

Mermaids are Birds

Embedding N.F.S. Grundtvig’s Bestiary

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Abstract

In a classic study of Nuer religion, British Social Anthropologist E.E. Evans-Pritchard explored the problem of religious symbols embedded in the Nuer metaphor ‘twins are birds’. In this paper we present a study concluding that not twins but mermaids are birds. At least this is how they semantically behave in the lexical habitat of the influential Danish romanticist and nineteenth-century poet, pastor, and politician N.F.S. Grundtvig (1783-1872). As in the Nuer case the cause for this behavior is to be found in the symbolic structures of a religious logic. The study consists of word embeddings plotting the bestiary arising from Grundtvig’s 1068 publications in their tokenized, lemmatized, ‘algorithmified’ avatar. Our interest here lies with exploring how non-human animals are displayed in a material that have left a dual cultural and religious imprint in Denmark. Anticipating the conclusion: pigs are food; mermaids are birds.

Keywords

N.F.S. Grundtvig, text mining, word-embedding, neural network, nineteenth-century religiosity, non-human animals, re-enchantment

1. Introduction

In a classic study of Nuer religion, British Social Anthropologist E.E. Evans-Pritchard (1902-1973) explored the intriguing case of a network of religious symbols instantiated in the Nuer metaphor ‘twins are birds’ [1]. According to Evans-Pritchard, the metaphor worked “on an imaginative level of thought where the mind moves in figures” and is driven by a “poetic fancy” [2]. In this paper we will present a study concluding that not twins but mermaids are to be understood as birds. At least mermaids semantically behave like birds in the lexical habitat of the influential Danish romanticist, poet, pastor, and politician N.F.S. Grundtvig’s (1783-1872) works. As in the Nuer case, the cause for this behavior is to be found in the symbolic structures of a religious logic. More precisely: in mediating conceptions of a divine Spirit. In order to plot and display this religious logic, we have combined simple neural word embedding procedures and insights from graph theory to represent parts of the bestiary arising from Grundtvig’s published works in their tokenized, lemmatized, ‘algorithmified’ form.

The present study is part of a suite of investigations exploring representations of non-human animals [3,4], mundane or fantastical, in the works of Grundtvig – as well as in text material produced in social spheres strategically dedicated to his intellectual work and poetic production. The main ones are: the rurally oriented Folk High School movement integral to the cultural development of Danish farmers as a social stratum in the nineteenth and twentieth centuries, on the one hand; and on the other, the Evangelical Lutheran Church in Denmark – the state-church-like institutional construction undergirding the ‘understated nature’ and ‘culturized’ form said to be distinguishing modern Danish religious life [5]. Community singing constitute a social signature practice in both milieus. Grundtvig’s lyrics (ripe with non-human animals) dominate the running editions of the official Folk High School songbook *Højskolesangbogen* and of the running editions of the official hymnal, *Den Danske Salmebog*. Plotting Grundtvig’s conceptions of non-human animals, we thus set out to sketch out ‘ontic

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assumptions’ in text material that became vastly distributed in two spheres significant for the cultural and religious development of modern Denmark – a nation characterized by, if not financially impingent upon [6], large-scale industrial production of pigs; a nation characterized by a vibrant song culture transmitting lyrics ripe with skylarks, angels, and mermaids. In other words, it is the ‘grundtvigian’ preconditions for the conspicuous asymmetry in Danish public discourses between consumption-animals and animals, who possess poetic potential and are “good to think” on the basis of [7], we seek to tweak out in the following.

2. The Data: N.F.S. Grundtvig’s Published Works (1804-1872)

Grundtvig was a polyglot and a polymath, who wrote extensively on a multiplicity of subjects. Therefore, the Grundtvig dataset is immensely varied in terms of genre and content. It covers dissertations, essays, and poems on Scandinavian history, pre-Christian Nordic mythology, and Christian Church history; political manifests, philosophical expositions, as well as linguistic studies of Old Icelandic and Old English. In the general public, however, he is first and foremost known for his hymns and songs, of which he wrote close to 1,600 [8].

The dataset, *Grundtvig’s Works*, represents the total number of works published in Grundtvig’s lifetime ($N = 1073$). The first work published is dated 1804, the last one 1872. This material has been OCR prepared and is being furnished with XML markup by the staff of Center for Grundtvig Studies, Aarhus University, following TEI guidelines. Currently 54% of the material is fully annotated. The process of enrichment is, however, ongoing: the project’s scheduled completion date is December 31, 2029. The data set comprises approximately 37.000 pages, has a median document size of four pages, and contains 3.968.841 word-tokens distributed over 115.240 word-types [9].

The data for the current study are available at: <https://github.com/centre-for-humanities-computing/grundtvig-data>. The data is available in this format through agreement with Center for Grundtvig Studies. Furthermore, we have developed a custom XML parser available to facilitate third-party data exploration. The parser is available at: <https://github.com/centre-for-humanities-computing/GrundtvigParser>.

3. Techno Structuralism: Simple Neural Word Embeddings

A keen explorer of semiotic patterns, French cultural Anthropologist, and father of structuralism Claude Lévi-Strauss (1908-2009) longed for a computational machinery. He wished for an apparatus that would enhance his methods of plotting structures within Native American myths. In his mind’s eye he saw a device consisting of:

a series of two-metre-long, and one-and-a-half-metre-high upright boards, on which cards containing mythic elements could be pigeonholed and moved at will. As the analysis moved into three dimensions, the cards would need to be perforated and fed through IMB equipment. The whole operation would require a substantial atelier, along with a team of dedicated technicians working to divine ‘the generic law of the myth’ [10].

Now, contraptions allowing analyses to move into not only three, but into multiple dimensions do not require a substantial atelier. They sit on desks; hide in cupboards. We have based the current study on a procedure allowed for by precisely such equipment: on simple neural word embeddings.

Neural word embeddings are learned low-dimensional representations of discrete data as dense arrays. Condensing a high dimensional space, such as the *Grundtvig’s Works* vocabulary, into a denser one, the procedure allows for visualizations of, e.g., a given term’s ‘semantic habitat’. Put in another way, it allows for teasing out the associative structures by which a given word (or a given compound of words) is nested within a corpus. As is well known, “the map is not the territory” [11], but (functional) maps do, nevertheless, retain certain relevant properties of the territory it seeks to represent. This is also the case with neural word embeddings. While reducing the complexity of a high dimensional semantic space, relevant properties from the original space is preserved. Further, they are preserved in a way

affording them to be conveyed as geometrical ratios [12]. This makes it possible to display semantic structures with an enhanced clarity.

The structural representations, or the *embeddings*, are ‘learned’. That is, they are the product of a training process over the data in an artificial neural network. A neural network uses a so-called auxiliary control task (ex. masked word/context prediction) to iteratively learn the best possible embedding of a word (ex. by minimizing prediction error). In this particular study, we deployed a so-called hierarchical softmax technique to train the neural network [13]. This choice was partly based on the fact that this approach has proved itself advantageous for dealing with infrequent words [14] and more generally its time complexity.

In order to explore the associative structure between given terms in the Grundtvig data, we constructed an algorithm that utilize geometric distances between neural embeddings to create (seeded) hierarchical semantic graphs. This algorithm generated graphs by computing the distance between, on the one hand, a given seed term (or compounds of seed terms) and the corpus lexicon *in toto*, on the other, using the inverse trigonometric arccosine function. The comprehensive catalogue of seed terms were established using two checklists: a) the 2.538 entries of the “Mythological Register” developed by *Grundtvig’s Works* [15], and b) the 353 non-human animals mentioned in professor Peder Hjort’s (1793-1871) highly popular reader for use in Danish schools in the last three quarters of the nineteenth century, *The Danish Child Friend, a Reader for Schools of the Citizenry and the Common People* [*Den Danske Børneven, en Læsebog for Borger- og Almue-Skoler*] [16]. This reader is assumed a gateway to the ‘trivia’ or the ‘back-ground knowledge’ deemed relevant and distributed in Denmark during the period of interest. From these we extracted a target catalogue of 183 non-human entities as seeds. In this paper we illustrate main trends within this catalogue based on seven seeds representing the two main groupings – the mundane (hest [horse], kalv [calf], svin [pig]), and the fantastical creatures (engel [angel], havfrue [mermaid], fugl, engel [bird, angel]). Finally, we have plotted what turned out to be an intermediary creature: the fugl [bird].

For each seed, the algorithm excerpted a pre-set number of primary associations of size m . These are the terms with the shortest distance to the seed term. For each of the m -terms the algorithm extracted a pre-set number of secondary associations; these associations to the primary associations are taken as secondary associations to the seed term. For this study the number of primary and secondary associations respectively was 10. The next step was to compute the distance between the respective categories of terms (seeds, primary associations, secondary associations); subsequently the bulk of terms were connected based on their distance under a given threshold estimated from the distance variance structure. At the final stage, semantic clusters (or ‘communities’) were unearthed by way of a so-called greedy optimization method, the Louvain method [17]. Visually, the graphs render terms as nodes and thresholded distances as edges. For reading purposes, node colour was chosen to specify the given term’s semantic cluster affiliation; further, the UPPER CASE was used to distinguish seeds and primary associations from secondary associations rendered in the lower case.

4. The Semantic Habitat of Mundane Non-Human Animals in Grundtvig’s Works

Overall, Grundtvig is interested in non-human animals in so far as they carry a symbolic weight or possess a poetic potential. This circumstance is well illustrated by his treatment of mundane non-human animals, who in his opinion do *not* hold such qualities: they are allotted a very limited and highly prosaic parcel within his writings. In fact, non-human animals part of everyday life in nineteenth-century Denmark, and thus candidates for the position of what Donna Haraway would term human ‘companion species’ [4], – such as, e.g., the horse [hest], the mare [hoppe], the cow [ko], the ox [okse], the calf [kalv], the stud [stud], the fish [fisk], the fox [ræv], the goose [gaas], the cat [kat], the dog [hund], the pig [svin], the boar [ørne], the hen [høne], the chicken [kylling], the duck [and] etc. – lead their lives squashed into a common semantic enclosure. Associated mainly with each other and with shared (potential) functions as nourishment, garments, vessels, utensils, and practical helpers, they constitute a relatively closed semantic circuit. These general tendencies are illustrated by the following three embeddings of the horse, the calf, and the pig (Figure 1-3).

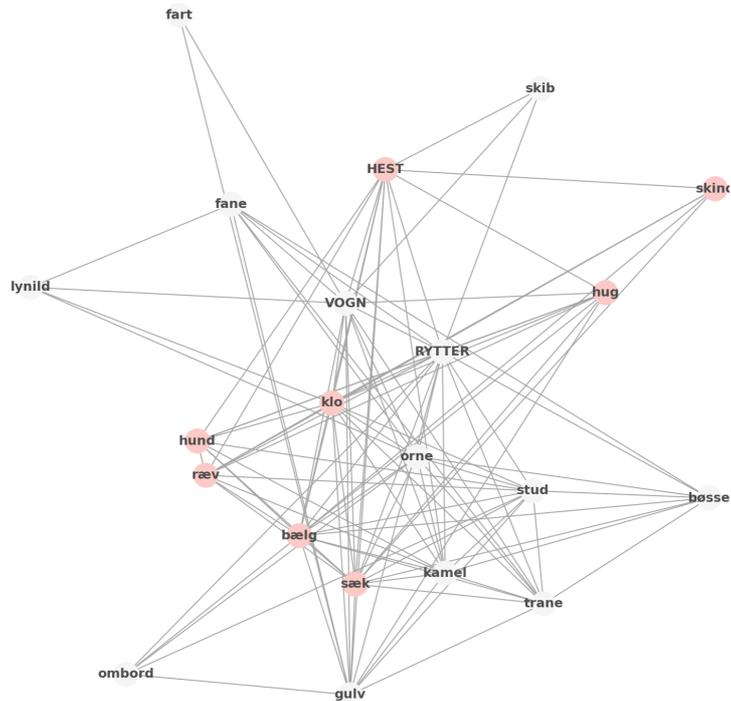


Figure 1: Embedding of ‘Horse’ [Hest] in *Grundtvig’s Works*. Translation left-to-right, top-to-bottom: fart [speed]; lynild [lightning]; fane [fane]; HEST [HORSE]; skib [ship]; VOGN [WAGON]; hund [dog]; klo [claw]; RYTTER [RIDER]; hug [chop]; skind [skin]; ræv [fox]; bælg [skin (bag/vessel)]; orne [boar]; ombord [on board]; sæk [sack]; kamel [camel]; stud [stud]; gulv [floor]; trane [crane]; bøsse [rifle].

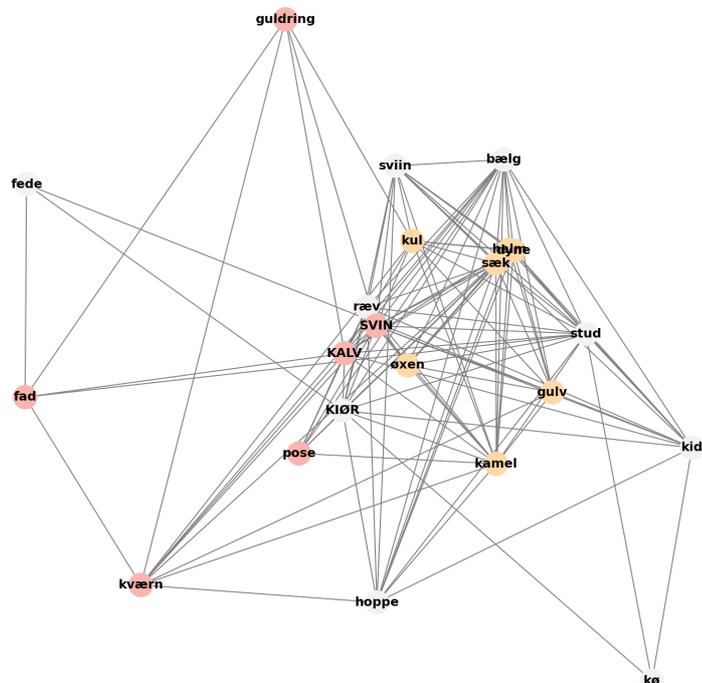


Figure 2. Embedding of ‘Kalv’ [Calf] in *Grundtvig’s Works*. Translation left-to-right, top-to-bottom: guldring [golden ring]; fede [fat/fatten]; sviin [swine]; bælg [skin (bag/vessel)]; kul [coal]; fad [platter]; KALV [CALF]; SVIN [SWINE]; ræv [fox]; sæk [sack]; halm [straw]; dyne [duvet]; kværn [grinder]; pose [bag]; KIØR [cows]; øxen [oxen]; hoppe [mare]; kamel [camel]; gulv [floor]; stud [stud]; kid [kid]; kø [*co(ws)].

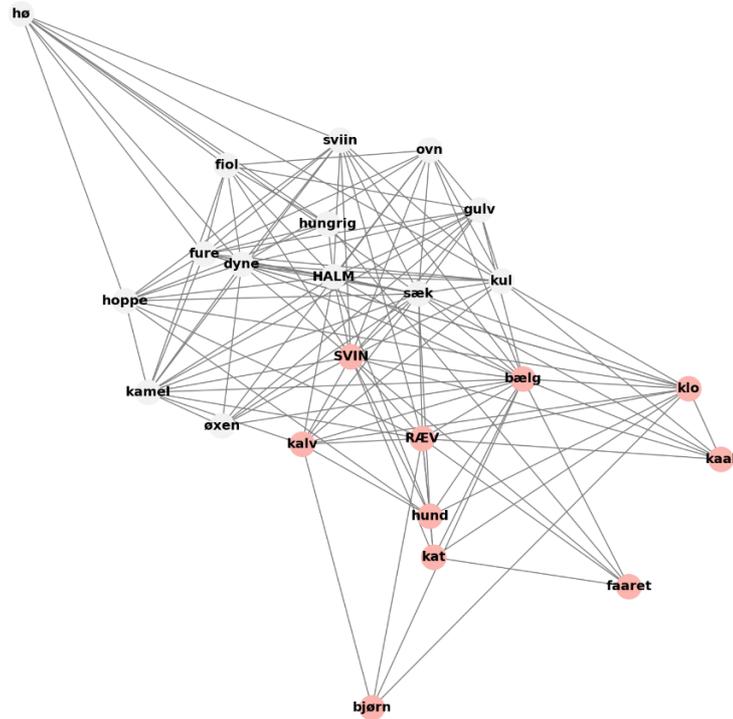


Figure 3. Embedding of ‘Svin’ [Pig/Pigs] in *Grundtvig’s Works*. Translation left-to-right, top-to-bottom: hø [hay]; hoppe [mare]; fure [furrow]; fiol [violet]; sviin [swine]; ovn [oven]; kamel [camel]; dyne [duvet]; hungrig [hungry]; øxen [oxen]; HALM [STRAW]; gulv [floor]; kalv [calf]; SVIN [PIG]; sæk [sack]; kul [coal]; RÆV [FOX]; bælg [skin (bag/vessel)]; hund [dog]; kat [cat]; klo [claw]; bjørn [bear]; faaret [the sheep]; kaal [cabbage].

In addition to co-companion species (the dog, the fox, the crane, the boar, the stud, the camel), the horse is associated with mobility, transportation, and logistics – indicated by primary associations such as ‘WAGON’ and ‘RIDER’ and secondary associations such as ‘speed’, ‘lightning’, ‘ship’, ‘on board’, ‘sack’ (cf. Figure 1).

Although, echoes of the Old Testament narrative of the cult image of a calf made by golden rings (in a Jahve-focused logic problematized in Exodus 32 and I Kings 12) seems to be audible when moving to the outskirts of the embedding (cf. the secondary association ‘guldring’ [golden ring]), the structure of ‘calf’ gravitate towards semantic associations similar to the one characterizing the horse. Though more static than the horse and more clearly confined to agricultural-rural life, the calf also appears with the fox, and the camel as well as it, like the horse, is associated with surfaces and containers – with, e.g., ‘floors’ and ‘bags’ (cf. Figure 2). Unlike the horse, its potential as nutrition for humans is, moreover, indicated by terms such as ‘fede’ [fat] and ‘fad’ [platter].

Alimentary associations are, however, more prominent in the case of the pig (Figure 3). At least secondary associations such as ‘ovn’ [oven] and ‘hungrig’ [hungry] seems to suggest a semantic path from the pigpen to the kitchen; correspondingly, ‘kaal’ [cabbage] could be said to indicate a channel into the storage chamber. Some cultural systems, such as the one American Anthropologist Roy Rappaport (1926-1997) seminally explored among the Tsembaga Maring people of the northern slopes of the Central Highlands of New Guinea, embed their consumption of pork protein and slaughter of swine in elaborate ritual cycles and ontic assumptions about debts owed to spirits and ancestors [18]. The system arising from Grundtvig’s work does not. In Grundtvig’s nineteenth-century, Danish, Christian outlook the transformation of pigs into pork was an unproblematic, straightforward (divinely sanctioned) process not calling for excuses, explanations, or atonement. Thus, in the semantic pigsty and the surrounding farmyard there is no need for ancestors, nor for spirits. This does not, however, mean that ancestors and spirits take no interest in non-human animals in Grundtvig’s writings; it means that they are attracted to the fantastical ones.

5. The Semantic Habitat of Fantastic Non-Human Entities in Grundtvig's Works

Grundtvig's writing is ripe with fantastic beasts. He picked them up during his extensive research of past Christo-European-Mesopotamian imaginaries. In the mythological and allegorical universes of Christian, pre-Christian Nordic, pre-Christian Hebrew, Antique Greco-Roman, and ancient Egyptian (etc.) cultures, he met the Fenrir, the Phenix, the Sphinx, the Lamb-of-God as well as elves and nixies, mermaids, dragons, and angels. Just to line up a snippet of the fantastical creatures roaming *Grundtvig's works*.

In general, the fantastical creatures are associated with a metaphysical, spiritual realm. 'Aand' [spirit] is a centrifugal concept in *Grundtvig's works* – an adhesive, generously and evenly distributed, as it was for many of Grundtvig's contemporaries (also) influenced by the discourses of Romanticism. In *Grundtvig's works* the term appears in numerous constellations: Holy Spirit; warrior spirit/giant spirit; spirit of the people/national spirit; spirit of the times; spirit of the world; spirit of the North; spirit of the light; guardian spirit; breath of spirit; spirit of tongues; heroic spirit; creative spirit; spirit of humankind; spirit of love; spiritual life; freedom of spirit, and so on. An onion-like pattern seems to emerge from these combinations. The pattern is roughly this: Individuals have individual spirits or souls, and these form part of the collective spirit of the people, which in turn form part of the overarching spirit of mankind. Ultimately, this structure *in toto* participates in the all-embracing Christian, Holy Spirit. Moreover, when embedding Grundtvig's 'Aand', as we have done in a previous study [19], it becomes clear that the spiritual realm is conceptualized in spacial and auditive terms: the spirit is a sphere, or perhaps more precisely: a soundscape connecting the space between Heaven and Earth [19]. This soundscape is the habitat of the fantastic entities, who are conceptualized as ontological mediators in *Grundtvig's works*.

The sonic quality is undisputedly articulated in the embedding of the predominant fantastic creature: the angel. 'Engel' [angel] pulls in RØST [VOICE] and the exclamation HALLELUJA as primary associations and the embedding is relatively coherent and clear: angels are creatures, who tend to flock and gather in choirs to sing God's praise (cf. Figure 4)

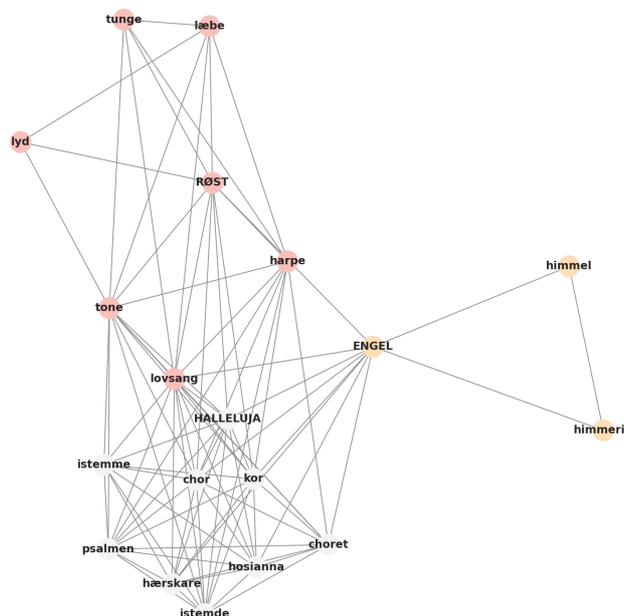


Figure 4. Embedding of 'Engel' [Angel] in *Grundtvig's Works*. Translation left-to-right, top-to-bottom: tunge [tongue]; læbe [lip]; lyd [sound]; RØST [VOICE]; tone [sound]; harpe [harp]; lovsang [praise]; HALLELUJA; ENGEL [ANGEL]; himmel [heaven]; himmerig [heavenly kingdom]; istemme [join (the choir)]; chor [choir]; kor [choir]; psalmen [the psalm]; hærskare [hosts]; hosianna [hosanna]; choret [the choir]; istemde [joined in (the choir)].

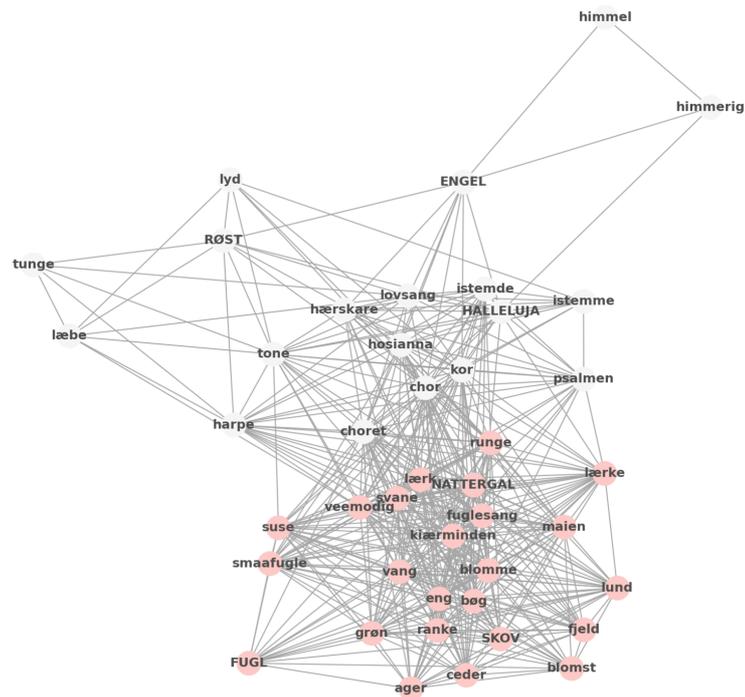


Figure 6. Embedding of ‘Fugl, Engel’ [Bird, Angel] in *Grundtvig’s Works*. Translation left-to-right, top-to-bottom: tunge [tongue]; læbe [lip]; lyd [sound]; RØST [VOICE]; tone [sound]; harpe [harp]; lovsang [praise]; HALLELUJA; ENGEL [ANGEL]; himmel [heaven]; himmerig [heavenly kingdom]; istemme [join (the choir)]; chor [choir]; kor [choir]; psalmen [the psalm]; hærskere [hosts]; hosianna [hosanna]; choret [the choir]; istemde [joined in (the choir)]. lærke [skylark]; klinger [rings]; gubbe [old man]; runge [rings]; trille [tune]; SVANE [SWAN]; dands [dance]; nattergal [nightingale]; gladhjems [Gladheim]; fuglesang [birdsong]; toned [sounded]; danavang [danevang]; himmelblaa [blue sky]; vang [meadow]; blidelig [gently]; LÆRK [skylark]; maien [May]; rosenrød [rosy]; KIÆRMINDEN [Forget-me-nots/Myosotis]; veemodig [woeful]; løv [foliage]; bøg [beech]; libanons [Lebanon’s]; grønnes [turns green]; MORGENSTUND [morning/dawn]; kiærminde [forget-me-not/Myosotis]; aftenstund [evening/sunset]; dagning [dawn/sunshine]; dugge [dew]; ager [field]; ceder [cedar]; lund [grove]; fjeld [mountain]; blomst [flower];

In the embedding of ‘fugl’ [bird] and ‘engel’ [angel], the universal angels seem to hover over the localistic birds. But being as both creatures are defined by their ability to sing it is not surprising that they seem to meet on the common ground of the choir.

For Grundtvig the angel was a clear-cut fantastical creature. He did not expect to stumble upon one going about his daily business. In that sense the world had, in his view, been disenchanted. A romanticist accepting the expanding naturalist worldview, he, nevertheless, routinely suspended his disbelief in the supernatural – competently and willingly [20]. One way of doing this was to train oneself to hear echoes of the supernatural in the mundane. Grundtvig enlisted birds to help solve this task. For Grundtvig, birds are convenient symbols of the spiritual realm: a) unlike most mundane creatures, they can fly high in the sky; b) unlike most mundane creatures (except from humans), they are able to sing. This logic makes them spiritual, angel-like creatures. But there is an obvious difference in range or ‘territory’ for angels and birds respectively. Angels move in the cosmological ‘outer’ or ‘ultimate’ realms of the divine and sing the praise of God; birds, however, seem to keep to a given local area close to earth and sing a more detailed praise of a given land- or ethnoscape (cf. Figure 6). In *Grundtvig’s works* birds, thus, sing of the Danish flora and landscape – of groves, meadows, fields, beeches, flowers, dew, foliage, dawns, and sunsets etc. (cf. Figure 5 and 6); and, just as importantly, they sing of a glorious past played out on these grounds – that is, they sing of the cultural memory connected to this place and signaled by pretty, little primary associations such as ‘KIÆRMINDER’ [FORGET-ME-NOTS] (cf. Figure 5).

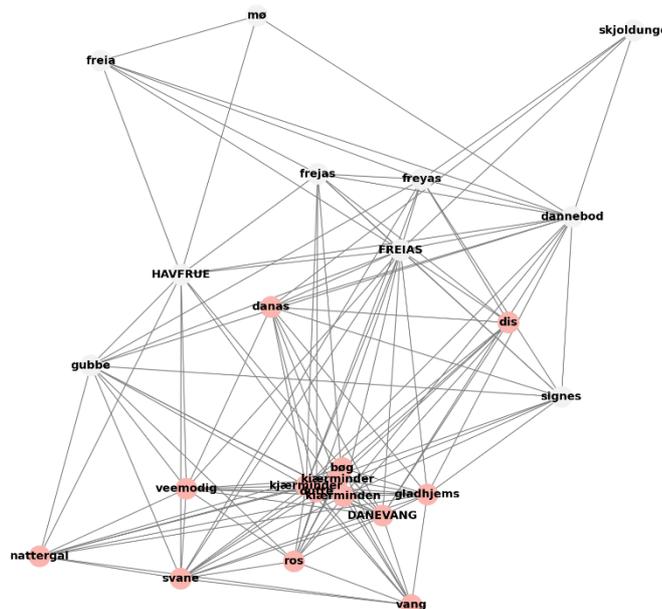


Figure 7. Embedding of ‘Havfrue’ [Mermaid] in N.F.S. *Grundtvig’s Work*. Translation left-to-right, top-to-bottom: Freia; mø [maiden]; skjoldunge; HAVFRUE [MERMAID]; frejas [Freja’s]; freyas [Freya’s]; dannebod [(Thyra) Danebod]; gubbe [old man]; danas [Dana’s]; FREIAS [FREIA’S]; nattergal [nightingale]; veemodig [melancholic]; bøg beech; dufte [scents]; kjærminde [Forget-me-not/Myosotis]; gladhjem [Gladheim]; DANEVANG [DAN-MEADOW (DEN-MARK)]; svane [swan]; ros [ros(e)]; vang [meadow].

Since songs of past glories are often bitter-sweet in marking what is no longer, the tune of the birds is melancholic and woeful (‘veemodig’). This is also the case for the creature of our climax embedding: the mermaid (cf. Figure 7). Generally, a highly ambivalent creature, often associated with the luring, ensnaring, singing sirens of Greco-Roman lore, the mermaid in Grundtvig’s writing is remarkably straightforwardly benevolent. She is connected to benign female agents each in their own way representing the primary association DANEVANG - Denmark and Danish territory: a supernatural agent (‘Freya’), an allegorical agent (‘Dana’), and a legendary agent ((Thyra) ‘Dannebod’). One might expect her habitat to that of the sea. But aquatic references are, remarkably, absent from her semantic terrain. Instead, we find the same beeches, groves, roses, and forget-me-nots over which the birds flocked and sung. We find neither fish nor laguna but nightingales and meadows. In short: the mermaid in terms of her semantic habitat seems to behave as a bird – her qualifying bird-trait being that she has privileged access to the national spirit of Denmark and from time-to-time bursts out in an elegiac song for its (mythological, legendary) glorious past.

6. Discussion: Re-enchantment Bias in *Grundtvig’s Works*

The magnitude of current animation, gaming, and enchantment industries [21] professes that the cognitive attraction of ascribing agency to phenomena, that have none, is not a trait confined to a pre-modern past [22, 23, 24]. It is a constant of the human condition; a constant, however, that has been sought glossed over within certain social elites in the so-called Western World – among freethinking naturalists and devout Christians alike. In fact, Christianity, not least in its Protestant variations, is characterized by a disenchantment impetus going by names such as ‘secularization’ and ‘rationalization’ [25, 26, 27]. Such terms seek to catch the deep-rooted and accelerating tendency among changing Christian clerisies to adapt to a naturalist worldview at the expense of conceptions of ‘agency-

out-place’ – that is: at the expense of fantastic, miraculous, and magical creatures, realms, and events [3].

In German-speaking and Scandinavian Europe, one type of data is particularly suitable for tracing this development: hymns nested in evermore popular hymnbooks. Following the expansion of print-capitalism and of the formation of a reading culture in the general populations of Europe, hymnbooks in private possession of one individual, became some of the most significant ‘exercise equipment’ for establishing and maintaining worldviews within Protestant pieties from the Reformation and onwards [28]. As mnemotechnic aids, hymns have thus reminded laypeople of the core narratives, the central agents, and focal dogma of Christianity for centuries. Through the course of the eighteenth century the lyrical content, however, underwent a striking change. Adapting to the currents of the Age of Enlightenment, Northern European hymns were systematically stripped of elements deemed unreasonable. Most noticeable was the eviction from the books of traditional Christian monstrous and fantastical creatures – such as the malevolent devils, demons, and dragons as well as the more benign Phoenix and to some extent even the hitherto ubiquitous angels. The trend of expelling the fantastic beasts was particularly evident in Danish hymnic productions at the close of the eighteenth century [29]. In a Deist air, these were songs of praise for abstract moral principles and virtues. Here no agents, no animals, and no narrative drive were to be found. This production was not a hit; it never caught grip of the general population. But as an extreme version of the deep-rooted Christian disenchantment drift, it exposed the absurdity of the trend. At least it did so for certain Danish, Christian poets of which Grundtvig was the most influential. His more than 1,600 hymns, flocking with fantastic beasts, was a ‘rebellious’ counter-poetry seeking re-enchantment over disenchantment [30], and preferring fantastical over mundane non-human creatures. This at least is our concluding suggestion.

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