviations within a few of Hildegard's late letters, the *Visio de Sancto Martino* and the *Visio ad Guibertum missa*,<sup>27</sup> which they

<sup>26</sup> Mosteller and Wallace's revolutionary work of 1964 demonstrated the usefulness of function words in statistically determining authorship, breathing life into the belief that there is something like a 'secret life of pronouns' whose occurrences betray aspects of the author's profile or his or her latent preferences and writing tics; see Frederick Mosteller and David L. Wallace, *Applied Bayesian and Classical Inference: The Case of the Federalist Papers*, Springer Series in Statistics, 2nd edn (1964; repr. New York: Springer, 1984).

<sup>27</sup> Hildegardis Bingensis, *Opera Minora II*, ed. by Jeroen Deploige and others, CC CM, 226A (Turnhout: Brepols, 2016).

convincingly attributed to the arrival of Hildegard's last secretary: Guibert of Gembloux. The study singles out a list of words that tellingly typify Guibert's stylistic preferences. An example is the higher frequency of relative pronoun *qui*, which relates to Guibert's notorious reputation for 'constructing eloquent but complex sentences with a lot of embedded relative clauses'.<sup>28</sup>

As emphasized already, we have limited our scope of investigation to an analysis of the effect of measurable change (function words and others), and we are currently not interested in 'attributing' the measured phenomena. Stylometry has often been viewed as the ideal method for tracing such external influences, but it has seldom been used for exploring internal development in texts. We want to take a step back and see whether we can also use stylometry to trace the development of these texts in their own right. Could we link some of the changes that stylometric analyses come up with to evolutions in form, thought, or method that contribute to how the texts function and maybe even to how they construct their monolithic voice and the impression of unchanging stability?

### III. Principal Differences

The word clouds in the network (figure 2) come with several disadvantages. Firstly, lemmatizing the trilogy is accompanied by the risk that some information of the original text is irrevocably lost. If a word often appears in a fixed context or construction, and therefore in the same inflection or conjugation, we cannot derive this information from the figure. The second problem ties in closely with this first issue: figure 2 only takes into account single words, not lengthier constructions or formulas. The third problem is more technical but also most pertinent: the way frequencies were calculated for the words in table 1 is very naive. Figure 2 does not take into account if these words' frequencies know a consistent distribution. This means that, hypothetically speaking, inflected forms of *firmamentum* could have occurred intensively only in the very last part of *Liber diuinorum operum* and not anywhere else in *Liber diuinorum operum*. One could then hesitate whether or not *firmamentum* is a representative word for *Liber diuinorum operum* as a whole. Distribution, then, is an informative aspect of the feature which we might want to retain.

In what follows we attempt to address all of these aforementioned problems. We computationally ascertain the principal variables that generate textual difference between the three works of the trilogy. Presently, we keep the trilogy's texts intact, and do not lemmatize them such as in the previous experiment. In addition we do not only focus on words, but also on so-called word bigrams, which here equals two-word combinations (e.g. the bigrams in the phrase 'nam a principio uisionum tuarum' are: 'nam a | a principio | principio uisionum | uisionum tuarum'). Thirdly, we split up the original text in a number of smaller

<sup>28</sup> Mike Kestemont, Sara Moens, and Jeroen Deploige, 'Collaborative Authorship in the Twelfth Century: A Stylometric Study of Hildegard of Bingen and Guibert of Gembloux', *Digital Scholarship in the Humanities*, 30.2 (2013), 199–224 (p. 215).

text segments (also called ‘samples’), each consisting of 3,000 words,<sup>29</sup> labelled by a class (i.e., *Sciuias*, *Liber uite meritorum* and *Liber diuinorum operum*) and a number indicating its ordinal position in the original text from which it was segmented. This concept of text segmentation or sampling, that is, splitting up a larger population (the text) into smaller groups, enables us to track down consistently recurrent features that typify a certain class.

Table 3 gives a technical overview of the subsequent steps. The main idea is to apply a few techniques from the field of multivariate data analysis and machine learning, the details of which are consultable in the table, in order to attain 60 features (both words and bigrams) that distinguish best between the works in the trilogy. These 60 features’ frequencies also indicate which words are typical and evenly distributed in *Sciuias*, *Liber uite meritorum* or *Liber diuinorum operum*. Consequently, we can plot the samples in a PCA cluster plot (figure 3), which is a visualization of the data’s principal components.<sup>30</sup> In essence, a PCA plot yields a simplified impression of the data’s most significant trends. The samples, indicated by colored dots and numbered by their position in the text, are overlaid by their ‘loadings’, the 60 words that discriminate the classes in writing style best.

Led by the PCA plot as a distant reading recommendation, we here further trace down the PCA’s loadings (the words that overlay the numbered dots indicating the text samples) for an actual close reading analysis. Surprisingly, the PCA plot teaches us that it is the smaller function words that present significant deviances as to the frequency by which they are applied. Even more conspicuous is that the strongest shifts seem to take place in the sphere of modal particles (*quippe* vs *uidelicet*), comparative conjunctions (*sicut*, *sic*, *et sicut*, *ut*), causal and interrogative adverbs or constructions (*ita quod* / *ut*, *quemadmodum*, *itaque*, *etenim*, *namque*, *quia*).

These words, meaningless as they may appear, first and foremost play a very practical role in the genre that Hildegard is exercising. After all, exegesis has an explanatory function. If those words that bind Hildegard’s exegetical argumentation together show a strong shift, then we must look out for how this affects the text’s tone, and to what extent we can ascertain a rhetorical purpose or systematicity in these preferences. Simultaneously (as has been emphasized a few times at this point) we also need to consider that some of these changes are likely the result of Hildegard’s collaborative authorship: the frequencies of

<sup>29</sup> Sampling is common practice in computational stylistics, yet finding a generally valid adequate length that is suitable to any author, genre, or language has been subject to much debate. Adequate sample length has been discussed explicitly for Hildegard of Bingen and medieval Latin in Kestemont and others, ‘Collaborative Authorship in the Twelfth Century’, pp. 210–11. For the problem in general, see Maciej Eder, ‘Does Size Matter? Authorship Attribution, Small Samples, Big Problem’, *Digital Scholarship in the Humanities*, 30.2 (2013), 167–82; or Kim Luyckx and Walter Daelemans, ‘The Effect of Author Set Size and Data Size in Authorship Attribution’, *Literary and Linguistic Computing*, 26.1 (2011), 35–55.

<sup>30</sup> For an elaborate explanation of PCA and how the technique is applied in computational stylistics, see José Nilo G. Binongo and M. Wilfrid A. Smith, ‘The Application of Principal Components Analysis to Stylometry’, *Literary and Linguistic Computing*, 14.4 (1999), 446–66.

Table 3. Steps towards finding the principal variables of difference

	1. Sampling	Original texts are sliced into 3,000-word samples. Each of the 3,000-word samples is assigned a label according to the class from which it was derived, of which there are 3 (i.e., 'does the text sample belong to <i>Sciuias</i> , <i>Liber uite meritorem</i> or <i>Liber diuinorum operum</i> ?')
Preprocessing	2. Labelling	We derive—from the entire corpus in general—the 1,000 most frequent words and 1,000 most frequent bigrams as features. Then, consequently, each of the <i>n</i> 3,000-word samples is vectorized according to this list. The raw frequencies were normalized by removing their mean and scaling to unit variance.
	1. Feature extraction	<p>'Predictae causae Deum ita tangunt, ut eas acceptando sciat <u>et</u> uideat quia homo, seipsum restaurans de instabilitate quae sibi <u>in</u> ruina Adae orta <u>est</u>'</p> <p><i>features:</i> ['et', 'in', 'est', ...]</p> <p>sample 1: [-0.90, 0.67, 0.02, ...] sample 2: [-0.94, -0.81, -0.98, ...] sample 3: [-0.40, -0.24, -0.15, ...] sample <i>n</i>: ...</p> <p>A mutual information regression algorithm is used as a filter method, where only those 60 features are selected (from originally 2,000 features) that distinguish particularly well between our 3 classes. This algorithm could, for instance, decide that function word 'et' is not informative enough to distinguish between classes, and therefore becomes superfluous.</p> <p>sample 1: [<del>-0.90</del>, 0.67, 0.02, ...] sample 2: [<del>-0.94</del>, -0.81, -0.98, ...] sample 3: [<del>-0.40</del>, -0.24, -0.15, ...]</p>
	2. Feature selection	<p>['et', 'in', 'est', ...]</p> <p>In order to visualize the high-dimensional feature vectors, the vectors are reduced to 2 principal components that capture the most important dynamics of the 60 selected features. This final dimensionality reduction step is necessary, since the human mind essentially visualizes in two or three dimensions only.</p>
Dimensionality reduction	3. Principal Components Analysis	
Plotting	Cluster plot (figure 3)	

smaller words with an agglutinative function such as *uidelicet* or *namque* are often seen as excellent examples for betraying an author's writing preferences. In this light, two of the bigrams in the PCA plot are telling, namely *ita quod vs ita ut*. We know—again from the Ghent autograph that was mentioned earlier—that secretaries made this correction very often in Hildegard's text and had to adjust the subjunctive that followed in such clauses.<sup>31</sup> In this particular case we are obviously dealing with a corrective procedure that has very little meaningful impact for the text. Yet, importantly, it seemed to have been a linguistic procedure to which her collaborators paid far more attention in her final work, and it might have contributed to the fact that the *Liber diuinorum operum* reads as the most complex work of the three.

In contrast to such more obvious scribal interferences, the interrogative function words deserve closer attention. In figure 1, the exclusivity of *an* to *Sciuias* had already been demonstrated. This could be linked to the more inquiring and dialogical character of *Sciuias*, which is also confirmed in the PCA plot: we see that interrogative constructions with *quomodo* and *quid est* appear very frequently. The work moreover contains an enormous number of question marks<sup>32</sup> (771) in contrast to *Liber uite meritorum* (206) and *Liber diuinorum operum* (68). These changes are unlikely to only have been the result of different scribes' interferences. Rather, they should be ascribed to a change of tone, which is much more didactic in *Sciuias*, where often a format of question-and-response is employed in its exegesis:

*Quod dicitur:* Mulier propter uirum creata est, et uir propter mulierem factus est; quoniam ut illa de uiro ita et uir de illa, ne alterum ab altero discedat in unitate factorum natorum suorum, quia in uno opere unum operantur, quemadmodum aer et uentus opera sua inuicem complicant.

*Quomodo?* Aer de uento mouetur, et uentus aeri implicatur, ita quod in ambitu eorum quaeque uiridia illis subdita sunt.

<sup>31</sup> Derolez, introduction to Hildegardis, *Liber diuinorum operum*, p. xciv: 'So the hundreds of instances of *ita quod* followed by a verb in the indicative were systematically changed into *ita ut* followed by the verb in the subjunctive. It is probably because of the intervention of learned friends after Volmarus's death that the language and style of *LDO* in its final form are better than in *Sciuias*, for instance'.

<sup>32</sup> The maintained punctuation in the editions closely follow the manuscripts (which indeed show question marks), and therefore can be argued to be a feature of the text for which Hildegard and her collaborators were responsible, and not the modern editors. For the *Liber diuinorum operum*, Albert Derolez states to have 'followed the punctuation of G[hent MS 241] strictly and continuously'; see 'Introduction', p. cxiv. For *Sciuias* and *Liber uite meritorum*, no explicit comment is made by Führkötter and Carlevaris on punctuation, but on our own closer inspection of the manuscripts they likewise appear to have followed Hildegard's punctuation closely. The digitized and consultable versions of *Sciuias* and *Liber uite meritorum* that were used for the edition are respectively the Wiesbaden Riesencodex and the former Dendermonde MS codex 9. The latter was moved in 2017 from the Abbey of St Peter and Paul in Dendermonde to the Maurits Sabbe Library in Leuven.

*Quid est hoc?* Mulier uiro et uir mulieri in opere filiorum cooperatur.<sup>33</sup>

This already explains why words such as *quid*, *quod*, and *quomodo* abound in *Sciuias*. It moreover turns out that these words actively appear in an exegetical function. They ensure the transfer from a biblical citation to its exegesis. We first notice that all exegeses of biblical citations are introduced by an exegetical formula such as *Quid est hoc?* (173 times in *Sciuias*, and practically never again in *Liber uite meritorum* and *Liber diuinorum operum*) or *Quod etiam sic intelligendum est* (only in *Liber uite meritorum*, nowhere else). If we further look at the distributions of such formulas, we discover an astonishing systemacity (table 4).

Table 4. Exegetical formulas in the vision books

*Sciuias*

Part 1 *Quod dicitur*

Part 2 *Quid est hoc?*

Part 3 *Hoc tale est*

*Liber uite meritorum*

Part 1 of each vision: *psychomachia* *Cuius sensus talis est*

Part 2 of each vision: *afterlife* *Quod etiam sic intelligendum est*

*Liber diuinorum operum*

Part 1 *Quod sic intellectui patet*

Part 2 *Hoc considerandum sic est*

Part 3 *Huius sententie intellectus hoc modo accipiendus est*

The first part of *Sciuias* uses the same words after each biblical quote: *quod dicitur*.<sup>34</sup> In the second part, however, we only and consistently find *quid est hoc*, and *quod dicitur* is never used again as an introduction to exegesis in any of the three works. *Quid est hoc* is an exception in this regard, because it is the fixed formula for the second part, but it also regularly occurred in the first part in the body of the exegesis (i.e., not immediately following the biblical citation). All other formulas are specific to the introduction of an exegesis in one particular part of a book and are never used elsewhere. To continue, yet another formula is used in the third part of the book, namely *hoc tale est*. In *Liber uite meritorum*, which is not divided into parts, we find a different but equally regular pattern. Each of these six visions has two parts. The first part is a *psychomachia* where the personifications of virtues and vices argue with each other, and the second part gives a view of the afterlife, where the sinners who fell victim to these vices undergo their punishments. Each of these two parts has its own exegetical formula: for the first part, this is *cuius sensus talis est* and for the second part *quod etiam sic intelligendum est*. Lastly, the same organization is apparent in the last vision

<sup>33</sup> Hildegardis, *Sciuias*, I.2.12, p. 21 (our italics).

<sup>34</sup> With one exception (Hildegardis, *Sciuias*, I.3.31, p. 59), where the text says *quid est hoc* instead.

book. Whereas the first part consistently uses *Quod sic intellectui patet*, the second part always says *Hoc considerandum sic est*, and the third part tells us that *Huius sententie intellectus hoc modo accipiendus est*.

To our knowledge, this sort of systematicity is found in no other exegetical text. The exact repetition of one formula for each part has a prophetic ring to it, whereas the variation in formulas is at once rhetorical *variatio* and yet so systematic and monolithic that readers do not even notice it. It acts as a sort of prophetic appropriation of the rhetorical technique. Furthermore, the change of formulas *between* the texts seems to follow a development in how the text teaches. The formulas in *Sciuias* indicate a simple deictic relationship between the citation and its exegesis, pointing from one to the other and saying ‘this is that’ (e.g. *quid est hoc, tale est, quid est, qui est, quod est, id est*). In *Liber uite meritorum*, there is a *sensus* which needs to be apprehended; the reader must make some effort to understand what is said. *Liber diuinorum operum* further develops this trend by putting the stress on *intellectus* as both the meaning of what is said and the intellect which grasps that meaning.

This rhetorical effect is reflected in the changing frequencies of smaller words. In *Liber diuinorum operum*, Hildegard starts using more words such as *quippe* (modal particle), *sicut* (conjunction of comparison), *itaque* (adverb of cause), and *quemadmodum* (interrogative adverb), *namque*, and *sic*. Her final work strongly revolves around ‘intellect’, around understanding (the *Capitula* of *Liber diuinorum operum* are teeming with the phrase *quomodo intellectum sit*), whereas *Sciuias* is more occupied with the condition that precedes understanding, namely the right way of thinking. In the same vein, the occurrence of *uidelicet* (etymologically linked to ‘seeing’: ‘it is easy to see’) drops in the *Liber diuinorum operum* in favour of other modal particles such as *quippe* or *scilicet* (in contrast a word that is etymologically linked to ‘knowing’: ‘it is easy to know’). The way in which Hildegard links the vision with its explanation has become less of a one-to-one relationship; the likeness between image and explanation has become *modal* (*quemadmodum [...] sic [...], sicut enim, sic que*). These are harder to interpret for the less advanced reader. In *Sciuias* Hildegard still takes her reader by the hand. This is reflected by the higher frequency of direct addresses throughout the work. In *Sciuias* it is God himself who is subject, speaking directly to the audience in terms of *ego, me, and meus* (also visible in the PCA plot). Later on in Hildegard’s trilogy, God becomes a more distant yet constantly present object in *Liber uite meritorum*, objectivized through Hildegard who takes on a reportorial role (*deum* or his *uocem*). Finally, it is his divine works that gain central focus in *Liber diuinorum operum* (*operibus, opera*).

As Sabina Flanagan notes, *Sciuias* is ‘essentially a work of instruction and direction, a ‘how to’ book rather than an abstract meditation on theological questions’.<sup>35</sup> Flanagan also stressed that Hildegard was still trying to find her

<sup>35</sup> Sabina Flanagan, *Hildegard of Bingen, 1098–1179: A Visionary Life*, 2nd edn (1989; repr. London: Routledge, 1998), p. 67.

method of writing in *Sciuias*: 'We might conclude, then, that many general themes are stated in the first part which are explored at greater length in subsequent books of *Sciuias*. Indeed, it is possible that Hildegard had not quite found her method at this stage'.<sup>36</sup> This sort of didacticism gradually disappears in the two later vision books, and makes way for a style of exegetical explanation targeting a more advanced reader. What we should mostly take away from these experiments is how much control the text exerts over the placement of its words, and that there is a strongly embedded didactic line that appears throughout. If in this case each word is right where it should be in a system of uninterrupted order, this suggests a similar attitude with regard to other words. It also shows how Hildegard's collaboration with secretaries in composing her works does not equal an absence of structured, underlying thought, when even the preferences for the very small words seem to have a distinct purpose.

#### IV. Lexical Richness

In this next section we devise a set-up in which we quantify Hildegard's lexical richness. Vocabulary richness—or diversity measurement—is a very intuitive and simple approach to measuring lexical differentiability between texts. It is one of the oldest methods for statistical text analysis,<sup>37</sup> and it remains a valid exploratory approach to an author's lexical variety.<sup>38</sup> Interestingly, the method has been conceived quite apt to yield informative figures of a developing mind in the process of creating. Lexical richness has been said to visualize a 'very subtle mental process',<sup>39</sup> which allows to see in what parts of the text the author meanders from one subject to another (high variety), or is highly fixated on a particular subject (low variety). Vocabulary richness is nowadays also considered a helpful method to assess the acquisition or proficiency of a (second) language, although a correlation between lexical richness and control over the language is harder to maintain in the context of literature (cf. below). Literature will often be homonymous, sparse, or repetitive with an artistic purpose.

In Figure 4, the texts were segmented into equally-sized 6,000-word slices or samples, the concept of which should by now be clear.<sup>40</sup> Again, there was no lemmatization. Consequently, the total size of the vocabulary was divided by the total number of words in the sample (always 6,000 words), yielding a type-token

<sup>36</sup> Flanagan, *Hildegard*, p. 57.

<sup>37</sup> It has for some time even been regarded a viable method to distinguish between works of different authorship. In the meantime its reliability to determine authorship has been much debated or withdrawn. For the earliest studies in this field, see George Udny Yule, *The Statistical Study of Literary Vocabulary* (Cambridge: Cambridge University Press, 1944).

<sup>38</sup> For an overview, see Fiona J. Tweedie and R. Harald Baayen, 'How Variable May a Constant Be? Measures of Lexical Richness in Perspective', *Computers and the Humanities*, 32 (1998), 323–52.

<sup>39</sup> Carrington B. Williams, *Style and Vocabulary: Numerical Studies* (London: Charles Griffin, 1970), p. 32.

<sup>40</sup> See n. 30 above.



ratio (TTR) for each of these samples. The TTR is a simple ratio that informs us how many different words are used within a text sample. The higher the number of different words, the more ‘lexically diverse’ or ‘lexically rich’ the sample becomes. For example, if there are 2,500 different words in a 6,000-word sample, then that sample is very diverse in vocabulary (the TTR would be 0.41, which is approximately the highest score Hildegard attains).

Once we have worked through the entire text and computed a TTR every 6,000 words, we are able to obtain an average TTR value for each work, which is indicated by the dashed line (following the usual color scheme maintained throughout this article).<sup>41</sup> As a *close reading* of the previous section has already suggested, this dashed line suggests that Hildegard consistently used fewer words for each work in the trilogy, with the clearest and most significant drop in the *Liber diuinorum operum*.

Hildegard shows a diachronic tendency to distil her vocabulary to a concentration of carefully chosen words. This style of writing also made her increasingly abstract or difficult to understand. In other words: Hildegard’s thought increases in complexity with a more limited range. When analysed more closely, lexically rich or, conversely, sparse episodes within Hildegard’s *oeuvre* give a good indication of what the TTR measures: this often turns out to be a stylistic strategy in line with a particular thematic focus. For example, one of the lexically sparsest episodes of the *Liber diuinorum operum* is the fourth vision. The vision’s obsession with cosmic symmetry<sup>42</sup> is embedded in the Latin: the descriptions are repetitive and synonymous. Strikingly, the third most frequent word throughout the entire passage is *uerbum*, which takes up a central position in the beginning of her commentary on the prologue of the Gospel of John. We can here observe how Hildegard meditatively revolves and circles around the equalization of *uerbum* and *Deus*, and the divine potential to create (*creatura*).

Because without the beginning, before the beginning of creatures, and even in the beginning of these creatures there was the Word, and this same Word was before the beginning and in the beginning of creatures with God and in no way distinct from God; because God’s will was in his Word and his Word created everything, just as he had preordained it before all time. And why is it called the Word? Because with a resounding voice it animated all creatures and summoned these creatures to itself. Because what God dictated in the Word, this Word ordered through sound; and what the Word ordered, God dictated in the Word. And so God was the Word. For the Word was in God, and God

<sup>41</sup> Note that text length can have an impact on such an average. However, this does not have to be a problem, since our aim is mostly to present a transparent overview of the lexical richness in the entire trilogy. Moreover, clearly text length has not withheld the *Liber uite meritorum* in outperforming *Liber diuinorum operum* when it comes to type/token ratio.

<sup>42</sup> Derolez and Dronke, introduction to Hildegardis, *Liber diuinorum operum*, p. xcii.

dictated to it all his will in secret; and the Word resounded and brought forth all creatures; and so the Word and God are one.<sup>43</sup>

A lexically rich passage within Hildegard's trilogy, on the other hand, is found in the fifth part of *Liber uite meritorum*. It concerns the divine judgement of man giving in to worldly temptations. Interestingly, in an episode that is teeming with many different words that semantically root in vice (*uitium, iniquitas*), overabundance (*superabundare*) and luxury (*luxuria*), Hildegard's writing style is somewhat more digressive and ornate. The sentences are much longer and the syntax is considerably more complex: the allurements of earthly distraction and open-endedness thereby seems to become tangible through the language.

For while injustice abounded, to the extent that it deemed itself unconquerable by anyone, the Lord in His zeal destroyed every beginning and every head that raged in the perversity of tenebrous infidelity, namely from the beginning of pride with the devil, which had prepared for itself a seat in the infernal kingdom, up to the beginning of Adam's transgression, where the latter—captivated and incarcerated—subjected himself to that same devil.<sup>44</sup>

The high contrast in between these two passages, where a humble vocabulary focuses on God's potential to create and a rich vocabulary on God's potential to destroy, emphasizes how Hildegard could adapt her style in function of the passage. Importantly, it should be noted that a usage of fewer words, as in the passage of *Liber diuinorum operum*, does not necessarily equal a simpler text or simpler reading experience. On the contrary: in observing the modest number of transmitted manuscripts of *Liber diuinorum operum*, Barbara Newman has speculated that the work might have rather been 'far too complex to become popular in Hildegard's time',<sup>45</sup> an observation which McGinn has echoed by stating that *Liber diuinorum operum* is bolder and more original than its predecessors in its material, structure, and narrative.<sup>46</sup> Kowalewska has likewise

<sup>43</sup> Our translation. See Hildegardis, *Liber diuinorum operum*, I.4.105.79–90, p. 251: 'Nam sine principio ante principium creaturarum et etiam in principio ipsarum erat uerbum, et idem uerbum ante principium et in ipso principio creaturarum erat apud Deum et nullo modo a Deo diuisum; quoniam Deus in uerbo suo uoluit et uerbum suum omnia crearet, sicut ante secula preordinauerat. Et | quare dicitur uerbum? Quia cum sonante uoce omnes creaturas suscitauit et eas ad se uocauit. Nam quod Deus in uerbo dictauit, hoc uerbum sonando iussit; et quod uerbum iussit, hoc Deus in uerbo dictauit. Et ita Deus erat uerbum. Verbum enim in Deo fuit, et Deus in illo omnem uoluntatem suam secreto dictauit; et uerbum sonuit et omnes creaturas produxit; et sic uerbum et Deus unum sunt'.

<sup>44</sup> Our translation. See Hildegardis, *Liber uite meritorum*, 5.852–57, p. 244: 'Dum iniquitas superabundauit, ita quod a nullo se superari existimauit, contriuit Dominus in zelo suo omne initium et omne caput quod in peruersitate tenebrosae infidelitatis grassabatur, scilicet ab initio superbie diaboli, que sibi sedem in tartareo regno parauerat, usque ad initium transgressionis Ade, ubi ipse captiuatus et incarceratus eidem diabolo se subiecerat'.

<sup>45</sup> Barbara Newman, review of Hildegardis, *Liber diuinorum operum*, ed. by A. Derolez and P. Dronke, in *Speculum*, 75.2 (2000), 478–80.

<sup>46</sup> McGinn, 'Hildegard of Bingen as Visionary and Exegete', p. 343.

asserted that ‘while it is undoubtedly a fact that Hildegard’s language is to a large extent homonymous, it does not manifest her linguistic poverty’.<sup>47</sup> Perhaps it is precisely this somewhat abstract quality to Hildegard’s later work, which seems less intent on explaining itself through the use of more words, that renders it more difficult to grasp.

### V. Semantic Change

This combination of decreasing lexical richness and increasing abstraction deserves closer attention. An abstract writing style implies more than simply using fewer words to describe a reality. It also implies that the semantic connection between the word and that reality is problematized. If fewer words are used, does that mean that fewer realities are indicated, or that larger parts of reality are taken together? We will give a few examples of philosophically significant words of which the relation between word and semantic content changes from the first vision book *Sciuias* to the last book *Liber diuinorum operum*.<sup>48</sup> These two works, which chronologically demarcate Hildegard’s literary achievement, are structurally and thematically very similar, yet show the greatest difference in lexical richness, which urges a closer comparison. In tracing these semantics, we will encounter a trend of specification: polysemic words are bent towards a single univocal meaning. On the other hand, we will sometimes encounter remarkable instances of quantitative change going hand in hand with qualitative, semantic, change. Sometimes, words just disappear. While we start out by looking at a cluster of terms in which the semantic values of the words shift in relation to each other, we end by zooming in on instances of words that disappear towards the last book of the visionary trilogy.

First, we will discuss terms or clusters of terms that acquire more specific and technical philosophical meanings. We start with Hildegard’s semantic cluster of the word itself: *uerbum*, *uox*, *sonus*, *sonitus*, and *nomen*. In *Sciuias*, *uerbum* occurs as the centre of the cluster. Forms of *uerbum* occur 479 times in the work. As one would expect, they are used all the time, both in non-philosophical usages and in the context of the Word of God. *Sciuias* contains little critical reflection on the nature of the word. The only time when Hildegard discusses the nature of the word is when she uses it as an analogy to demonstrate the nature of the Trinity. The word has three elements: ‘sonus, virtus et flatus’.<sup>49</sup> ‘Sed sonum habet ut audiatur, uirtutem ut intellegatur, flatum ut compleatur’. These three correspond to the Father, the Son, and the Holy Spirit, respectively: like the elements of the word, the persons of the Trinity cannot be separated.

<sup>47</sup> Małgorzata Kowalewska, ‘The Linguistic Artistry of Hildegard of Bingen as Exemplified in Her Letters’, *Roczniki Kulturoznawcze*, 5.1 (2014), 125–52 (p. 132).

<sup>48</sup> It might be helpful for the reader to know the words which we investigated but for which we could not detect significant semantic changes. These were: *speculum*, *uoluntas*, *intellectus*, *imago*, and *similitudo*.

<sup>49</sup> Hildegardis, *Sciuias*, II.2.7, p. 129.

*Sonus* occurs 41 times in *Sciuias*. Apart from being used as an aspect of the word, it denotes harmonious sound, often the sound of singing or of a message or truth that is revealed.<sup>50</sup> Mostly, this happens in a typological relationship where *sonus* denotes the anterior and hierarchically lesser element. The second element is then often *uerbum*.<sup>51</sup> We would rather expect such a typological relation to be represented, in the Augustinian tradition, by *uox* and *uerbum*. However, in *Sciuias*, *uox* occurs only in its most common, non-metaphoric usage. The same is true for *nomen*: it only denotes the name and title by which one identifies a person, and has no further philosophical connotation. A word related to *sonus*, *sonitus*, appears 23 times and represents the negative connotations of sound, with the meaning of noise and distorted sound. This difference between positive *sonus* and negative *sonitus* corresponds to the normal usage. However, it also happens that they are used interchangeably.

The semantic relations within this cluster change markedly in *Liber diuinorum operum*. As was noted earlier, Hildegard's last book includes important theoretical reflections on language and knowing through words.<sup>52</sup> This engagement with words is reflected by the change of terms. The most significant change is that the word is now also that through which we understand, whereas in *Sciuias* it was only the means of communication. In this sense, the word is called 'name', *nomen*. *Nomen* in this philosophical usage is now often found in the vicinity of words like *forma*,<sup>53</sup> *officia*,<sup>54</sup> *discernere*,<sup>55</sup> *comprehendere*. The name corresponds to the form of something created (*forma creaturae*), and through the name we discern (*discernere*) the functions (*officia*) that it has. Consequently, the use of *uerbum* is reduced to signifying the word that is communicated. Either it is the Word of God, in the form of creation or Christ, or it is the spoken human word. In these contexts,

<sup>50</sup> For instance at I.6.12, p. 107: 'Sonus laetitiae et prosperitatis'; at III.4.1, p. 392: 'tunc etiam declaratum est in acuta iustitia mysterium Verbi Dei, insinuatum uidelicet per sonum patriarcharum et prophetarum'; and at III.13, p. 615, ll. 38–40: 'Et sonus ille, ut uox multitudinis in laudibus de supernis gradibus in harmonia symphonizans, sic dicebat'.

<sup>51</sup> For instance, Adam and Christ at III.3.12, p. 386: 'significante in circumcissione primum sonum oboeditionis post casum Adae, praecurrentem operantem oboedientiam in uero **uerbo** quod est in Filio Dei, ut sonus **uerbum** praecurrit'; the patriarchs, prophets, and Christ at III.4.1, p. 392: 'insinuatum uidelicet per sonum patriarcharum et prophetarum, qui praedixerunt ipsum **Verbum** cum omni iustitia manifestandum'.

<sup>52</sup> For a more extensive discussion of the philosophy of the word in Hildegard, see Ranff, *Wege zu Wissen und Weisheit*; Chávez Alvarez, *Die brennende Vernunft*; and Dinah Wouters, "'Nisi per nomina": Language as the Medium of Thought in Hildegard of Bingen's Thinking', *Revue d'Histoire Ecclésiastique*, 113.1–2 (2018), 66–93.

<sup>53</sup> Hildegardis, *Liber diuinorum operum*, I.4.33, p. 169, ll. 5–6: 'uelut creaturas, quae homini note sunt, formis et nominibus suis ab inuicem discreuit'.

<sup>54</sup> Hildegardis, *Liber diuinorum operum*, I.4.67, p. 189, l. 10: 'officia et nomina creaturarum discernit'.

<sup>55</sup> Hildegardis, *Liber diuinorum operum*, I.4.105, p. 249, ll. 24–25: 'quia homo nullam rem alio modo nisi per nomina discernit'.

*uerbum* is still used in a typological relation to *sonus*, and now also to *uox*.<sup>56</sup> Thus, the traditional, Augustinian pair of *uox–uerbum* comes into play, and *uox* is now also part of the word, which was not the case in *Sciuias*. *Verbum* now no longer has three parts; it is not analogous to the Trinity anymore. Instead, *nomen* has adopted this structure.<sup>57</sup>

Lastly, the word *sonitus* disappears in *Liber diuinorum operum*, which is not easy to explain, because it did carry a different meaning than *sonus*. It is not the case that *sonus* loses its connotation of harmony. Instead, the meaning of disharmonious sound is filled in by *strepitus*, which was also present in *Sciuias*, but only 9 times. So, this change seems less motivated by a change of meaning than by the desire to use fewer words for the same meaning.

The same phenomenon presents itself with the term *species*: there exists a semantic overlap with *forma* in *Sciuias*, but *Liber diuinorum operum* narrows down the use of the term so that the two are strictly separated in meaning. *Species* is used 34 times in *Sciuias* and for all kinds of meanings. It denotes visible beauty and the outer appearance of things. It also has the meaning of the English word *species*, to denote the species of animals that left the ark and the species of humankind. In its sense of outer appearance, *species* overlaps with *forma*, which stands both for the outer appearance and the inner nature of something. The concept of *forma* thus corresponds to the philosophical idea that the ‘form’ of something is its essential nature, the sum of its properties, which is abstracted from the thing and thought in the mind. So, *forma* indicates a continuity between outer and inner appearance, and if *forma* and *species* would occupy wholly different semantic fields, we would expect *species* not to carry this meaning. However, this is not the case: *species* also sometimes includes a metaphorically motivated analogy between outer appearance and inner essence.<sup>58</sup> In *Liber diuinorum operum*, however, *species* occurs only in the commentary on Genesis 1 and only to denote animal ‘species’. The term did not even keep its meaning of ‘beauty’. For a word that is fairly common, this points to a deliberate avoidance. Hildegard chose to appoint *forma* as the philosophically correct word for outer and inner appearance, and, more importantly, for the continuity between them. There cannot be an overlap of meaning.

<sup>56</sup> Hildegardis, *Liber diuinorum operum*, II.1.21, p. 289, ll. 2–3, 14–15: ‘Hoc considerandum sic est: Vox primum sonat et uim uerbi in se habet, ita ut quecumque annuntiat scienter intelligantur. [...] Sed et uox aliquantum aliena est nec intelligibilis, uerbum autem notum et intelligibile est’.

<sup>57</sup> Hildegardis, *Liber diuinorum operum*, I.4.105, p. 260, ll. 396–97.

<sup>58</sup> Hildegardis, *Sciuias*, II.3.26, pp. 150–51: ‘Quapropter et ibi Spiritus sanctus apparuit, quia fidelibus per eum remissio peccatorum fit, ibi uidelicet ob mysticum secretum eundem Vnigenitum meum idem Spiritus sanctus in **specie** columbae ostendens, quae simplicis et sinceri moris est; quoniam et Spiritus sanctus in simplicitate et in bonitate omnium bonorum indeficiens iustitia est’; and at III.4.17, p. 402: ‘Sed homines isti quos uides in hac multitudine dicuntur compulsae oues, humanam **speciem** habentes propter opera hominum, et umbrosum uestitum quod est dubitatio in operibus peccatorum, in districtione tamen timoris metuentes iudicium Dei’.

Further, we will give some examples of terms that completely disappear from *Sciuias* to *Liber diuinorum operum*, due to, presumably, overspecification. First, there are *typus* and the adverb *typice*, which denote either the way that an image features in Hildegard's visions or the typological relation of prefiguration between Old and New Testament. We see that Hildegard uses *typus* and *typice* together 14 times in *Sciuias*, but not at all in *Liber diuinorum operum*.<sup>59</sup> In *Sciuias*, she used the word together with *figura* (10 times), which replaces *typus* completely in *Liber diuinorum operum* (9 times), a process that is familiar by now.

Second, there is the strange case of *conscientia*, which is a central word in *Sciuias* (39 times), but disappears without a trace in *Liber diuinorum operum*. Viki Ranff offers a hypothetical explanation that fits in well with our own findings.<sup>60</sup> She notes that *scientia* is very close and almost identical with *conscientia*, because it always serves ethical knowledge. *Scientia* is, for Hildegard, always *scientia boni et mali*, with which *conscientia* was associated in *Sciuias*. Therefore, we may conjecture that Hildegard felt that the word *conscientia* had become superfluous. It says much about Hildegard's terminological rigour that she would even do away with such a common and culturally central word.

The last term that we will discuss is one that disappears almost completely: *sermo*. In *Sciuias*, the word appears 25 times. It is not a word that seems to receive special attention. It is used for Hildegard's own visions,<sup>61</sup> the words of the faith,<sup>62</sup> the kind words of a teacher,<sup>63</sup> angelic words,<sup>64</sup> and all kinds of human words. In

<sup>59</sup> The term only appears once in the *Capitula* or introductory chapters of the *Liber diuinorum operum*, which we did not include in this analysis. The *Capitula* have been identified by Albert Derolez as written by another hand, one that is not found anywhere else in the work ('hand 1'). The chapters also originally headed a version of the *Liber diuinorum operum* which must have looked quite different from the current one, meaning that it was written somewhat before the work's 'final' completion (inasmuch that term can be properly used here); see Derolez and Dronke, introduction to *Liber diuinorum operum*, p. lxxxviii.

<sup>60</sup> Ranff, *Wege zu Wissen und Weisheit*.

<sup>61</sup> Hildegardis, *Sciuias*, I.2.18, p. 26: 'Ego enim opus istud per hunc hominem edissero, cui idem opus in homine ignotum est et qui sermonem istum non ab homine, sed a scientia Dei accepit'.

<sup>62</sup> Hildegardis, *Sciuias*, I.3.15, p. 48: 'Quapropter et ex eo quidam flatus cum turbiniis suis exiens per praedictum instrumentum se ubique diffundit: quoniam ab inundatione baptismatis salutem credentibus afferentis uerissima fama cum uerbis fortissimorum sermonum egrediens omnem mundum manifestatione beatitudinis suae perfudit, ut iam in populis infidelitatem deserentibus et fidem catholicam appetentibus aperte declaratur'.

<sup>63</sup> Hildegardis, *Sciuias*, II.5.49, p. 217: 'Quomodo? Si habet rectos rectores et spiritalis magistros zelum meum habentes, hi debent eum ad seruitutem meam reuocare, et hoc primum facient supplicatione, exhortatione et blando sermone eum lenientes, et deinde uerberibus et constrictione frigoris ac famis et aliis his similibus castigationibus eum corripientes, quatenus his miseriis admonitis infernales poenas ad mentem suam reuocet, et eas timens a se putredinem animae suae auferat, et ad semitam illam quam deseruerat ita reuocatus redeat'.

<sup>64</sup> Hildegardis, *Sciuias*, II.6.15, p. 244, ll. 648–49: 'Sed quod eadem beata Virgo per angelicum sermonem in eodem secreto ueram allocutionem audiuit'.

the latter sense it may also be used negatively.<sup>65</sup> In the last vision book, however, things have changed drastically: *sermo* appears only 2 times. If we look at the two passages in which *sermo* does appear, we see that it is now used in an extremely specific, namely in an extremely negative, sense. The first time is in a biblical quote which warns against the trickery of the Antichrist: ‘Neque terreamini neque per spiritum neque per sermonem neque per epistolam tanquam per nos missam, quasi instet dies Domini’.<sup>66</sup> In explaining the quote, Hildegard defines this *sermo* as *verbosa seductio*. Four chapters later, the talk is about the ‘two witnesses’ in the *Apocalypse*, Enoch and Helias. God has taught them his mysteries, and therefore they know things ‘ita ut illa sciant quasi ea corporaliter uiderint’, which makes them ‘sapientiores [...] scriptis et sermonibus sapientium’.<sup>67</sup> It is instructive to also take a look at *Liber uite meritorum*. This book, too, only features *sermo* twice. The first time it is used by the personified *Fallacia*, who says that she voices a multitude of opinions because she fears to be contradicted.<sup>68</sup> The second time it is used by *Infidelitas*, who decides to do as she pleases, because she is confused by the ‘[m]ultos [...] rumores et multos sermones ac multas doctrinas’ that she hears but does not understand.<sup>69</sup> From these four passages we can conclude that *sermo* had lost all of its positive connotations after *Sciuias*. Apparently, *sermo* had come to be associated with bad and misleading teaching, and even with fallacy, seduction and infidelity. But why *sermo*? *Sermo* was a word that carried much meaning, and many different meanings, too, but it was in no way a negative word or one that would be shunned by some writers. Hildegard’s usage seems completely idiomatic.

What this analysis of philosophically relevant vocabulary shows is that terms are used with greater care and specification in the last vision book than in the first one. First of all, Hildegard apparently acquired a more philosophical vocabulary: philosophical distinctions are made (*uerbum–nomen*), and terms are combined in ways that are more in line with tradition (*uox–uerbum*). Secondly, there is the tendency to eliminate semantic overlap by restricting competing terms both in meaning and use (*species–forma*, *sonus–uox*, *sonitus–strepitus*, *typus–figura*, *conscientia–scientia*).

The changes described above are motivated by the wish to create a philosophical terminology that is clear and precise. Researchers of Hildegard’s

<sup>65</sup> Hildegardis, *Sciuias*, III.9.21, p. 353, ll. 697–701: ‘Sed te in eadem emptione durante non habebis partem lucis in consortio supernorum angelorum: quoniam in sermone linguae tuae rapacitatem cordis tui protulisti aliud concupiscens quam ciues aeternae claritatis desiderent’.

<sup>66</sup> II Thessalonians 2.2; Hildegardis, *Liber diuinorum operum*, III.5.29, p. 49, ll. 1–3.

<sup>67</sup> Hildegardis, *Sciuias*, III.5.33, p. 456, ll. 9–11.

<sup>68</sup> Hildegardis, *Liber uite meritorum*, II.7, p. 78, ll. 206–08: ‘Si enim loquela mea in uno modo esset, ab omnibus damnarer; et ideo sermones meos multiplico, ne ab ullo superer, et hoc mihi utilius est, quam fustibus et gladiis percutiar’.

<sup>69</sup> Hildegardis, *Liber uite meritorum*, III.11, p. 132, ll. 271–72: ‘Multos quoque rumores et multos sermones ac multas doctrinas audio, quas nescio. Vnde faciam quicquid ad utilitatem meam optimum fuerit’.

philosophy have noticed her careful choice of words: 'Die differenzierte und präzise Nuanciertheit des sprachlichen Ausdruckes vornehmlich bei Wissens-, Erkenntnis- und Weisheitsthemen wirkt wie ein bewußt erstelltes begriffliches Instrumentarium, das eine hohe Sensibilität gegenüber philosophischen Fragestellungen erwarten läßt'.<sup>70</sup> Christel Meier has spoken of '[die] Kontingenz einer Art Bildterminologie die systemhaft wie die abstrakte Terminologie eines philosophischen Werks die Visionsschriften durchzieht'.<sup>71</sup> Meier herself has analysed the 'Bildterminologie' of colour, while Barbara Maurmann has described the terminology of the winds.<sup>72</sup>

Despite the attention that scholars have paid to this terminology, the changes in it have been less noticed. This might be partly due to how the text itself deals with these changes. First of all, Hildegard does not signal that she will use certain words for certain meanings, and she does not give definitions. Second, her preference goes to common words to denote very specific philosophical meanings in favour of more specialized words. Although Hildegard chooses her words with great care, this only becomes apparent to a reader when one closely analyses her word use, not when one reads the text linearly or analyses her philosophy.

Her terminology does not serve the purpose of making connections to other ideas and texts. On the contrary, Hildegard seems intent on avoiding any such inferences. With regard to Hildegard's use of sources, Peter Dronke has noted 'a sense [...] that verbal reminiscences have at times been deliberately covered over', Christel Meier has voiced the strong suspicion that 'mögliche Wortanklänge an verwandte Vorstellungen durch Synonymengebrauch umgangen werden', and Jochen Schröder has asserted that in Hildegard's use of Ezechiel 'naheliegende Similien wie demonstrativ ausgemerzt [werden]'.<sup>73</sup> This phenomenon certainly has to do with Hildegard's 'bewußt angestrebte Originalität', as Schröder says, and Dronke sees it as 'a mark of the individual creative will of [a] writer [...] of

<sup>70</sup> Ranff, *Wege zu Wissen und Weisheit*, p. 365; and Chávez Alvarez, *Die brennende Vernunft*.

<sup>71</sup> Christel Meier, 'Eriugena im Nonnenkloster? Überlegungen zum Verhältnis von Prophetentum und Werkgestalt in den *figmenta prophetica* Hildegards von Bingen', *Frühmittelalterliche Studien*, 19 (1985), 466–97 (p. 470).

<sup>72</sup> Christel Meier, 'Die Bedeutung der Farben im Werk Hildegards von Bingen', *Frühmittelalterliche Studien*, 6 (1972), 245–355; Barbara Maurmann, *Die Himmelsrichtungen im Weltbild des Mittelalters: Hildegard von Bingen, Honorius Augustodunensis und andere Autoren* (Munich: Funk, 1976).

<sup>73</sup> Peter Dronke, 'The Allegorical World-Picture of Hildegard of Bingen: Revaluations and New Problems', in *Hildegard of Bingen: The Context of Her Thought and Art*, ed. by Burnett and Dronke, pp. 1–16 (p. 14); Meier, 'Zwei Modelle von Allegorie im 12. Jahrhundert: Das allegorische Verfahren Hildegards von Bingen und Alans von Lille', in *Formen und Funktionen der Allegorie*, ed. by Walter Haug (Stuttgart: Metzler, 1979), pp. 70–89 (p. 82); Jochen Schröder, 'Die Formen der Ezechielrezeption in den Visionsschriften Hildegards von Bingen', in *Im Angesicht Gottes suche der Mensch sich selbst*, ed. by Rainer Berndt (Berlin: Akademie Verlag, 2001), pp. 343–74 (p. 373).



genius'.<sup>74</sup> Meier explains it as an effect of Hildegard's wish to create an allegory that is hermetically closed to the reader.<sup>75</sup>

However, we do not only notice this elusiveness in the creative use of allegory but also in the use of philosophical terms. Hildegard is deliberately disowning her learning. Her persona of a visionary prophet writing the words of God brings her in a difficult position in relation to her steep learning curve. As Hildegard the visionary, she is unlearned and knows nothing of philosophical knowledge. The voice that speaks in her visionary texts, however, is the voice of God, who knows everything, but is also not learned, in the sense that He is above all human learning. Both can neither gain new knowledge nor refer to other human knowledge. This provides Hildegard with a great freedom of saying things in her own way, but it also puts restrictions on what she is able to say.

This argument might explain why the specification of a philosophical terminology would go hand in hand with the use of fewer words. Usually, the creation of such a technical terminology rather seems to entail using more or even new words. If you want every semantical node to correspond to one lexical form, as Hildegard clearly does, you would need more and not fewer words. Yet, this lexical analysis—together with our lexical richness analysis—suggests that the more Hildegard's thought gained complexity, the fewer words she used. It is of course not proven that philosophical terms play the major role in this trend, but seeing that many terms simply disappear, we can assume that this does play a role. This is an interesting phenomenon which deserves to be pursued further.

## VI. Conclusion

Hildegard of Bingen's visionary trilogy is not as monolithic as it appears, although it is designed to give that impression. Precisely this aspect of her work makes it a grateful study object for a distant reading. Such an abstract approach, which is inductive and exploratory, prides itself on being capable of temporarily deactivating any subjective impressions that can be misleading in a close reading. Moreover, it allows spotting subtle nuances, changes and meaningful variations which often go unnoticed in an extensive corpus, by laying bare statistically measurable trends. It has been our aim to show that, on the one hand, statistical analysis is able to point out patterns which otherwise remain unread, and, on the other hand, that these patterns are not automatically incidental or 'unconscious' elements of the text. A text will always be incomparably richer than its most deep and nuanced reading. Distant reading or data analysis can help us reduce the complexity of the text so that it yields an overview.

Our starting point was the analysis of the principal components in each of the three works, which showed that each work is stylistically distinct from the others to quite a large degree. We then traced the paths of words changing frequency, position, and meaning. Through close readings of particular elements,

<sup>74</sup> Schröder, 'Ezechielrezeption', p. 374; Dronke, 'The Allegorical World-Picture', p. 14.

<sup>75</sup> Meier, 'Zwei Modelle', p. 81.

we tried to indicate how these changes and differences need not only indicate external influences on the writing process but can also be emblematic of a strategic development within the visionary works as they evolve from didactic treatise to abstract philosophy.

Beginning with the small words, we looked at the frequencies of modal particles, comparative conjunctions, causal and interrogative adverbs that introduce exegetical explanations. These kinds of words were a distinctive marker of change in our computational analysis. Behind some of their functionalities we have been able to ascertain a systematicity and a rationale which complicates any claim that they are solely 'coincidental' or 'unconscious' imports of Hildegard's assistants. *Sciuias* relies on a question–response structure where an instructor directly addresses a readership, and where exegesis functions largely through deictic one-to-one relationships. *Liber diuinorum operum* dispenses with this didactic style and its corresponding word use. The exegetical formulas which introduce biblical exegesis in each of the treatises are a particularly interesting case by which to demonstrate how Hildegard deals with change. Variation of these formulas occurs only en bloc, which reinforces rather than diminishes the monolithic voice of the visionary works. Moreover, the change of formulas seems to be involved in the evolution from a question-and-answer format to the dry style of a treatise, evolving from a deictic *Quid est hoc?* to admonishments to probe the deeper sense of something.

We continued with an analysis of the variety and decrease in vocabulary richness throughout the three texts. We showed how the variety in vocabulary richness can often be attributed to conscious variations in style bound to a particular thematic focus. The decrease of richness over the course of the trilogy is a more complex case, and one we decided to elucidate through the study of some philosophical terminology. The remarkable results of this analysis indicate that decreasing vocabulary richness goes hand in hand with deliberate semantic shifts. We apparently have to do with an author who greatly evolved in thought and in the ways by which she put that thought into language. Interestingly, it appears that the more Hildegard's thought gained complexity, the fewer words she used. Moreover, this evolution appears to go hand in hand with the didactic-exegetical rationale, where the word reaches a level of abstraction and distance that would only have been comprehensible for the advanced reader. There is a development in didactic strategy from the deictic character of *Sciuias* to the intellectual qualities of the *Liber diuinorum operum*, where one could say that *Sciuias* is the *minor* to the much more abstract *maior Liber diuinorum operum*. Indeed, Hildegard's striving for a philosophical clarity has not made her an easier read. The exact meanings of words are not explicated to the reader. A helpful way to understand the changing semantics of Hildegard's words is by looking at 'word' itself. Whereas in *Sciuias*, *verbum* denotes only spoken communication, in *Liber diuinorum operum* *verbum* is contrasted with *nomen*, which denotes the word that is thought. In a long intellectual tradition which distinguishes between the linguistic word and

the metaphorical ‘inner word’, the latter consists of pure insight into the essential reality of that which a word denotes.<sup>76</sup> We suggest that this is what Hildegard tries to accomplish in her later books by using words the way she does, namely with the utmost precision and by trying to make form and meaning line up. Whereas *Sciuias* follows the model of spoken language in using a wide array of words with different meanings, *Liber diuinorum operum* interiorizes the word by using an intellectual and philosophical language, a theological language, too, which imitates the univocal act of the Word about which John says ‘Et verbum caro factum est’.

In conclusion, this article has attempted to pair a broad, computational, view on variation, change, and development in Hildegard of Bingen’s visionary trilogy with a close analysis of occurrences of variation and change in the works. We have been able to link our stylometric data to a didactic programme, to a variation in high and low style, and to a refinement of philosophical ideas. Moreover, there is an interesting link between the way in which the text construes a monolithic voice and the way it deals with variation and change. We hope that the preliminary discussion presented here can make an argument for studying change and development in the works of Hildegard in a more comprehensive way. The aim of further scholarship should be to read these texts as being the product of collaborative authorship but not therefore lacking a proper internal voice, coherence, and development.

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<sup>76</sup> Shimizu Tetsuro, ‘Words and Concepts in Anselm and Abelard’, in *Langage, sciences, philosophie au XII<sup>e</sup> siècle*, ed. by Joël Biard (Paris: Vrin, 1999), pp. 177–97; *Le Langage mental du Moyen Âge à l’âge classique*, ed. by Joël Biard (Louvain: Peeters, 2009); Luisa Valente, ‘Verbum Mentis — Vox Clamantis: The Notion of the Mental Word in Twelfth-Century Theology’, in *The Word in Medieval Logic, Theology and Psychology*, ed. by Tetsuro Shimizu and Charles Burnett (Turnhout: Brepols, 2009), pp. 365–402; Martin Lenz, ‘Mental Language’, in *The Oxford Handbook of Medieval Philosophy*, ed. by John Marenbon (New York: Oxford University Press, 2012), pp. 363–82.

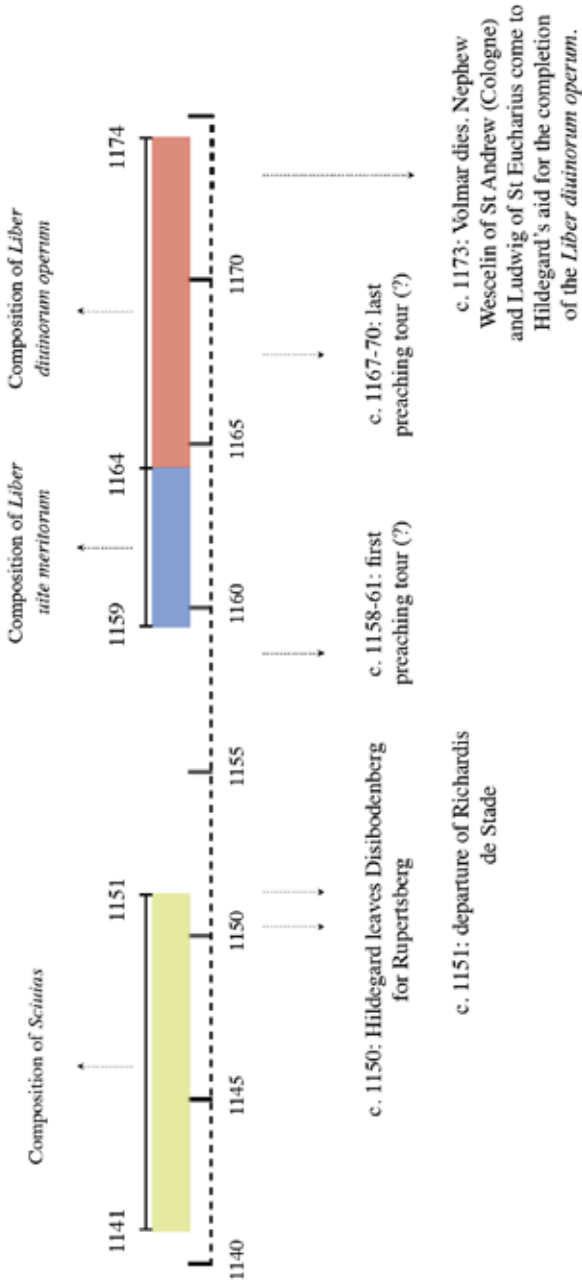


Figure 1.

Timeline of the trilogist's composition process

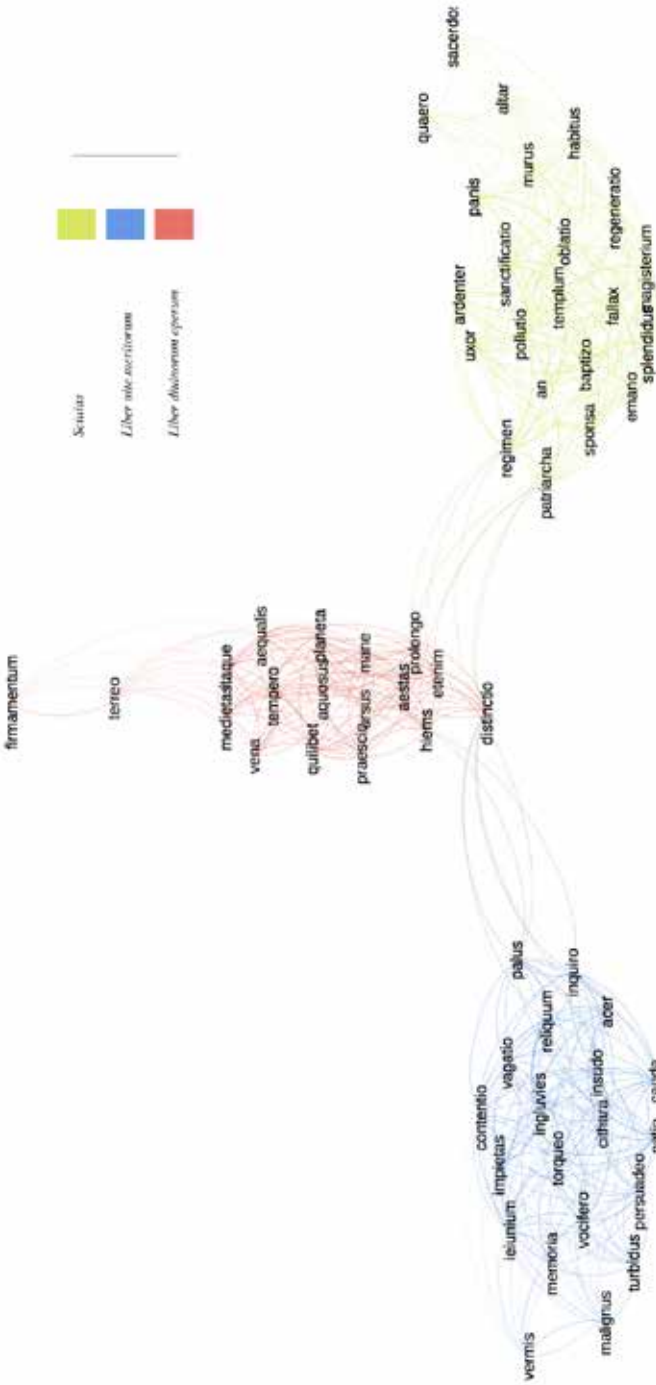


Figure 2.

Network Graph generated by means of *k* nearest neighbour algorithm, connecting the 60 lemmas with the highest coefficient of variation by their frequency vectors. Created with Gephi (the algorithm used was Force Atlas 2, embedded in GEPHI, an open-source tool for network manipulation and visualization; see Mathieu Jacomy and others, 'ForceAtlas2, a Continuous Graph Layout Algorithm for Handy Network Visualization Designed for the Gephi Software', *PLoS One*, 9.6 (2014), 1–12). Algorithm = 'ball tree'; Number of neighbours = 15.



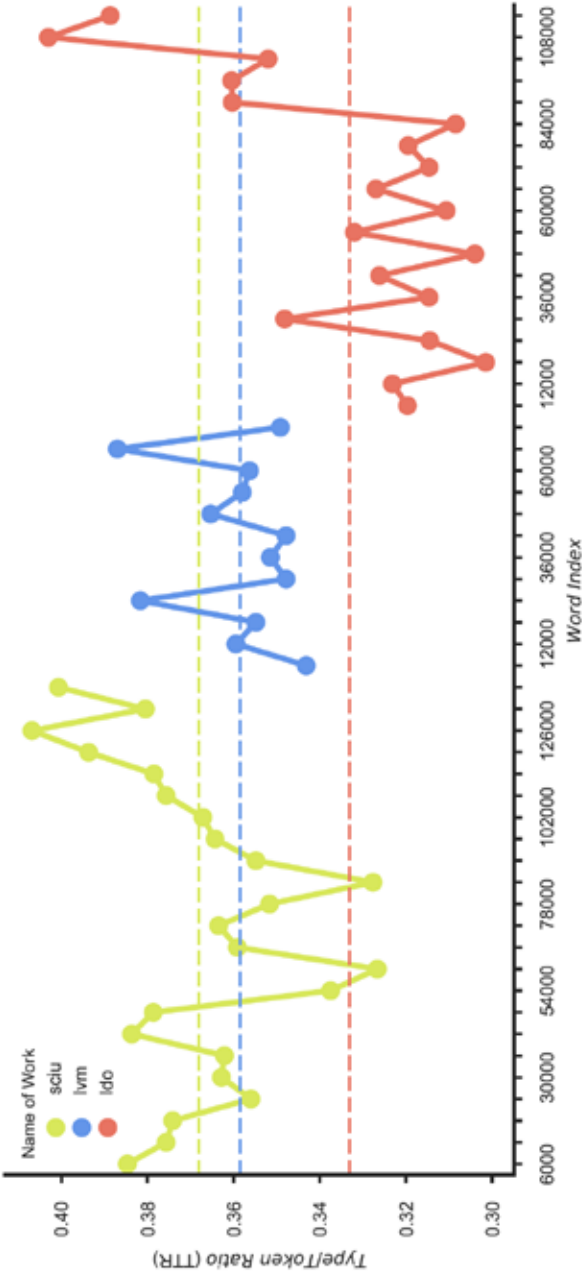


Figure 4. Type-token Ratio (TTR), yielding figures of Hildegard's decreasing lexical richness. The dashed line indicates the mean. Created with Matplotlib (John D. Hunter, 'Matplotlib: A 2D Graphics Environment', Computing in Science & Engineering, 9, 90 (2007), 90–95).