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| RESEARCH ARTICLE

## A Corpus-Assisted Analysis of *Silent Spring* from the Discourse-Historical Perspective

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| ABSTRACT

*Silent Spring*, an ecological work written by Rachel Carson, symbolizes the inception of the modern environmentalist movement since it reveals the astonishing and catastrophic consequences brought by the abuse of insecticides without beautification. The work struck the whole world and brought environmental protection to attention through its powerful arguments and rigorous logic. As a problem-oriented approach, the discourse-historical approach (DHA) examines a discourse from three aspects, namely context, discourse and text. This study integrates quantitative and qualitative methods to investigate the linguistic features of *Silent Spring* within the theoretical framework of DHA. It is found that the work centers around the abuse of insecticides and utilizes the nomination strategy and predicate strategy to present a negative image of human beings. In doing so, the writer opposes anthropocentrism and constructs her ecological holism thoughts in this work.

| KEYWORDS

Corpus; Discourse-Historical Approach; *Silent Spring*.

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### 1. Introduction

In recent decades, addressing the environmental crisis has become a global consensus. As one of the influential forces driving this achievement, *Silent Spring*, written by American marine biologist Rachel Carson, has long been regarded as the inception of the modern environmental movement. This work provides a vivid portrayal of the ecological imbalance and species extinction resulting from the extensive use of pesticides, serving as a cautionary tale that urges respect for life and reverence for nature. It has greatly influenced the course of human history with its exquisitely detailed description, compelling arguments, and clear and strict logic on the basis of thorough research, whose language in itself holds significant research value in the field of linguistics. Nevertheless, most researchers conduct studies on *Silent Spring* from the perspective of literary criticism and ecological philosophy, neglecting its linguistic features.

The Discourse-Historical Approach (DHA) was first proposed by Austrian critical discourse analyst Ruth Wodak and then improved by Reisigl & Wodak (2009), which is one of the prominent research methods of critical discourse analysis and has a broad sociological and philosophical basis. Wodak (2015) distinguished three key concepts of DHA, namely context, discourse and text. Therefore, the DHA is a three-dimensional approach which follows a three-step analysis: (1) identify the specific contents or themes of a specific discourse, (2) investigate discourse strategies, and (3) examine the linguistic means and specific, context-dependent linguistic realizations (Reisigl and Wodak, 2016). For the meso-level analysis, the DHA systematically analyzes five discursive strategies, namely nomination strategy, predicate strategy, argumentation strategy, perspectivization strategy, and intensification/mitigation strategy, which are located at different levels of linguistic organization and complexity, constituting a strategy network from the lexical to pragmatic levels. The DHA enables the integration of historical context with specific discourse practices in social reality, guiding critical inquiry into how societal issues are realized at the micro-level of discourse. Consequently, DHA, with its inherent temporal characteristics, is attracting increasing attention and is being widely applied to studying the

linguistic realization of social issues. Hence, the present study takes DHA as an analytical framework to explore the linguistic means used in *Silent Spring*, a book that reveals the severe environmental problem, to construct ecological discourse.

## 2. Literature Review

### 2.1 Discourse-historical approach

Discourse-historical approach (DHA), a widely used and well-accepted approach in critical discourse analysis (CDA), has been established for approximately three decades. Since 2001, numerous scholars have adopted and developed the DHA in the Western and Chinese academic contexts.

Initially formulated to investigate the construction of anti-Semitic stereotyped images within public discourses in 1986 (Wodak et al., 1990). Since then, the DHA was further elaborated on studies of discrimination against migrants from Romania (Matouschek et al., 1995) and the national identities of Austria and Hungary in the post-cold War era (Wodak & Kovács, 2004). Over recent decades, the DHA, as an interdisciplinary approach, has also been integrated with ethnographic methodologies to analyze identity politics and the decision-making patterns in European Union (EU) institutions since it provides insights into the “backstage” of politics (Wodak, 2011) and contributes to the examination of social transformations in EU member states.

According to Wodak (2015), the DHA is distinguished by four prominent features: interdisciplinary, teamwork, triangulation, and orientation toward application. In addition to these defining attributes of the DHA, various principles characterizing the approach have evolved over time since the study on Austrian postwar anti-Semitism by Wodak (2015). Some of the theoretical and methodological concepts for CDA are also valid for the DHA, such as argumentation (Forchtner, 2020).

To sum up, western researchers have contributed to both the empirical and theoretical development of the DHA approach.

The DHA was not introduced to China until the 2010s, thus making it a relatively new approach for Chinese researchers. Xiang (2013) published a paper on the DHA, elucidating its theoretical and practical implications, content and features, limitations, and applications. Furthermore, Zhong and Chen (2014) explicated the methodological framework of the DHA. Subsequently, various Chinese scholars have begun to adopt the DHA in their research. The DHA has primarily been applied to the analysis of identity construction, encompassing institutional identities (Chen, 2016), national identities (Feng, 2019), gender identities (Chang, 2020), and corporate identities (Chang, 2020b). Additionally, the DHA has also been utilized in educational discourses (Xiang, 2015), political discourses (Yang, 2017), media discourses (Yang & Fu, 2018) and business discourses (Kang, 2019) by Chinese scholars. However, little attention has been paid to the study of ecological discourse from the perspective of DHA.

In recent years, a growing number of scholars have integrated quantitative approaches into critical discourse analysis, thereby bolstering the credibility of their research endeavors (Wodak, 2014: 9). Corpus linguistics, in particular, has emerged as a valuable adjunct method that mitigates subjectivity and significantly contributes to the field of critical discourse studies (Afzaal et al., 2019). This methodology enables researchers to discern recurring patterns, lexical items, and collocations within the minutiae of discourse, which facilitates the interpretation of subtleties that are not overtly apparent and has been widely used in recent years (Yang, 2021; Zhang & Chang, 2021; Zhao, 2021, Zeng, 2023). The synthesis of discourse-historical analysis with corpus methodology has thus evolved into a sophisticated and robust approach, proving its efficacy in the examination of reportage within an academic context.

### 2.2 *Silent Spring*

*Silent Spring*, authored by the American marine biologist and science writer Rachel Carson in 1962, is a seminal work that addresses the detrimental impact of pesticides on the human environment. This book is celebrated as a landmark in the annals of ecological literature. It exposes the environmental, human health, and societal repercussions of pesticide misuse in American industrial society through compelling examples, thereby drawing public attention to the long-term consequences of such practices.

Existent research on *Silent Spring* both at home and abroad, mainly conducted from the perspectives of eco-feminism, eco-criticism and ecological philosophy (Cafaro, 2006; Kroll, 2006; Li, 2013; Qi, 2014), affirming its leading role and unprecedented contribution to environmentalism. Within the field of linguistics, only a few researchers concentrate on and interpret the linguistic features of *Silent Spring*, comparing its Chinese translated text and its dissemination in China under the guidance of translation theory (Liu & Li, 2018; Liang, 2022; Ren, 2022) and conducting the functional discourse analysis on the book (Lin, 2018). However, there has been a scarcity of research that examines the ecological discourse through the lens of CDA, not to mention within the framework of the discourse-historical approach.

**3. Methodology**

**3.1 Research questions**

This study takes an interdisciplinary approach that integrates the DHA with a corpus-based method to investigate the construction of ecological discourse in *Silent Spring*. For this purpose, the following research questions are proposed:

1. What is the central theme of the book *Silent Spring*?
2. What discursive strategies are employed in the book to articulate viewpoints and construct ecological discourse?
3. How does the ecological discourse in *Silent Spring* embed into its socio-historical contexts at that time?

**3.2 Research data and preprocess**

Based on the research questions mentioned above, this paper will explore the ecological discourse construction of *Silent Spring* in terms of themes, discursive strategies and linguistic features. The linguistic data are collected from all the seventeen chapters in *Silent Spring*, whose tokens and types are shown below. As we can see from the following figure, the Type/Token Ratio of *Silent Spring* is 11.04%, displaying a moderately high lexical density, which indicates the book contains a relatively diversified vocabulary. Additionally, the BNC corpus is selected as the reference corpus to explore the prominent semantic domains of the observed corpus, the information of which is presented in Table 1 as well.

**Table 1 Basic Information of the Target and Reference Corpora**

	The Number of Chapters/Files	Word Tokens	Word Types
<b>Target Corpus</b>	17	86605	9559
<b>Reference Corpus</b>	4049	98562088	456792

**3.2 Research method**

In this specific study, a mix of quantitative and qualitative methods have been adopted to explore the main topics, the discursive strategies, and the linguistic features of *Silent Spring*.

This study employs the corpus tool Wmatrix 5, which incorporates the USAS (UCREL Semantic Analysis System). Hence, it can not only perform semantic annotation with an accuracy rate of 92% but also generate a semantic domain table by comparing the target corpus with a reference corpus (Rayson, 2008). The UCREL semantic tagging scheme adopted in this study comprises 21 semantic domains (A-Z) and 232 sub-domains, with each semantic domain containing multiple sub-domains. This tool is adopted in the macro- and meso-level analyses to identify the prominent semantic domains of *Silent Spring* and their concordance lines, which serve to summarize the main topics of the observed corpus and the discursive strategies appropriated to construct ecological discourse by the writer, respectively. The micro-level analysis utilizes concordance and collocate tools in AntConc 4.2.2 to examine the specific linguistic resources that realize the discursive strategies. In addition, to better reveal the discourse features, the socio-historical contexts of the discursive practices are considered in discussion.

**4. Results and Discussion**

**4.1 Topics of Silent Spring**

At the macro-level analysis, which is the first level of the discourse-historical analysis, the semantic domains of *Silent Spring* will be examined with the help of Wmatrix 5. Specifically, during the pre-processing of the corpus data using Wmatrix 5, function words that lack semantic significance are systematically removed. The analysis then focuses on substantive linguistic elements such as nouns (Noun), proper nouns (Proper Noun), adjectives (Adj), verbs (Verb), and tags (TAG) to refine the thematic precision.

**Table 2 Basic Semantic Domains in Wmatrix 5**

Item	Semantic domain	Item	Semantic domain
A	General and abstract terms	M	Movement, location, travel and transport
B	The body and the individual	N	Numbers and measurement
C	Arts and crafts	O	Substances, material, objects and equipment
E	Emotion	P	Education, language and communication
F	Food and farming	Q	Language and communication
G	Government and public	S	Social actions, states and processes

H	Architecture, housing and the home	T	Time
I	Money and commerce in industry	W	World and environment
K	Entertainment, sports and games	X	Psychological actions, states and processes
L	Life and living things	Y	Science and technology
		Z	Names and grammar

Table 2 is a list of 21 basic semantic domains in Wmatrix 5. Each basic semantic domain falls into different parts, which are more specific. It is worthy of note here that the tagset in Table is cited from the website of Wmatrix ([https://ucrel.lancs.ac.uk/usas.usas\\_guide.pdf](https://ucrel.lancs.ac.uk/usas.usas_guide.pdf)), which is initially based on Tome McArthur’s Longman Lexicon of Contemporary English (McArthur 1981) and modified by Baker et al. (2002). According to Baker et al. (2002), the semantic tags represent the specific semantic domains that put together word senses that are related in light of their connections at some level of generality with the same mental concept. The same categories include synonyms and antonyms and, hypernyms and hyponyms. The lexicon contains about 37000 words, and the template list includes over 16000 multi-word units, showing that it is very comprehensive. The examination of topics is based on these general and specific semantic tags.

Note that the minus “-” and plus “+” signs at the end of each tag indicate the negative and positive end of the evaluation domain.

**Table 3 Top 10 Semantic Domains of *Silent Spring***

No	Items	Semantic Domains	High-frequency Words
1	Z99	Unmatched (Z: names and grammar)	DDT, insecticides
2	L2	Living creatures: animals, birds, etc.	insects, birds, insect, fish
3	A1.1.1	General actions/making	spraying
4	B1	Anatomy and physiology	cell, body, liver, chromosome
5	O1	Substances and materials generally	chemicals, pesticides, material, substance
6	A7+	Likely	may, would, could, might
7	W3	Geographical terms	stream, land, forests, river
8	T1.3	Time: Period	year, day, period, months
9	A2.2	Cause & Effect/Connection	effect, cause, result, produce
10	M1	Moving, coming and going	come, came, reached, followed

Table 3 shows the top 15 semantic domains of *Silent Spring*. As we can see from the “Items” list in Table 2, there are eight basic semantic domains, which are “A: general and abstract terms”, “B: the body and the individual”, “L: life and living things”, “M: movement, location, travel and transport”, “O: substances, material, objects and equipment”, “T: time”, “W: world and environment”, “Z: names and grammar”.

Through examining the high frequency words in the top 10 semantic domains respectively, it is found that Carson’s ecological holism thoughts mainly centers around the insecticides—DDT. Semantic domains A1.1.1 (general actions or making) and Z99 (names and grammar) are relevant to the fact that the social actor, human beings, are spraying a large amount of DDT, the insecticides. In view of this fact, the author then unfolds the narrative around how the chemical constituents in DDT would affect or cause harmful changes within the human body and the living creatures in nature in a few years, reflecting in the semantic domains of O1 (substances and materials generally), A7+ (likely), A2.2 (cause & effect/connection), B1 (anatomy and physiology), W3 (geographical terms), L2 (living creatures: animals, birds, etc.), M1 (Moving, coming and going) and T1.3 (time: period).

#### 4.2 Discursive strategy analysis in *Silent Spring*

After previously exploring the themes of the book, the second analytical dimension of discourse-historical analysis focuses on the discourse strategies, which are primarily realized through various linguistic devices. This chapter will adhere to it and conduct a further analysis of the linguistic means in the text through the concordance and collocates tools of AntConc 4.2.2 from a micro level, so as to obtain a comprehensive view of Rachel Carson’s ecological discourse construction.

##### 4.2.1 Nomination Strategy of *Silent Spring*

The nomination strategy is commonly implemented through deictics and nouns, serving to name and categorize participants in social practices, including individuals, objects, phenomena, events, processes, and actions (Wodak et al., 2016). In this section, the most frequently used personal deictic, *we, us, our, ourselves*, and the non-deictic, *human*, which denotes the major social actor in this book, man as a whole, will be examined.

The first-person plural pronouns are particularly noteworthy in exploring the linguistic means of nomination to get a glimpse of the ecological thought, as Reisigl and Wodak (2001) argue that the first-person plural pronouns can be used to distinguish the in-group and out-group members. Therefore, the pronouns *we*, *us*, *our*, and *ourselves* in the corpus are retrieved by using them as the node word, and altogether, 483 results are displayed.

**Table 4 Nominations in *Silent Spring***

<b>Nomination</b>	<b>Raw frequency</b>	<b>Per 10000</b>	<b>Range</b>
<b>deictics</b>			
we	253	29.21	17
us	60	6.93	14
our	160	18.47	16
ourselves	10	1.15	4
<b>non-deictics</b>			
human	75	8.66	15
man	72	8.31	15

It is found that the use of the personal deictic *we* to refer to mankind is significantly more frequent than the non-deictics *human* and *man*, which amount to 75 and 72, respectively. By analyzing the results, the author finds that all of the personal pronouns are inclusive, with none of them being exclusive, denoting the whole of mankind. As an environmentalism work, *Silent Spring* relates the current man-made conflict between human society and nature, which is constructed by the writer as two groups, *we* human beings and nature, including abiotic environment and living creatures. Carson employs a large amount of first-person pronouns and constructs this in-group and out-group relationship. As Reisigl and Wodak (2001) further argue, the deliberate construction of a positive in-group identity consequently results in a negative image of the out-group and the strategic use of different personal pronouns is aimed at establishing a positive in-group and a negative out-group. In this work, Carson states that the abuse of man-made chemicals is the cause of disasters in nature, thus dexterously modifying the attitudes towards the in- and out-groups by building a negative image of mankind and consequently giving rise to the positive one of nature. It is Carson’s rebellion against anthropocentrism. Anthropocentrism posits that rationality is the unique quality of humans, hence, human beings are the sole thing-in-itself and the existence of humans in their own right is considered an end in itself. Human rationality confers a privilege upon the species, enabling them to treat other non-rational beings as mere tools for their use (Xie, 2008). The belief in “human rationality” leads to a disregard for the rights of other living creatures, resulting in the unscrupulous exploitation of nature, disrupting the inherent balance of ecosystems, and exacerbating environmental problems. While Carson vehemently opposed this anthropocentric view of nature, which prevailed in the early twentieth century (Lu & Wu, 2020) and advocated for ecocentrism that puts emphasis on the equal relationship between mankind and other lives in nature, through which she constructs her beliefs that man himself is a part of nature and upholds the collective interests of the ecosystem. Additionally, as a typical example of interactional meta-discourse, the personal deictic *we* can engage the readers into the discourse in order to make the writer’s argument more striking and thought-provoking. An example is presented below to make a full analysis.

Example 1

I contend, furthermore, that we have allowed these chemicals to be used with little or no advance investigation of their effect on soil, water, wildlife, and man himself.

(Chapter 2, The Obligation to Endure)

In the above example, the writer strongly states that it is human negligence that leads to the abuse of lethal chemicals and results in a severe environmental crisis, consequently which will eventually affect human beings themselves. By using the first-person pronoun, *we* to indicate humanity, Carson endows the subject human with careless and arrogant attributes and constructs a negative image of in-group members. Furthermore, the writer expresses that all of us should take responsibility for our erroneous behaviors, warning that human beings cannot exploit and destroy nature at their will and the outdated and pernicious thinking-pattern will devastate both the environment and human society eventually, which functions as a powerful argument against anthropocentrism.

**4.2.2 Predication Strategy of *Silent Spring***

The predication strategy refers to the way in which the characteristics and attributes of social actors, objects, events, and actions are presented more or less negatively or positively by the linguistic devices of predicative nouns, explicit predicates, adjectives, presuppositions and so on (Reisigl & Wodak, 2009: 95). Because the linguistic means of nomination also involve using predicative nouns to construct and identify the social actor, these two linguistic means show overlapping elements. Predicative nouns used to describe human beings have been analyzed above, so the linguistic means of predication here mainly focuses on explicit predicates,

adjectives and adverbs. The study shows that the linguistic means of predication in the book *Silent Spring* are mainly manifested as explicit predicates.

The Collocate tool of AntConc 4.2.2 is applied to identify explicit predicates employed to denote humans. This tool presents the collocates of a target word; that is, *we*, in this research, facilitate the examination of non-sequential linguistic patterns. Sinclair (1991: 170) characterized collocation as extremely important in interpreting meaning. Collocates are considered statistically significant when their log-likelihood exceeds 3.841 (Meng, 2020: 49). Based on the result of the nomination strategy analysis; we conduct a close and detailed examination of the words that collocate with the personal pronoun *we*. The table below presents the results, sorted by log-likelihood, with a window span ranging from 5 words to the left (5L) to 5 words to the right (5R) of the node word.

**Table 5 Collocations of *we* in *Silent Spring***

Ranks	Verbs	Log-likelihood	Frequency
1	our	81.470	33
2	know	78.620	17
3	see	58.053	16
4	seen	55.046	17
5	must	41.358	17

The results display that *Silent Spring* employs mainly explicit predicates to depict mankind. The top five verbs matched with the personal pronoun *we* indicating the major actor are presented in the above table. Words like *are*, *have*, *shall* and *do* are omitted from the output data, for they have no practical meaning in the discourse. The concordance lines of the seven verbs are then retrieved respectively to find out what characteristics and attributions of humanity are expressed by these explicit predicates. Generally speaking, human beings are presented negatively in *Silent Spring*. Notably, the corresponding adjective possessive pronoun *our* ranks first in the collocate list of *we* (LL value = 81.470). Through inspecting the broader context where *we* collocates with *our*, we found that *we* and *our* are generally placed in the context with negative semantic prosody, 26 out of 33 co-occurrences, so as to directly point out the incorrect philosophy and the inappropriate deeds of human beings, with the majority of co-occurrence follows the pattern that *we* + *destructive actions*, *our* + *environment/life in nature*. Consequently, it also provides a solid foundation and sufficient reasons for the writers to propose her point of view and appeal for change. The collocation in a negative context reveals the background that there's a striking contrast between the severity of environmental issues at that time and the public's unawareness of it. It is against this backdrop that Rachel Carson brings the dire state of affairs to the attention of the global audience so urgently. The example below will be adopted to make a detailed analysis.

#### Example 2

Today, we are concerned with a different kind of hazard that lurks in our environment—a hazard we ourselves have introduced into our world as our modern way of life has evolved.

(Chapter 12, The Human Price)

In the above example, Carson describes the scene in which mankind is now facing the ecological crisis they made themselves, stressing that the horrible damage human beings have caused to nature eventually exerts negative effects back to themselves. Human beings, who thought they were the sole dominator of the earth, wantonly adopted the newly invented toxic chemicals to murder the lives in nature, which they thought posed an impediment to their advance towards a better world, destroying the environment they live in and broking the ecological balance. In the end, mankind would pay the price for their ignorance and arrogance. The recursive use of *we* and *our* highlights the power and superiority of man on the one hand, resembling what anthropocentrism holds. On the other hand, by assigning negative attributes to *we* and *our*, Carson directly reveals the stark reality underneath the rapid development of the modern human world and the philosophy of human superiority. Altogether, it facilitates the writer to refute the previous perspective that has been well-accepted worldwide and lays the foundation for the forthcoming argumentation of ecological holism by presenting counterevidence.

The explicit predicates *know* also exhibit a high frequency, and their concordance lines primarily indicate that there remains hope for humanity to reverse the current predicament due to their cognitive capabilities. Upon closer inspection, out of the seventeen instances, ten employ the verb *know* in a positive context, while the remaining seven are negative. By juxtaposing the collocate *know* in both affirmative and negative sentences, the writer not only recalls and underscores the information provided but also asserts that humans possess introspective abilities and subjective initiative, which are fundamental for rectifying past erroneous actions, which contributes to carrying forward the argumentation towards the ecological holism, a viable solution to the issues at hand suggested by Carson. In the mid-twentieth century, having experienced the technological and economic boom boosted by World War II, human society was embracing unprecedented prosperity in several aspects, especially in America; hence, Carson

affirms the ability of humans to some extent instead of criticizing them completely. The following example presents the role of *know* in *Silent Spring*.

Example 3:

Storage in human beings has been well investigated, and we know that the average person is storing potentially harmful amounts. (Chapter 3, Elixirs of Death)

In Example 3, the writer relates the relevant scientific findings that due to the abuse of insecticides, human beings are storing store in the potentially harmful amounts of toxic chemicals within their body. Through adeptly appropriating this discovery and integrating it into a shared context, Carson enhances the credibility of her argument, rendering it more compelling, and upholds the scientific advances which are progressing along the correct road.

## **5. Conclusion**

In conclusion, the paper integrates the quantitative and qualitative approaches to objectively examine the construction of the ecological discourse of *Silent Spring* from the perspective of DHA. At the macro-level, the author finds that Rachel Carson's ecological holism thoughts mainly centers around the destructive human actions at that time when the social actor, human beings, were spraying a large amount of DDT, the insecticides, which brought crisis, not only to the nature but also to the humanity themselves. On the basis of the topic, this paper examines the nomination strategy and the predication strategy for the meso-level analysis. In terms of nomination strategy, Rachel Carson employs a large amount of inclusive first-person pronoun in its plural form, *we*, to designate the major social actor human in the book. The abundant use of *we* functions in constructing negative in-group identity and positive out-group identity facilitating the writer to attack the prevailing philosophy of anthropocentrism and advocate ecocentrism. Based on the results of the nomination strategy, the paper further examines the characteristics attributed to humanity through the use of explicit predicates and obtains coherent findings that *our* ranks first in the collocates of *we* and the two generally co-occur in the context with negative semantic prosody to point out the incorrect philosophy and the inappropriate deeds of human beings directly, based on which the writer can subsequently introduce the ecological holism thoughts and make it more acceptable by the readers.

Despite the intensive efforts, there are still some limitations in the present study: (1) Due to the limited time, this paper only conducts the thorough analysis of the two discursive strategies in the target corpus, leaving the argumentation, perspectivization and intensification/mitigation strategies to be examined. (2) DHA requires not only the breadth but also the depth of interdisciplinary knowledge, which is difficult to be equipped in one researcher. Further research can take all five discursive strategies into consideration and recruit researchers from different academic backgrounds.

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