

Some Argumentative Uses of the Rhetorical Figure of Antithesis in Environmental Science Policy Articles

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Abstract

This paper presents examples of the figure of antithesis in five environmental science policy journal articles and describes their argumentative functions. The examples include not just contrasting words (antonyms) but contrasting ideas. Many of the examples were found within instances of the RST relations of Contrast, Concession, and Antithesis. Other examples fit argument patterns such as argument from opposites. Collecting and analyzing such examples may contribute to future techniques for automatic rhetorical figure detection and argument mining.

Keywords

Rhetorical figure of antithesis, Rhetorical Structure Theory, Argumentation, Environmental science policy

1. Introduction

We are interested in exploring the argumentative uses of the rhetorical figure of antithesis in environmental science policy writings. This paper presents examples of antithesis from five articles written by experts on the subjects of food security, climate change, and water resource management in three journals [5, 13, 15, 16, 22]. Each article involves a conflict between the perspectives of biologists and engineers, i.e., the view that nature should be preserved versus the view that it can be engineered to solve human problems. By studying examples of antithesis in the corpus, it is possible to better understand the role of antithesis in argumentation in this genre. Eventually, this may contribute to computational techniques for rhetorical figure detection and argument mining [11, 17].

According to Fahnestock [4, p. 232], “A perfect antithesis takes pairs of terms opposed as contraries, contradictories, or correlatives and puts them in parallel phrases.” Contraries, also known as polar or scalar opposites, are gradable terms such as hot/cold. Contradictories, also known as binary opposites or complementaries, are nongradable opposites such as dead/alive or predicates and their negation, such as red/not red. Correlatives refer to opposite roles in a relationship such as buy/sell, father/son. Other types of lexical opposites include reversives (reversed actions or events, such as build/destroy, start/finish) and directional opposites, opposites referring to a horizontal axis (such as front/back), a vertical axis (such as head/feet), a lateral axis (such as left/right), or a temporal axis (such as past/present/future) [14]. Parallelism may consist of repeated words, similar grammatical structures, and/or acoustic similarity [3].

On the other hand, we have adopted a broader definition of antithesis, given in *Silva Rhetorica* (<http://rhetoric.byu.edu/>) as the “juxtaposition of contrasting words or ideas (often, although not always, in parallel structure).” Previous computational treatments of antithesis considered only contrasting words, i.e. lexical opposites. By widening the scope to include contrasting ideas, not just lexical opposites or negated predicates, it is possible to get a wider appreciation of how antithesis is used.



Furthermore, we discovered that although some longer examples did not exhibit syntactic parallelism, they did play a role in the discourse coherence relation of Antithesis in Rhetorical Structure Theory (RST) [18]. This led to the realization that many of the other uses of antithesis in the corpus played a role in two discourse coherence relations of RST related to Antithesis, Contrast and Concession. The next section provides some background on RST and its definition of those discourse coherence relations. Subsequent sections present uses of (the rhetorical figure of) antithesis in the corpus, a survey of related work, and a discussion of implications and conclusions.

2. RST: Contrast, Antithesis and Concession

Rhetorical Structure Theory (RST) [18] models adjacent spans of coherent text in a hierarchical structure of coherence relations. The leaves of the tree are elementary discourse units (EDUs), i.e., a sentence of one clause, or each clause of a complex sentence, not including complement clauses or relative clauses [21]. In relations such as Antithesis and Concession, the more important text span is labeled as the nucleus (N), while the span labeled as satellite (S) provides support for the nucleus. In certain relations such as Contrast, instead of S and N, there are two nuclei of equal importance. Note that discourse connectives such as ‘although’ and ‘but’ are not sufficient for identification of coherence relations. The following definitions and criteria for distinguishing these three relations are given in [21].²

In Contrast (p. 20), the contents of the two nuclei are “comparable yet not identical”. The effect of Contrast is that the reader (R) “recognizes the comparability and the differences” between the contents of the two nuclei. Although similar to the relations of Concession and Antithesis, “if neither segment is deemed more important than the other, then Contrast is to be chosen (p. 23).”

In Concession (p. 11), the writer (W) “concedes S and implicitly confirms that S and N are usually not compatible; in the current instance, however, they are compatible, and N is being emphasized.” The effect is that “R’s positive regard for N is increased.” (In RST definitions, the term ‘regard’ encompasses attitude and belief.)

In Antithesis (p. 10), W “identifies with” the nucleus, and “the contents of N and S are not compatible. Due to the incompatibility, one cannot have equal regard for N and S.” The effect is that “R’s positive regard for N is increased”.

On distinguishing Concession and Antithesis (p. 24), Concession “generally involves a violated or failed expectation [in N] ... One important difference between Antithesis and Concession is that the claim which is represented by S is dismissed in Antithesis, but is acknowledged in Concession.”

3. Antithesis Used in RST Concession Relation

In the following examples of Concession from the corpus, one of the pair of opposites of a rhetorical figure of antithesis occurs within S and the other within N. In the examples in this and later sections, S and N are distinguished using square brackets, and underlining is added to identify opposing elements of the rhetorical figure of antithesis. In examples containing more than one pair of opposites, e.g. in (2), different styles of underlining are used to identify each pair. None of the following examples involve lexical opposites; two of the examples involve negated predicates. N and S exhibit a high degree of syntactic parallelism, and opposites tend to occur at the end of the phrase. Per the definition of Concession, S conveys what is conceded by W, in order to increase R’s acceptance of N. The rhetorical figure of antithesis in this context has the following role: the use of opposite concepts in N and S emphasizes the contrast between N and S.

- (1) [Moreover, certain marine species are vulnerable to acidification]_N [whereas others are relatively resilient.]_S [15]
- (2) [Most carbon dioxide remains in the air.]_S [but as much as 25 percent is absorbed by the world’s oceans...]_N [15]

² Complete definitions of all RST relations are given at <http://www.sfu.ca/rst/01intro/definitions.html>.

- (3) [And although it might seem creepy ...]s [doing so is, in fact, no big deal, proponents say]N [5]
- (4) [It is theoretically possible]s [but hugely improbable]N [5]
- (5) [Solar geoengineering is not a substitute...]N [It is –at best—a supplement.]s [16]
- (6) [These concerns do suggest ...]s; [they do not, individually or collectively, amount to ...]N [16]
- (7) [The insect research is a meaningful step toward sustaining the river for habitat as well as for humans.]s [It also runs straight into a core conflict between science and Colorado River policy]N³ [13]

4. Antithesis Used in RST Antithesis Relation

In the following examples of RST Antithesis from the corpus, one of the pair of opposites of a rhetorical figure of antithesis occurs within S and the other within N. Note that, except in one case -- annual/perennial in (12) -- none of the examples involve lexical opposites or negated predicates. Also, S and N do not exhibit syntactic parallelism. Per the definition of Antithesis, S and N are incompatible, thereby increasing R's acceptance of N. As was the role of the figure of antithesis in the examples of Concession, the use of opposite concepts in N and S emphasizes the contrast between them.

- (8) [But as climate change reached the top of the environmental agenda ..., discussion of solar geoengineering went quiet.]s [However, there are now signs of rapid change in the politics of solar geoengineering.]N [16]
- (9) [Yet opponents maintain that because the wholesale swapping or alteration of entire packages of genes is a natural process ..., it tends to produce few scary surprises today.]s [Changing a single gene, on the other hand, might turn out to be a more subversive action, with unexplained ripple effects, including the production of new proteins that might be toxins or allergens.]N [5]
- (10) [Yet here they are scrabbling in the dirt at a small organization privately funded by citizens' donations.]N [If this work is so important, where are the powerful institutions, the high-tech equipment, the labs full of students?]s [22]
- (11) [Allocation of funds on this scale becomes dependent on an average of the opinions of numerous bureaucrats, lawmakers, administrators and committees.]s [This is a far cry from the privately wealthy gentlemen of science of the 17th to 19th centuries...]N [22]
- (12) [Annuals die each year and must be replanted.]s [Perennials can stay green year-round (evergreens), drop their leaves and go dormant during the winter (other trees) or die back to the ground, surviving as underground stems (perennial herbs).]N [22]

5. Antithesis Used in RST Contrast Relation

In the following examples of Contrast from the corpus, one of the pair of opposites of a rhetorical figure of antithesis occurs within each nucleus (N). Note that, except in a few cases (proponents/critics, rise/fall, low/high), none of the other examples involve lexical opposites or negated predicates. Also, the two N clauses exhibit a high degree of syntactic parallelism. Per the definition of Contrast, the effect is that R recognizes “the comparability and differences” between the contents of the nuclei. However,

³ The pairs habitat/humans in S and science/policy in N play a different role than the role played by meaningful step/core conflict in Concession. These two pairs represent two sides of a debate or conflict, similar to the use illustrated in (21) and (22).

unlike the case with Concession and Antithesis, the rhetorical figure of antithesis contributes to the argumentative meaning in several ways as described below.

In (13) and (14), antithesis characterizes opposing sides of a debate or conflict. In (15) and (16), antithesis conveys a type of causal inference; the difference between two comparable situations is seen to be responsible for their different outcomes.⁴ In (17), antithesis conveys another type of causal inference; by comparing two extremes, each having negative consequences, it is suggested that a situation between the two extremes is desirable.

(13) [Proponents of genetically modified crops say the technology is the only way to feed a warming, increasingly populous world.]N [Critics say we tamper with nature at our peril.]N [5]

(14) [scientists want the flexibility to experiment.]N [whereas power and water managers want stability.]N [13]

(15) [Normally, ... effectively sequestering those compounds from uptake by photosynthetic organisms;]N [under acidified conditions, however, hydroxide and carbonate remain as free metals that are bioavailable.]N [15]

(16) [Native prairies often remain productive even after decades of harvesting and removing hay.]N [By contrast, adjacent prairies plowed up for wheat quickly degraded ...]N [22]

(17) A balance of trace metals ... is crucial. [If trace-metal concentrations fall too low, photosynthesis falters;]N [if they rise too high, the excess of metal may prove toxic.]N [15]

6. Other Argumentative Uses of Antithesis

A number of examples of the rhetorical figure of antithesis in the corpus do not involve RST relations since they occur within a single EDU. The following use of antithesis conveys a sort of argument from negative consequences [23], i.e., that if X causes Y and Y is undesirable, then X is undesirable. (Increasing influxes of CO₂ have undesirable results, so increasing influxes of CO₂ are undesirable; changing something has undesirable results so changing something is undesirable.) In addition to the argument from negative consequences, (18) conveys a causal argument from correlation [23]: the correlation of the second pair of opposites, increase/decrease, implies a causal relationship between them.

(18) Increasing influxes of CO₂ cause a decrease in pH, which results in an increase in H⁺ and thus a decrease in hydroxide and carbonate ions in most surface waters. [15]

(19) “We change something we can control, and then two things we can’t control very quickly change,” says geologist Ted Melis ... [13]

The following use of antithesis conveys an argument from opposites [23]: if the opposite of X has a property P, then X has the opposite of property P. In particular, if water released from Lake Powell causes stress to endangered fish, then the natural state of the Colorado river does not cause stress to those fish. Note that while clear/silty are lexical opposites, 48-degree water/80-degree flows are not.

(20) The clear, 48-degree water, released from the depths of Lake Powell, stressed endangered fish, which were adapted to silty, 80-degree flows. [13]

The following use of antithesis conveys opposing sides of debate or conflict. World knowledge would be necessary to recognize the opposition in the pair mainstream research/nonprofits.

⁴ This is similar to use of antithesis to convey “the logic of single-difference experimental design” [4, p. 233]. The difference is that these examples describe naturally occurring situations rather than human-designed experiments.

(21) A second difference between mainstream research and nonprofits is that funding for universities and experiment stations increasingly comes from competitive grants. [22]

(22) He argues that the benefits of GM crops greatly outweigh the health risks, which so far remain theoretical. [16]

In the following example, use of three pairs of lexical opposites (small/large, short/long, high/low) emphasizes the differences between lexically opposite types of crops (annual/perennial).

(23) Plant domestication has resulted in small, short-lived, high-yield annual crops and longer-lived, larger [low-yield] perennial crops. [22]

Lastly, use of the opposites powerful/vulnerable lends emphasis to a prolepsis-as-presage [19] argument against failing to protect people from the consequences of climate change.

(24) these changes would have their most powerful impact on the world's most vulnerable people ... [16]

7. Related Work

On-line collections of literary uses of antithesis and other figures can be found on Silva Rhetorica (<http://rhetoric.byu.edu/>) and RhetFig (<https://artsresearch.uwaterloo.ca/chiastic/display/>). In [3, 4] Fahnestock discussed how antithesis was used in historical scientific works to generate hypotheses about opposites of known phenomena and as a rhetorical device to epitomize arguments based on single-difference experimental design.

Mitrović et al. [20] noted that, despite the different focus of RST and the rhetorical tradition, there are some similarities between the figure of antithesis and the RST relation of Antithesis. In their research on automatic detection of irony, simile, and oxymoron, rhetorical figures that like antithesis involve meaning, they made use of a Serbian WordNet ontology as a knowledge source.

Azar [1] described the use of several RST relations including Antithesis and Concession for modeling arguments. Green [6] attempted to represent discourse structure and argument structure in a single model combining RST relations, including Concession and Antithesis, with certain causal argument schemes used in biology. However, Green later argued for modeling argument structure independently of RST discourse structure [7]. In [8], Green analyzed the argument structure and discourse structure of a scientific research paper and showed that they were not in one-to-one correspondence. In [9], Green analyzed the argument schemes and a variety of rhetorical devices in two of the papers from the corpus used in the current study, but did not specifically examine the argumentative use of antithesis.

Lawrence et al. [17] explored the role of the figure of antithesis in argumentation by developing an algorithm for detecting antithesis in a dialogic corpus whose arguments had been annotated. The algorithm defined antithesis solely in terms of antonyms given in WordNet (wordnet.princeton.edu). They found that cases of antithesis detected by the algorithm were often used in turns annotated as rebuttals in their corpus. That use is consistent with use of antithesis in the context of the RST relation of Antithesis described in this paper, but does not cover other uses described in this paper.

Green and Crofts [10] explored automatic detection of antithesis in a dataset of quotations that had been annotated previously for chiasmus. The motivation for using that dataset was the hope that it would contain many examples of antithesis since it had been noted that antithesis often occurs in combination with chiasmus [12]. Green and Crofts developed an antithesis detection algorithm using a broader definition of antithesis than Lawrence et al.'s. In addition to WordNet, the algorithm used ConceptNet (conceptnet.io), and searched not only for antonyms but for antonyms of synonyms, as well as for certain simple forms of negated predicates. However, there were many cases of antithesis in the

dataset that did not involve lexical opposites. In addition, although the dataset was indeed a rich source of antithesis examples, it is not representative of the genre studied in this paper.

8. Discussion

The current study of contemporary environmental science policy articles has found that many cases of the rhetorical figure of antithesis have argumentative force from the RST relations of Concession and Antithesis. In addition, the study identified a number of other argumentative uses of antithesis. Thus, detection of antithesis may play a future role in argument mining. However, many cases of antithesis illustrated here do not involve lexical opposites or negated predicates. The problem of automatic recognition of antithesis requires a deeper level of semantic/pragmatic interpretation than is possible with available on-line lexical resources. A possible stopgap is to construct a domain ontology from a corpus for a particular genre (e.g. science policy arguments) and topic (e.g. climate change) as a resource for antithesis detection. Also, it may be helpful to examine features that have been used for parsing RST structures in text.

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