

Colour Semiotics in the *Kalevala*: Analysis of the Original Text and English Translation

Tatiana Pertseva
Computational Literacy
University of Helsinki 2025

Introduction

In semiotic theory, colour functions as a communicative code linking culture and perception. Lotman (1994) views colour as a "modelling system" – a visual "phonetic alphabet" of culture. In his framework, natural language is the primary code, while visual art, including mythic colour imagery, is a secondary code shaped by cultural history. Similarly, Eco (1985) defines colour as a "cultural unit" that combines individual and social meaning. Hallidayan semiotics (Halliday 1978) applied to colour (Kress and van Leeuwen 2006) treats colour as metafunctional, with referential, expressive, and textual roles. These scholars emphasize two main sources of colour meaning: culturally learned associations (e.g., red signifies passion) and perceptual attributes (hue, saturation, lightness). Van Leeuwen (2011) extends this approach, conceptualizing colour as a social semiotic resource, where meanings arise from materials and cultural practices. Almalech (2021) further observes that limitations in colour vocabularies lead to intra-colour antonymy (one hue bearing opposite connotations) and inter-colour synonymy (different hues sharing a similar idea; see also Almalech 2016). From an interdisciplinary perspective, Biggam, Hough, Kay, and Simmons (2011) highlight the integration of linguistic, psychological, and cognitive approaches to colour, while Karakin and Pashkova (2023) demonstrate how colour symbolism, particularly red, white, and blue, operates in the cultural coding of the Karelians. Studies of national epics provide further insights: in the Finnish tradition, the *Kalevala* encodes mythic meanings through colour, and Valta (2017) discusses blue and green as symbolic cultural categories in translations. Recent developments in the digital humanities (Mäkelä 2017) suggest that computational tools can be applied to colour research, enabling large-scale corpus analysis of mythic and cultural terms. In short, prior research suggests that colour terms encode culturally specific mythic meanings (Lotman 1994; Eco 1985; Biggam et al. 2011) and are simultaneously shaped by semiotic codes, perceptual qualities, and cultural practices (Kress and van Leeuwen 2006; van Leeuwen 2011; Almalech 2021; Karakin and Pashkova 2023).

Humanities research questions

The epic of a nation often serves as a cultural "Bible," a foundational text that embodies its identity. In the case of Finland, the *Kalevala* fulfills this role, representing Finnish culture, history, and worldview. This study examines the role of colour in the *Kalevala* as a semiotic system, one that conveys meanings, emotions, and ideas. Building on previous research by scholars such as Almalech (2021), Kress and van Leeuwen (2001), Kourdis (2014), Eco (1985), and Lotman (2009), this research investigates how colour systems within the text function as an internal structure, adding layers of meaning.

Lotman's concept of the "text within a text" is especially relevant here, where the use of colour serves as a coded system that enhances the narrative and symbolically enriches the reader's interpretation. According to Lotman, a "text within a text" refers to how the differentiated coding of text elements helps define both the author's structure and the reader's interpretation. Lotman's concept emphasizes the complexity of texts and their interrelation with cultural contexts. He suggests that culture itself can be viewed as a "text"—a layered, interrelated system of subtexts, each contributing to the overall meaning. For our purposes, this study explores how colour references serve as semiotic decoders of cultural codes, reflecting deeper meanings within the narrative. Colours, in this context, act as semiotic decoders of cultural codes.

We build on Almalech's concept of verbal and visual colours: verbal colours involve the use of words to describe colour, while visual colours encompass hues, saturation, and brightness as perceived visually. A key task of this study is not only to extract colour terms but also to identify colour epithets that express the emotional tone of events or characters, often subconsciously perceived by readers. For this purpose, we focus on Almalech's concept of megacolours, encompassing all lexical methods of expressing colour: basic terms (e.g., "black"), prototypes (darkness, coal), prototype competitors (raven, shadow), and contextual characteristics (warm, cold, etc.). Psychological and cultural colour associations also play a crucial role, emphasizing the need to create a colour dictionary of the epic in the future. Additionally, we aim to compare the use of colours in the original Finnish text and its English translation, while acknowledging the challenges posed by cultural differences, linguistic nuances, and the metric structure of the text. The translation process may lead to discrepancies between verbal and visual meanings of colours, further complicating their analysis.

For example, in Reijo Valta's article *Kalevalan sininen*, Norwegian translator Mikael Holmberg notes the absence of the word "vihreä" (green) in the *Kalevala*. However, using Octavo UI, we identified the green colour in the text, for example, in the phrase "kyyn viherän käärmeheksi," because the word "viherä" is used in the *Kalevala* as a rhythmic and archaic variant of "vihreä." Accordingly, the colour green is present in the epic.

As for the colour blue, it is important to mention the study of the colour red in Karelian culture (Karakin & Pashkova, 2023), as the material for the epic was collected in Karelia, where red, as well as white and blue, were considered appropriate (healing) and protective colours with therapeutic properties. Regarding blue, Holmberg replaced references to blue forests and elf clothing in his translation. He used the word "grønn" for these instances: "Olen siis joissakin paikoissa kääntänyt sini-sanaa grønn-sanalla. Siniviitaksi kutsutaan joitakin metsän olentoja, ja olen antanut niille vihreät vaatteet," kertoi Holmberg. "Esimerkiksi säkeestä 'siniviitta viian eukko' on tullut 'kone i din grønne mantel'. Olen yleensä käyttänyt grønn-sanaa metsän adjektiivina, siinä missä metsää kutsutaan Kalevalassa siniseksi."

("I have, in some places, translated the word 'sini' as 'grønn'. Some forest beings are called 'siniviitta', and I have given them green clothes," Holmberg said. "For example, the line 'siniviitta viian eukko' has become 'kone i din grønne mantel'. I have generally used 'grønn' as an adjective for the forest, whereas in the *Kalevala*, the forest is referred to as blue.")

From the interpretation of magical contacts and associations related to cultural context, blue forests might symbolize healing contexts or denote dark, dense forests. Concerning the status of the queen of the forest and women's attire, the colour blue may signify a higher level of magical hierarchy compared with green garments, highlighting the need to carefully consider the implications of such shifts in translation. Furthermore, traditional Finnish clothing (*muinaispuku*) typically incorporated blue rather than green fabric. The article concludes with the words: 'But did the ancient Finns see green? They saw it, but they called it blue.' This conclusion may be inaccurate.

The *Kalevala* represents a complex semiotic system where visual and verbal meanings of colours are interconnected. Exploring colours requires consideration of historical, cultural, religious, and linguistic contexts, underscoring the importance of semiotics and linguistics in the analysis of folk epics. The *Kalevala* is not only a cornerstone of Finnish and Karelian national culture but also a rich source of insights into pre-Christian Finnish beliefs and traditions. Its role in Finnish cultural history is unparalleled, even on a global scale. It reflects national spirit and unity, serving as a foundation for Finnish identity.

This project is a preliminary attempt to analyze this fundamental text, emphasizing the significance of colour as a tool for exploring cultural and linguistic worldviews and the challenges of translating these meanings across languages. The colour system within the text represents an internal structure with boundaries shaped by the worldview matrix of Finnish and other languages of translation.

Research Questions:

1. How do colour words and epithets function in the Finnish *Kalevala* and its English translations, particularly in terms of character depiction and narrative development?
2. How do colour references contribute to the emotional and symbolic tone of the narrative, and how do they shift across different sections of the text?
3. Are there significant differences in how colour epithets are presented in the Finnish and English versions of the *Kalevala*, and how do these differences affect the symbolic meaning of the text?
4. How are colour epithets related to key themes in the *Kalevala*, such as the transition from nature to human conflict or the involvement of magic and the supernatural?

Theoretical Framework

Almalech's distinction between "verbal" colours (descriptions expressed through words) and "visual" colours (perceived through hues, saturation, and brightness) serves as a key premise for this study. The aim is not only to identify colour terms but also to examine how colours are associated with characters in the *Kalevala*, as well as to identify colour epithets that reflect emotional context and narrative significance. This study focuses on Almalech's concept of "mega-colours"—basic colour terms (black, white, red, green, blue)—and their contextual meanings, as well as their role in character development and plot progression.

Data

The primary data for this project will consist of the Finnish version of the *Kalevala* from the Project Gutenberg database. At least one English translation of the *Kalevala* from the same database will be used for comparison, helping to identify any shifts in colour symbolism during the translation process. Scholarly articles, reviews, and other interpretations of the *Kalevala* will provide context and further guide the interpretation of colour symbolism within the text.

Methodology and Pipeline

This study adopts a mixed-methods approach that combines quantitative frequency analysis with qualitative contextual interpretation to examine the role of colour in the *Kalevala* and its English translation. The workflow begins with text preprocessing, where both the Finnish and English versions are cleaned of metadata, tokenised, and normalised to lowercase. Stopwords are removed, and Named Entity Recognition (NER) is applied to identify characters, places, and other entities. Two predefined colour lexicons, one for Finnish and one for English, are employed to extract both basic colour terms—corresponding to Almalech’s “mega-colours”—and extended colour epithets.

Following preprocessing, frequency analysis is conducted using Python’s collections counter module to measure occurrences of each colour term. The results are visualised through bar charts generated in Matplotlib, enabling a comparative overview of colour distributions across languages and sections of the epic. In parallel, contextual analysis associates colour terms with characters by cross-referencing sentences containing both colour expressions and character names. These instances are compiled into structured datasets and stored in CSV format for subsequent interpretation.

The pipeline is primarily automated but allows for manual validation to ensure semantic and semiotic accuracy. While computational methods facilitate large-scale analysis, manual review is required to interpret figurative uses, symbolic connotations, and morphological variations (e.g., *kulta* vs. *kultainen*). Limitations of this approach include dependence on predefined colour lists, which may overlook rare or archaic terms, and the use of sentences as contextual units, which may not fully capture discourse-level connections. Future extensions may incorporate dependency parsing, co-reference resolution, or semantic embeddings, as well as interactive concordance tools for enhanced interpretability.

Overall, this methodology and pipeline provide a reproducible framework for integrating computational text analysis with cultural semiotics, shedding light on how colour symbolism functions within the narrative structure and characterisation of the *Kalevala*.

Methods and Approaches

This study employs a combination of computational text analysis and interpretative literary methods in order to explore the symbolic role of colour in the *Kalevala*. The quantitative approach relies on corpus-based methods, including text preprocessing, frequency analysis, and visualization. These computational techniques allow for the systematic identification of colour terms and epithets, the measurement of their distribution across the text, and the comparison between the Finnish original and English translations.

In parallel, qualitative interpretative approaches are applied to examine the narrative, emotional, and symbolic functions of colour. Contextual analysis is used to identify how colours are associated with characters, landscapes, emotions, and cultural symbolism. This includes both close reading of selected passages and distant reading supported by automated extraction. The integration of these methods ensures that colour symbolism is not only represented in terms of statistical presence but also understood within its literary and cultural framework.

Results

The quantitative analysis produced frequency tables of colour terms in Finnish vs. English (see Table 1). Notably, the English translation uses a wider palette: for instance, crimson (verenpunainen) appears only in English, whereas Finnish adds intensity distinctions (e.g. tulipunainen "bright red "). Table 1 illustrates that Finnish punainen (red) and keltainen (yellow) are frequent, but English offsets these with additional synonyms (crimson, golden etc.). This confirms Almalech's point that "there has never been a single language of colour ". Thematically, colours carry mythic meaning. For example, in the English text silver and gold are prominent attributes of sacred objects: Wainamoinen carries a "magic knife, silver-edged and golden-handled", evoking mythic craftsmanship. Crimson (deep red) frames celestial imagery ("crimson borders of the clouds"), signifying portent. Earth and nature are coloured green: after a flood, "the fields became green", symbolizing rebirth. Conversely, black often signals death or the underworld (e.g. black milk of fate in RUNE IX).

Critically, the translation expanded some contrasts. Finnish typically uses valkea (the variant of "white") for purity of North; Crawford's English often specifies (white swan, white linen). He also introduces purple cloths and dresses to heighten nobility imagery where Finnish may simply say kirkas ("bright"). Thus we see the translator's role: choosing richer colour terms to match English poetic conventions. In sum, the data uphold key hypotheses: translation does expand the colour spectrum, colours are semiotic carriers of mythic meaning (Lotman's notion of modelling systems), and cultural differences reflect distinct visual perceptions. These patterns illustrate the interplay of language, culture, and translation in shaping the epic's colour semantics.

colour (FIN/ENG)	Frequency in Kalevala (FI)	Frequency in Kalevala (EN)
kultainen / golden	27	257
tulinen / fiery	18	28
hopea / silver	17	242
valkea (valkoinen) / white	12	59
musta / black	12	64
sininen / blue	5	96
punainen / red	4	33
keltainen / yellow	4	4
kirkas / bright	3	22

ruskea / brown	2	3
viherä (vihreä) / green	1	18
verenpunainen / crimson	0	22
tumma / dark	0	21
smaragdinen / emerald	0	4
taivaansininen / azure	0	3

Table 1. Counts of major colour terms in the Finnish Kalevala vs. Crawford's English translation (approximate values). Note that some English terms (e.g. "crimson") map to Finnish intensity forms (e.g. verenpunainen). The full English text uses crimson, emerald and azure not found in Finnish.

Quantitative analysis of colour terms in the Finnish *Kalevala* and Crawford's English translation reveals noticeable differences in frequency, diversity, and semantic distribution. In the Finnish text, both *kulta* (36 occurrences) and *kultainen* (27 occurrences) appear frequently, highlighting that morphological and lexical variants carry nuanced semiotic meanings and reflect different levels of symbolic coding within the narrative (e.g., *kultaaksa kuusosessa* [RUNE XLVI / Kuudesviidettä runo], *terä kulta kuumoksesta* [RUNE X / Kymmenes runo] vs. *Ukko, kultainen kuningas* [RUNE XXIV / Kahdesneljättä runo]). Other prominent colour terms in Finnish include *tulinen* (18), *hopea* (17), *valkea* (12), and *musta* (12), while colours such as *sininen* (5), *punainen* (4), and *viherän* (1) appear relatively rarely. In the English translation, colour terms occur not only more frequently but also demonstrate a broader spectrum. *Golden* (257) and *silver* (242) dominate, while *blue* (96), *black* (64), *white* (59), *red* (33), and *fiery* (28) are also common. Additional terms such as *crimson* (22), *dark* (21), *purple* (21), *green* (18), and less frequent terms like *emerald* (4) and *azure* (3) reflect the translator's tendency to specify intensity, hue, or symbolic nuance that may only be implied in the Finnish original. In future analyses, this spectrum could be divided into chromatic (red, blue, yellow) and achromatic colours (dark, light) for a more detailed semiotic investigation.

Comparison of the two texts shows that the English translation expands both the frequency and descriptive richness of colour references. For instance, Finnish *tulinen* corresponds to English *fiery*, while *verenpunainen*, which does not occur in the Finnish text, is rendered in English as *crimson*, a variant of deep red. Similarly, *kulta* and *kultainen* together correspond to *golden*, but the high frequency in English emphasizes the symbolic and narrative significance of precious metals. Colours such as *green* (18, mostly *viherän*; the older variant *vihreä* occurs once) and *blue* (96, *sininen* 5) are used moderately in Finnish, while they occur much more frequently in English, indicating shifts in perception and cultural emphasis. Overall, these results suggest that Finnish colour usage relies on morphological variation and contextual interpretation, whereas the English translation standardizes and intensifies colour terms for clarity, emphasis, and symbolic effect. This analysis demonstrates how the translator's choices can influence narrative, emotional tone, and the semiotic weight of colour

in the epic, emphasizing the importance of considering both lexical variations and cultural context when interpreting the Kalevala's colour system.

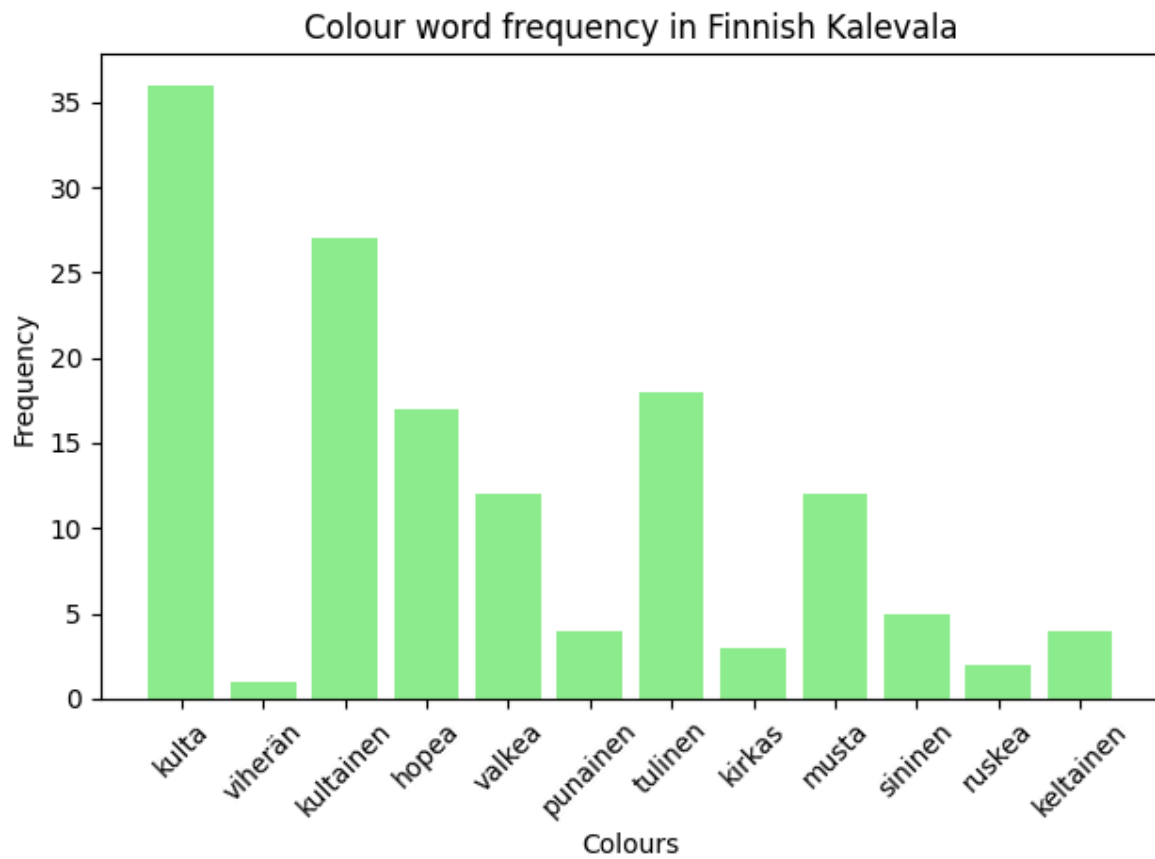


Figure 1. Colour word frequency in the Finnish Kalevala.

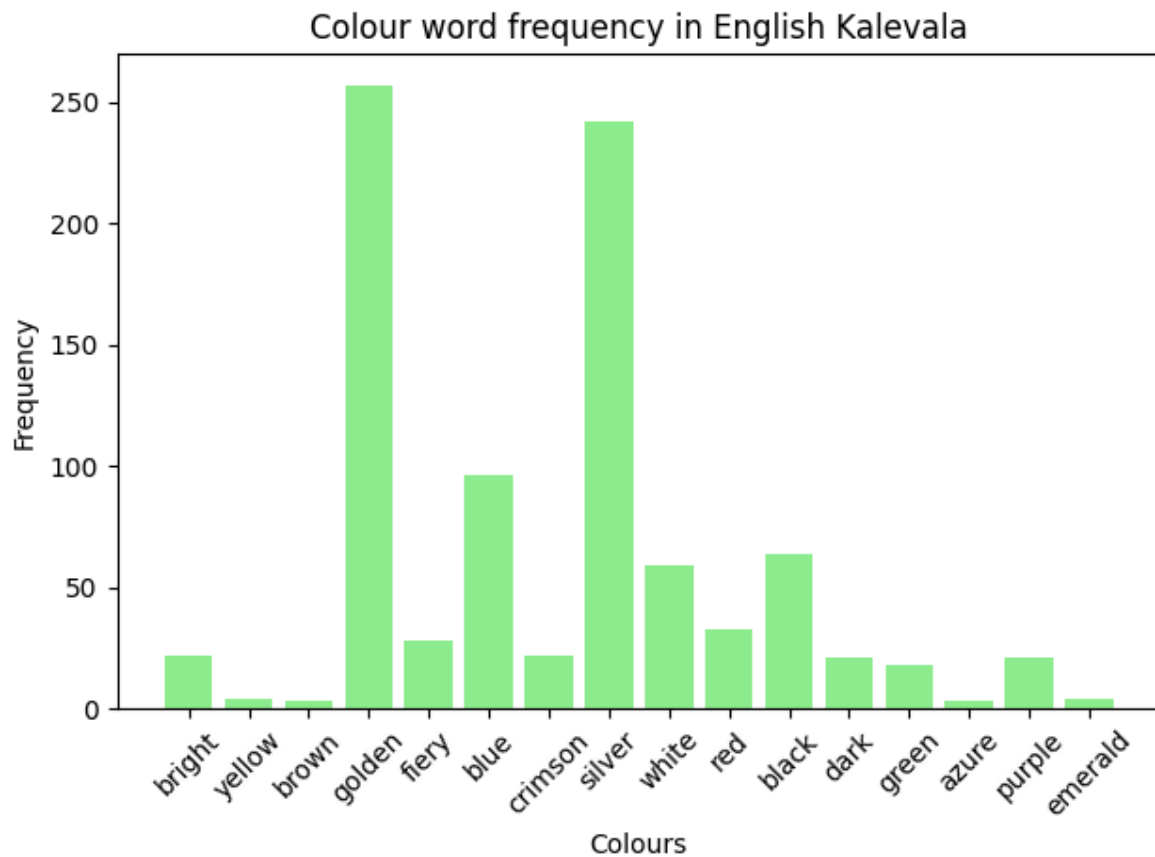


Figure 2. Colour word frequency in the English Kalevala.

A comparative analysis of the frequency of colour terms in the Finnish original and the English translation of the Kalevala (Figure 1 and Figure 2) reveals a striking asymmetry: the English text contains about five times more chromatic references (35 vs. 250). This difference may be understood not only as a matter of translation technique but also as an index of distinct cultural models of visualizing the world. Almalech's theory that biblical translations were often "colourized" through the systematic addition of chromatic epithets finds resonance here: Crawford's English Kalevala is not merely more vivid, but culturally reoriented toward a literary tradition in which colour plays an intensified descriptive and symbolic role. In this way, the translation highlights both linguistic transformation and cross-cultural variation in how narrative worlds are visually and semantically constructed.

Character colour report

Character	Finnish colours	English colours
Ahti		black, fiery, golden, silver
Ahto		bright, red, silver, white
Aino		blue, bright, golden, silver
Iku-Turso	kultainen	blue, golden, silver
Ilmarinen	hopea, kultainen, ruskea, tulinen, valkea	black, blue, bright, emerald, fiery, golden, silver, snow-white, white
Ilmatar		fiery, red
Joukahainen	viherän	
Kalervo		silver
Kaukomieli	musta, tulinen	azure, black, blue, fiery, golden, silver
Kullervo	keltainen, tulinen	black, blue, golden, silver
Kyllikki	valkea	black, golden, red, silver, white
Lemminkäinen	musta, tulinen	
Lempo		blue, bright, fiery, golden, red, silver, white
Louhi		black, blue, bright, dark, fiery, golden, red, silver, white
Marjatta	kultainen	
Mielikki	hopea, keltainen, kultainen	golden, silver, white
Mimerkki	kultainen	blue, golden, silver
Nyyrikki	hopea	
Osmo		emerald, golden, snow-white, white
Sampo	kultainen	blue, fiery, golden, red, silver, white
Tapio	hopea	blue, dark, golden, green, red, silver, snow-white, white
Tellervo	keltainen, kultainen	golden, silver
Tiera		green

Turso	kultainen	blue, golden, silver
Tuulikki	kultainen	
Ukko	kultainen, musta, sininen, tulinen	black, blue, bright, crimson, dark, golden, red, silver, snow-white, white
Untamo		black, blue
Untamoinen		blue, golden, silver
Väinämöinen	hopea, kultainen, sininen, tulinen, valkea, viherän	

Table 2. Character Colour Report in the Finnish Kalevala and Crawford's English Translation

The analysis of the Character Colour Report (Table 2) indicates that the distribution of color markers among the characters in the Kalevala varies in both the Finnish original and the English translation. The quantitative aspect reveals differences in the richness of the chromatic palette: certain characters, such as Ukko, Louhi, and Ilmarinen, exhibit a high number of color associations. For instance, in the Finnish text, Ukko is represented by gold, black, blue, and fiery (kultainen, musta, sininen, tulinen), whereas in the English version, this set is supplemented with additional hues: snow-white, crimson, and bright blue. In contrast, characters like Kalervo, Tuulikki, or Tellervo are associated with a more limited range of colors (Kalervo: silver; Tuulikki: golden; Tellervo: yellow and golden), indicating a relatively lower chromatic and symbolic load. These data allow the identification of characters with high “color saturation” and facilitate an assessment of their narrative significance through the lens of color semiotics.

Comparative and cultural analysis shows that the English translation significantly expands the chromatic palette of the characters. The Finnish text frequently employs basic terms (kultainen, tulinen, sininen), whereas the English version adds refinements and new shades (crimson, azure, emerald, snow-white). For example, Sampo in the Finnish text is predominantly associated with gold (kultainen), while in the English translation, he is linked to a full spectrum: blue, fiery, golden, red, silver, and white (blue, fiery, golden, red, silver, white). These changes reflect differences in cultural traditions of color perception: the Finnish palette is more restrained and functional, whereas the English version emphasizes artistic and emotional expressiveness.

Narrative analysis demonstrates that colors are closely connected to character roles and their emotional attributes. White and silver, associated with purity and sanctity, appear in characters linked to sacred and heroic motifs, such as Ilmarinen (hopea, kultainen, valkea) and Väinämöinen (hopea, kultainen, sininen, tulinen, valkea, viherän). Black and fiery tones

(musta, tulinen) are more frequent in tragic or antagonistic characters, for example, Kullervo (keltainen, tulinen) and Lemminkäinen (musta, tulinen), reinforcing the dramatic impact of their portrayals. Nature-associated shades, such as blue and green, emphasize the connection of characters to forests, water, and magical aspects of nature: Aino is associated with blue and golden (blue, bright, golden, silver), Tapio with green, blue, and dark (blue, dark, golden, green, red, silver, snow-white, white), and Ahto with bright, red, and silver (bright, red, silver, white). Thus, color epithets serve not merely decorative purposes but also narrative functions: they guide the reader's perception of the emotional tone of a scene, inform character evaluation, and situate the narrative within cultural and mythological contexts.

Overall, the integration of quantitative, comparative-cultural, and narrative analyses allows the delineation of a complex network of associations between characters and color designations in the Kalevala. The English translation demonstrates an expansion of the color palette, reflecting differences in the linguistic worldview across cultures and highlighting the text's heightened expressiveness. This phenomenon may be regarded as a marker of the emotional and social structure of the semiotic cultural-linguistic field, illustrating how language, cultural practices, and narrative strategies interact in the construction of artistic imagery while simultaneously reflecting cultural divergences in color perception.

Conclusions

Our bilingual study confirms that translation both expands the colour palette and enriches the semantic structure of the text. In Crawford's English version of the Kalevala, the number of colour references is approximately five times higher than in the Finnish original, demonstrating a systematic enhancement of visual and symbolic density. Colour terms function as semiotic carriers of mythic, cultural, and emotional meaning: white and silver are associated with purity and the sacred, red and fiery tones with drama and fate, green and blue with nature and magic. Narrative analysis shows that the intensity and diversity of colour epithets correlate with the roles of characters and the significance of scenes, reflecting their emotional and symbolic weight.

A comparative cultural perspective reveals that the Finnish palette is more restrained and functional, while the English translation emphasizes expressiveness and aesthetic impact, highlighting cultural differences in the perception of colour. The translator's interpretive role is evident in the choice of terms that enhance poetic and semiotic significance, confirming Almalech's thesis that there is no "single language of colour." Overall, the integration of quantitative, cultural-comparative, and narrative analyses illustrates how colour terms shape characterisation, structure narrative meaning, and reflect cultural variations, providing a comprehensive understanding of the semiotics of colour in the Kalevala and its translations.

Critical Reflections and Future Work

Future research could further integrate quantitative and semiotic methods. For example, computational semantic models (e.g., word embeddings) might quantify how colour terms cluster within each language's conceptual space. Additional translations of the Kalevala could

be examined to determine whether palette expansion is translator-specific or a more universal phenomenon. Psycholinguistic experiments could test how contemporary Finnish and English readers perceive the epic's colour imagery. Extending the corpus to contemporary Finnish legends or visual art might reveal diachronic shifts in colour semantics. From a technical perspective, improved morphological tagging of Finnish would refine term counts, while topic modeling could uncover hidden thematic colour patterns. Finally, interdisciplinary approaches combining textual analysis with illustrations of the Kalevala could enable a multimodal study of colour semiotics.

Despite these results, the study remains preliminary and requires further development. From a literacy perspective, it is important to note that not all research questions have been fully addressed: the detailed comparison of the impact of colour epithets on character perception and the emotional tone of the narrative has only been partially analyzed. The analysis needs to be expanded to cover all the research questions, including the connections between colour and the key themes of the epic, such as magic, nature, and human conflicts. Methodological limitations include the use of predefined colour lexicons, which restricts the ability to identify rare, archaic, or context-dependent colour terms. It is recommended to expand the colour lexicon to include synonyms, archaic forms, and metaphorical expressions, as well as to apply more advanced semantic analysis methods, such as topic modeling and semantic embeddings.

For a more comprehensive study, additional experiments should be conducted, including psycholinguistic tests and reader perception analysis, to examine how contemporary Finnish and English readers perceive the epic's colour symbolism and how translation affects its interpretation. Despite the mixed-methods approach, a closer integration of quantitative data with qualitative analysis is required, including an in-depth examination of the contextual meanings of epithets and their influence on reader perception through close reading of key passages. The current colour analysis focuses on primary terms, but it is also important to consider the metaphorical and symbolic meanings of colours in relation to characters, objects, and events. Overall, the present study demonstrates the potential of a mixed-methods approach but requires further work: expanding the colour lexicon, incorporating additional analytical methods, and conducting further experiments to validate and deepen the results. These steps will enable a fuller assessment of the role of colour as a semiotic and literary resource in the Finnish Kalevala and its English translations.

References

- Almalech, Mony. 2021. "Colours as a Semiotic Tool for Bible Analysis". In *Sign, Method and the Sacred*, 243–266. 1st ed. Berlin and Boston: De Gruyter.
<https://doi.org/10.1515/9783110694925>
- Almalech, Mony. 2016. "Semiotics of Colour." *Proceedings of the World Congress of the IASS/AIS*, Sofia: IASS Publications & NBU Publishing House.
https://eprints.nbu.bg/id/eprint/3051/1/Almalech_Semiotics_of_colour_IASS_2014.pdf.
- Biggam, Carole P., Carole A. Hough, Christian J. Kay, and David R. Simmons, eds. 2011. *New Directions in Colour Studies*. Amsterdam: John Benjamins.
- Eco, Umberto. 1985. "How Culture Conditions the Colours We See". In Blonsky M. (ed.), *On Signs*, (157–175). Baltimore: Johns Hopkins Univ. Press.
- Halliday, M. A. K. *Language as Social Semiotic: The Social Interpretation of Language and Meaning*. Baltimore: University Park Press, 1978. Accessed January 27, 2025.
<https://www.scribd.com/document/618862766/Halliday-M-A-K-Language-as-Social-Semiotic-1978>.
- Karakin, J. V., and T. V. Pashkova. 2023. "Red colour in the Linguo- and Ethnoculture of the Karelians." *Finno-Ugric World* 15 (3): 334–342.
<https://doi.org/10.15507/2076-2577.015.2023.03.334-342>.
- Kourdis, Evangelos. 2014. "Colour as Intersemiotic Translation in Everyday Communication: A Sociosemiotic Approach". *Semiotica* 198: 123–145. Accessed January 27, 2025.
https://www.researchgate.net/publication/303458970_Colour_as_Intersemiotic_Translation_in_Everyday_Communication_A_sociosemiotic_approach
- Kress, Gunther. 1993. "Against Arbitrariness: The Social Production of the Sign as a Foundational Issue in Critical Discourse Analysis". *Discourse and Society* 4(2): 169–193.
- Kress, Gunther and van Leeuwen, Theo. 2001 [1996]. *Reading Images: The Grammar of Visual Design*. Bury St Edmunds: St Edmundsbury Press.
- Lotman, Yuri M. 2009. *Culture and Explosion*. Edited by Marina Grishakova. Translated by Wilma Clark. Berlin and New York: Mouton de Gruyter (formerly Mouton, The Hague). Translated from the edition: Lotman, J. M. 2004. *Kul'tura i vzryv*. In *Juri Lotman, Semiosfera*, 11–148. St. Petersburg: Iskusstvo-SPB. First published as: Lotman, J. M. 1992. *Kul'tura i vzryv*. Moscow: Gnozis. Footnotes: T. K. T. D. Kuzovkina (from 2004 edition).
https://sisu.ut.ee/wp-content/uploads/sites/172/juri_lotman_culture_and_explosion_semiotics_communication_and_cognition_2009.pdf
- Lotman, Yuri. 1994. "The Text within the Text." Translated by Jerry Leo and Amy Mandelker. *PMLA* 109 (3): 377–384.
<https://doi.org/10.2307/463074>.

- Mäkelä, Eetu. 2017. "Octavo UI – Interface for Digital Humanities Research Based on Text Collections with Associated Metadata." GitHub.
- <https://github.com/hsci-r/octavo-ui>.
- Project Gutenberg. *Kalevala: The Epic Poem of Finland*.
<https://www.gutenberg.org/ebooks/5186>.
- Project Gutenberg. *Kalevala: The Epic Poem of Finland*. Translated by John Martin Crawford. <https://www.gutenberg.org/cache/epub/5186/pg5186.txt>.
- Valta, Reijo. 2017. "Kalevalan sininen." *Kaltio* 1.
- <https://kaltio.fi/kalevalan-sininen/>.
- Van Leeuwen, Theo. 2011. "The Language of Colour: An Introduction". London: Routledge.