Expanding a theoretical framework for English adjective order

James Spizzirro
Boston College
Department of Slavic and Eastern Languages and Literatures
Lyons Hall 210
Boston College
140 Commonwealth Ave
Chestnut Hill, MA 02467
spizzirr@bc.edu

Abstract

In her 2003 study "A multifactorial corpus analysis of adjective order in English", Stefanie Wulff surveys a number of factors that help explain preferred adjective ordering in adjective-adjective-noun constructions, drawing from previous work in fields ranging from phonology to pragmatics. In the present work, I pose an expansion in the criteria for one of these factors, which should yield a more effective utilization in determining adjective order. In addition, I propose that one factor in Wulff 2003 provides support for the expansion proposed here. Following this, I will explain areas for further research which have come to light over the course of this study, but which have not been treated in this paper.

1 Introduction

An interesting and largely unexplained phenomenon in language is the preference of a particular order of adjectives over another. For instance, compare the grammaticality of the utterance in (1) with that of the utterance in (2):

(1) small green car
(2) *green small car

Or, as a more relevant example, compare the utterance in (3) with the one in (4):

(3) beautiful colourful jewels
(4) ?colourful beautiful jewels

Syntactically, these are all equally well-formed utterances. The vast majority of native English speakers, however, would claim that, according to some intuition, the utterances in (1) and (3) are more natural than the utterances in (2) and (4). Since this order cannot be explained by any known hierarchical relationship, we must look elsewhere for an explanation.

A number of linguists have proposed rules that help predict adjective order. The vast majority of work in this field has focused on phonology (cf. Behaghel 1930, Goyvaerts 1968), syntax (cf. Biber 1999, Posner 1986), semantics (cf. Whorf 1945, Kilgarriff 1997, Stubbs 2001, Richards 1975, Martin 1969, Ertel 1971, Dixon 1977, Quirk et al. 1985, Hetzron 1978, Richards 1977, Deese 1964) and pragmatics (cf. Lockhart and Martin 1969, Posner 1986, Bock 1982, Ney 1983, Lapata et al. 1999). It is worth noting that there has been little substantial work regarding the influence of morphology on adjective order, and whatever work has been done has been largely restricted to superlative and comparative structure (cf. Teodorescu 2006). Stefanie Wulff presents a comprehensive study on this topic in her 2003 work "A multifactorial corpus analysis of adjective order in English". In this study, Wulff surveys a number of previously proposed factors, drawing primarily from work in phonology, syntax, semantics, and pragmatics (with no section devoted to the treatment of morphological factors). By analyzing these factors at first individually, and then together in a multifactorial analysis, Wulff was able to predict adjective order with 73.5% accuracy.

One factor presented in Wulff's study, referred to as Nominal Character (NOMCHAR), is described as problematic, and loses much of its predictive capability when used in a multifactorial analysis. Wulff addresses this by saying that "the

operationalization of NOMCHAR applied [in her analysis] is not inadequate, but probably incomplete in the sense that NOMCHAR should be more adequately conceived of as a multifactorial construct of which the tendency towards nominalization is just one aspect" (Wulff 2003). In the present work, I present one such aspect of Nominal Character which could aid in a more effective operationalization of this factor, and which takes morphology into account, which (as noted above) has largely been ignored in the literature. I propose that by expanding Nominal Character to include adjectives which are nominalized by means of removing or adding an affix, rather than restricting the criteria to zero-derived nouns and adjectives, Nominal Character can be utilized more fully. Furthermore, I propose that one factor in particular presented in Wulff's 2003 study lends validity to expanding Nominal Character.

2 Method

This study will treat adjectives and adjective strings that were dealt with Wulff's study. For a full explanation of the constraints on this analysis, see Wulff 2003, §2 "Scope of the investigation." For purposes of clarity, I will here delineate a number of parameters within which I have conducted this study.

Descriptive Adjectives: There is a distinction between adjectives such as "many" and "fourth" and adjectives such as "red," "beautiful," and "big." This first group (described by Wulff as "limiting adjectives") specifies and constrains the head, whereas this second group (described by Wulff as "descriptive adjectives") serves primarily to describe, rather than to specify, the head. It is this second group of adjectives that this study is concerned with. Additionally, all adjectives used here must fulfill the description of either a *central* or *peripheral* adjective, according to the four criteria prescribed by Quirk et al., namely (i) attributive function; (ii) predicative function after the copula *seem*; (iii) ability to be modified by *very*; and (iv) gradability by the use of morphology (*-er, -est*) or periphrastic comparison (*more, most*). Central adjectives must fulfill at least (i) and (ii), and peripheral adjectives must fulfill at least (i), otherwise they must fulfill at least three of the criteria in general (cf. Quirk et al. 1985: 402–404).

Triples: This survey has considered "triples", groups containing two prenominal adjectives immediately followed by a noun. Though there are instances in the BNC of more than two adjectives preceding a single noun, these are rare: In the entire 10 million-words spoken portion of the BNC, there are 9,647 adjective pairs. Only 426 of these pairs are immediately followed by another adjectives, or 4.41%. Conversely, the vast majority of these adjective pairs (6,560, or 68%) are followed by a noun (cf. Wulff 2003). Therefore this study will be primarily concerned with the behavior of triples (Adjective-Adjective-Noun constructions).

Unbroken adjective pairs: This study treats "unbroken" adjective pairs; that is, those that are not joined by a conjunction. The behavior of "broken" adjective strings is not well understood at the present moment. It seems that broken strings are, at least at first glance, less sensitive to adjective ordering restrictions. For example, compare the grammaticality of the utterance in (5) with that of the utterance in (6):

(5) *green small car
(6) ?green and small car

This is doubtless an area for further research, but one that will not be discussed further in the present work.

3 Expanding Nominal Character

When analyzing Nominal Character, Wulff draws primarily from Posner's (1986) so called "nouniness principle" – less "noun-like" adjectives tend to precede more "noun-like" ones. There are two methods of analyzing the Nominal Character of an adjective: Posner's analysis, which has some noted problems and cannot be effectively utilized in a corpus analysis[1]; and Wulff's analysis, which was created specifically for operationalization in a corpus analysis. For purposes of ease and clarity, this study is concerned with Wulff's (slightly

[1] For a full discussion of the problems of Posner's analysis, see Wulff 2003, §4.2.1. Suffice it to say that there are problems in interpreting Posner, and his analysis relies upon intuitions that cannot be utilized on a large enough scale in a corpus analysis.

altered) presentation of Nominal Character, which in turn draws a number of key insights from Posner.

Wulff's use of Nominal Character: Wulff maintains a number of the parameters of Posner's original study. The most important of these for the purposes of this study is that Wulff surveys adjectives and zero-derived nouns (e.g., "green" as an adjective '*green car*' and "green" as a noun '*I love this green*') to be consistent with Posner's apparent intentions. For use in her analysis, Wulff determined the number of times each word was tagged as an adjective or as a noun in the BNC, and used these numbers to calculate a word's Nominal Character value. According to Wulff's formula for Nominal Character, the higher a word's Nominal Character value, the more likely it would be to appear as the second adjective in a string (and conversely, the lower its value, the more likely it would be to appear as the first adjective in a string). See §3.1 below for a fuller discussion of Wulff's formula.

3.1 Beyond zero-derivation

In order to approach a fuller operationalization of Nominal Character, we must stray a bit from Posner's original criteria: Zero-derivation should not be a strict criterion in determining Nominal Character. If we expand our analysis to include overtly derived adjectives and nouns, we can highlight relationships currently considered outside of the scope of Nominal Character. There is a significant problem with expanding this analysis past zero-derivation, however: In Wulff's operationalization of nominal character, the BNC's tags were sufficient to provide the variables needed to solve the equation for Nominal Character, whereas a simple tag search for a single word will not provide us with the information necessary for morphologically distinct, rather than zero-derived, forms. In order to analyze morphologically distinct forms, we must slightly alter Wulff's formula for Nominal Character. The original formula is represented by (7), and the revised formula is presented in (8):

$$(7)\ \textsc{NomChar} = 1 - \frac{\text{frequency}_{adj}}{\text{frequency}_{adj} + \text{frequency}_{n}}$$

Here, frequency_{adj} is the frequency of the word as an adjective and frequency_{n} is the frequency of the word as a zero-derived noun.

$$(8)\ \textsc{NomChar}_{D} = 1 - \frac{\text{frequency}_{adj}}{\text{frequency}_{adj} + \text{frequency}_{dn}}$$

Here, $\textsc{NomChar}_{D}$ is "Nominal Character (Derived)", frequency_{adj} is the frequency of an adjective, and frequency_{dn} is the frequency of a noun derived from this adjective ("derived noun").

Alternatively, $\textsc{NomChar}_{D}$ can analyze words with an opposite derivation pattern, i.e. an adjective that is derived (morphologically) from a noun and the noun from which it was derived. In this case, the formula will take the form in (9):

$$(9)\ \textsc{NomChar}_{D} = 1 - \frac{\text{frequency}_{da}}{\text{frequency}_{da} + \text{frequency}_{n}}$$

The only difference is that here, frequency_{n} is the frequency of a noun, and frequency_{da} is the frequency of an adjective derived from this noun ("derived adjective").

The output of this formula provides the same predictions as Wulff's formula: The higher a word's Nominal Character (Derived) value, the more likely it is to be the second adjective in a string, and vice-versa.

Due to a lack of resources and technical expertise, this analysis was not performed automatically, and as a result of this, the test pool is necessarily smaller than the one presented in Wulff – 528,714 words. On the one hand, this manual analysis corrects any instances of incorrect tagging in the BNC. On the other hand, however, this manual analysis increases the possibility for human error – I have checked and double-checked all results, but any errors are my own.

3.2 Interpreting the Results

Since this analysis is manual, interpretation of the output is manual as well – by utilizing native speaker intuitions, and drawing generalizations and conclusions when comparing them with a word's $\textsc{NomChar}_{D}$ value. A noted difference between Nominal Character and our expanded Nominal Character (Derived) is that, whereas the vast majority of adjectives (89.1% in Wulff's analysis) have a Nominal Character value between 0 and 0.1,

Nominal Character (Derived) values seem to vary more widely. As a result of this, conclusions regarding the influence of Nominal Character (Derived) on adjective order can be made utilizing a larger portion of the Nominal Character spectrum, making manual interpretation considerably less daunting. The following generalizations draw on the fact that Nominal Character (Derived) values vary more widely, and assume a fairly regular distribution of values from 0 to 1. For now, take these conclusions as generalizations that will be specified and clarified by examples (§4) and explanations of these examples (§5).

Outputs between 0 and .5: When the input of $frequency_a$ (or $frequency_{da}$) is greater than the input of $frequency_{dn}$ (or $frequency_n$), the output of Nominal Character (Derived) will fall somewhere between 0 and .5, non-inclusive ($\{0<\text{NOMCHAR}_D<.5\}$). When an adjective has a Nominal Character (Derived) value between 0 and .5, it is relatively less "noun-like." These adjectives are more likely to appear as $adjective_1$ (that is, the adjective further from the noun). In a more general sense, this indicates that the quality represented by the adjective is conceptualized by native speakers as somehow more adjectival rather than noun-like – the adjective is the semantically primary member of the pair.

Outputs at .5: When the input of $frequency_a$ (or $frequency_{da}$) is equal to the input of $frequency_{dn}$ (or $frequency_n$), the output of Nominal Character (Derived) will be exactly .5 ($\{\text{NOMCHAR}_D = .5\}$). When an adjective has a Nominal Character (Derived) value of .5, there can be no definitive statement of whether it should occur generally in $adjective_1$ or $adjective_2$ position, and so its position will be determined by the tendency of the other adjective in the string. For instance, if an adjective with a Nominal Character (Derived) value of .5 is put into a string with an adjective with a value of .2 (which should appear in $adjective_1$ position), the adjective with the value of .5 should appear as $adjective_2$. In the present study, however, no words are presented that have a Nominal Character (Derived) value of exactly .5. Indeed, it would be quite a coincidence if an adjective were to appear exactly as many times as its corresponding noun – but the possibility should not be ruled out entirely. Given the relatively limited scope of the test pool in this study, to do so would be hasty at best.

Outputs between .5 and 1: When the input of $frequency_a$ (or $frequency_{da}$) is less than the input of $frequency_{dn}$ (or $frequency_n$), the output of Nominal Character (Derived) will fall somewhere between .5 and 1, non-inclusive ($\{.5<\text{NOMCHAR}_D<1\}$). When an adjective has a Nominal Character (Derived) value between .5 and 1, it is relatively more "noun-like." These adjectives are more likely to appear as $adjective_2$ (that is, the adjective closer to the noun). In a more general sense, this indicates that the quality represented by the adjective is conceptualized by native speakers as being somehow more noun-like rather than adjectival – the noun is the semantically primary member of the pair.

See Figure 3.1 for a graphic representation of the tendencies of adjectives of various Nominal Character (Derived) values.

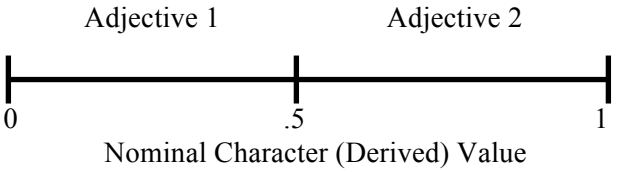

Figure 3.1: NOMCHAR_D Value Spectrum.

Interpretation in Pairs: When analyzing a pair of adjectives, the individual Nominal Character (Derived) values for each are first interpreted. If it is the case that one adjective should prefer $adjective_1$ position and the other should prefer $adjective_2$ position, there should be no discrepancy in determining the order of the two adjectives. If it is the case, however, that the two adjectives should prefer the same position, say, $adjective_1$, the two values have to be compared with one another. Whichever adjective more strongly prefers this position will occupy it, and force the other adjective into the remaining position. For instance, if two adjectives should prefer $adjective_1$ position, and their corresponding Nominal Character (Derived) values are .1 and .4, the adjective with the value of .1 will occupy $adjective_1$ position, forcing the remaining adjective into $adjective_2$ position.

4 Examples of NOMCHAR_D

For this study, a manual search through a test pool of 528,714 words in the BNC was performed for 8 adjectives and corresponding nouns: Four of these

pairs consisted of a noun and an adjective that had been overtly derived from this noun, and four of these pairs consisted of an adjective and a noun that had been overtly derived from this adjective. The pairs are listed in Table 4.1 below.

Pair #	Adjective	Noun
1	beautiful	beauty
2	colourful	colour
3	wonderful	wonder
4	dangerous	danger
5	heavy	heaviness
6	smooth	smoothness
7	certain[2]	certainty
8	positive	positivity

Figure 4.1: Adjective-noun pairs.

Pair #	$freq_{a/<da>}$	$freq_{dn/<n>}$
1	134	90
2	17	354
3	77	48
4	115	83
5	157	0
6	80	3
7	359	15
8	94	0

Figure 4.2: Adjective-noun frequencies.

Pair #	$NomChar_D$
1	.402
2	.954
3	.384
4	.410
5	*
6	.036
7	.040
8	*

Figure 4.3: Nominal Character (Derived) Values

[2] It has been brought to my attention that I overlooked this word's function as a determiner, and due to time constraints I have not been able to rectify this in the present study. See §6 for further discussion.

4.1 Interpreting examples of $NomChar_D$

When taken together, two adjectives' Nominal Character (Derived) values can aid us in predicting their position in a triplet. To begin, we will only consider Nominal Character (Derived), and once we have come to a basic understanding of this relationship we will extend the interpretation to reconcile it with Nominal Character as a singular entity.

Nominal Character (Derived): When looking at Nominal Character (Derived) values, we should be able to pair any two of these adjectives and predict their position in a string. The exceptions here are pairs 5 and 8, which do not have enough information in the corpus, and therefore escape analysis: These can be analyzed, however, through the values of other adjectives, as we will see below. Beginning with a random pairing, compare "wonderful" (from pair 3) and "certain" (from pair 7). When we pair these to modify some noun, say "traits," we find that the ordering is as their values predict. Compare the grammaticality of the utterance in (10) with that of the utterance in (11):

(10) certain (.040) wonderful (.384) traits
(11) ?wonderful (.384) certain (.040) traits

Native speakers generally accept the grammaticality of the utterance in (10). On the other hand, the grammaticality of the utterance in (11) is context-dependent at best: In the absence of any special emphasis or changes in prosody, this seems a less-grammatical utterance.

To take another example of the predictive capability of Nominal Character (Derived), another random pairing: Take smooth (from pair 6) and colourful (from pair 2), along with a noun, say, "dress." Compare the grammaticality of the utterance in (12) with that of the utterance in (13):

(12) smooth (.036) colourful (.954) dress
(13) ?colourful (.954) smooth (.036) dress

The distinction here is, admittedly, less clear than the distinction between (10) and (11). The difference in two adjectives' Nominal Character (Derived) values should not be taken as a measure of the rigidity of the ordering preference, but rather as a general guideline for ordering preference.

It isworth noting that there are pairings that will not fit this general guideline. Take, for example, “beautiful” (from pair 1) and “smooth” (from pair 6). The predicted ordering is represented in (14), while the preferred ordering is shown in (15):

(14) ?smooth (.036) beautiful (.954) door
(15) beautiful (.954) smooth (.036) door

This example violates the principle of Nominal Character (Derived). For a full discussion of exceptions to Nominal Character (Derived), see §§6-7 below. Given the apparent multifactorial nature of adjective order, it is not surprising that there are some exceptions to Nominal Character (Derived).

Now, returning to pairs (5) and (8), which could not be properly analyzed in the corpus analysis: We can use a reverse analysis to attempt to find the Nominal Character (Derived) value of these two adjectives. Consider the preferred ordering of “heavy” and “smooth”, shown in (16), and the non-preferred ordering, shown in (17):

(16) smooth (.036) heavy (*) door
(17) ?heavy (*) smooth (.036) door

For the purposes of this study, this generalization will suffice: By comparing an adjective (which is either derived from a noun, or from which a noun is derived) with an unknown Nominal Character (Derived) value with an adjective with a known Nominal Character (Derived) value, we can approximate a range of values. For instance, in (16) we see that the Nominal Character (Derived) value for “heavy” likely falls somewhere above .036. With enough adjective pairs, the range can be narrowed, and we can estimate a more accurate value.

5 Situating NOMCHAR$_D$

Nominal Character (Derived) is, in essence, a single aspect of Nominal Character. Use of Nominal Character (Derived) should generally be restricted to those adjectives that would not be properly analyzed through Nominal Character (for instance, “colourful” is considerably less likely to appear as a zero-derived noun than it is as “colour”). In order to use Nominal Character (Derived) under the umbrella of Nominal Character, we must make adjustments that take into consideration the fact that, while Nominal Character (Derived) values cover a very large range, the vast majority of Nominal Character values fall between 0 and .1 (Wulff 2003). Doing so simply involves multiplying the Nominal Character (Derived) value by .1 (in *general*, however, in order to account for the minority of adjectives with values between .1 and 1, some adjustments should be made which, at present, have not been included).

External support for NOMCHAR$_D$: By drawing generalizations from a pragmatic factor in adjective order, we find that Nominal Character (Derived) fits into Wulff’s framework. Wulff presents a factor, drawing on the work of Bock (1983) and Ney (1982), called General Frequency, that presents a correlation between the number of times an adjective occurs in a corpus (its *general frequency*) and its proximity to the noun: The more frequently an adjective occurs, the more likely it is to appear as adjective$_1$, further from the noun. By generalizing this factor to take into account an adjective’s *relative frequency* (i.e., the number of times it occurs as an *adjective* rather than a *noun*), we find another way of interpreting Nominal Character (Derived). In this view, the greater the frequency of an adjective, and the lower the frequency of its corresponding noun, the more likely it is to appear as adjective$_1$ in a string (and vice-versa).

6 Discussion

In general, Nominal Character (Derived) can be used as a secondary aspect of Nominal Character in cases where Nominal Character would not accurately analyze an adjectives trend toward nominalization. Due to the apparent multifactorial nature of adjective ordering restrictions, however, there are times when it seems nominal Character (Derived) cannot properly predict adjective order. When there is significant influence from other factors that have not been considered in the present analysis, there may be a discrepancy in predicting adjective order with Nominal Character (Derived). In these cases, it seems that this factor’s efficacy may be dwarfed by other factors. Nonetheless, by expanding the criteria of Nominal Character we are able to more accurately represent a phenomenon which likely accounts, in part, for adjective order.

Returning to the issue presented in note 2 in §4: It has been pointed out that the usage of 'certain' and 'certainty' here may fall outside the scope of this study: Its use in (10) and (11) is more akin to a determiner than an adjective. Therefore, as noted by one reviewer, it is possible that rather than preferring adjective$_1$ position, it occupies the determiner position. Unfortunately, due to time constraints, this cannot be rectified in the current analysis. This will, hopefully, be addressed when this analysis is more complete.

Regarding the future of this study, it is this author's hope that an automated analysis can be performed, in order to provide a more representative sample of adjectives in a larger test pool. Additionally, see §7 for a discussion of further research in morphological factors in adjective ordering.

7 For further research

Over the course of this study, a number of conceivable relationships have come to light specifically regarding the status of morphology in determining adjective order that have not yet been considered in a corpus analysis. I will here describe these and give some basic considerations regarding them[3].

Adverbial Character: Adverbial Character, or ADVCHAR, analyzes the relative frequency of an adjective and its corresponding adverb (for instance, *wonderful* and *wonderfully*). This factor predicts that the higher an adjective's Adverbial Character value, the more likely it is to occur as adjective$_1$ (in contrast to Nominal Character). The formula is shown in (18):

$$(18)\ \text{ADVCHAR} = 1 - \frac{\text{frequency}_{adj}}{\text{frequency}_{adj} + \text{frequency}_{adv}}$$

Average Nominal Character (Derived): For either (i) an adjective from which a number, *n*, of nouns can be derived using distinct derivational affixes, or (ii) a noun from which a number, *n*, of adjectives can be derived using distinct derivational affixes, it may be possible to predict adjective order by calculating the average of the Nominal Character (Derived) values for each adjective. For instance, if we take the adjectives *green* and *greenish*, and find that they have greatly differing Nominal Character (Derived) values, it may be the case that by comparing the average of these two values with the other adjective in the string, we may be able to correct our prediction. The formula for this is shown in (19):

$$(19)\ \text{AVGNCD} = 1 - \frac{\text{NCD}_1 + \cdots \text{NCD}_n}{n}$$

Where NCD is Nominal Character (Derived) and *n* is the number of Nominal Character (Derived) values that are being compared.

Relative Morpheme Frequency: There may be a relationship between the derivational affix used to derive an adjective and its place in a two-adjective string. Following the pattern of Nominal Character (Derived) and our generalization of General Frequency, it may be the case that the more often a derivational affix occurs, the more likely it is to force an adjective into adjective$_1$ position. There are two ways to assess an affix's frequency, represented by (20) and (21):

$$(20)\ \text{RMF} = \frac{\text{frequency}_{M1}}{\text{frequency}_{M1} + \ldots \text{frequency}_{Mn}}$$

Where M is a morpheme, M1 is the morpheme in question, and *n* is the total number of *all* derivation affixes. Alternatively:

$$(21)\ \text{RMF} = \frac{\text{frequency}_{M1}}{\text{S}}$$

Where S is the size of the test pool.

8 Conclusion

In order to more effectively utilize Nominal Character in predicting adjective order, it may prove helpful to expand the analysis past zero-derivation. By including derived forms, certain adjectives may be analyzed more accurately in those situations where Nominal Character may not correctly predict an adjective's position in a string. More generally, morphological considerations for adjective order may help further our understanding of the phenomenon as a whole.

[3] What follows in this section is largely speculation. No corpus analysis has been performed to test these hyptotheses.

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Appendix (Abbreviations)

adj: adjective
AO: adjective order (or adjective ordering restrictions)
adv: adverb
ADVCHAR: Adverbial Character
AVGNCD: Average Nominal Character (Derived)
BNC: (Second) British National Corpus
da: derived adjective
dn: derived noun
M: morpheme
NOMCHAR: Nominal Character
NOMCHAR$_D$: Nominal Character (Derived)
n: noun (though it may be a variable in certain equations)
RMF: Relative Morpheme Frequency

References

Andrews, Avery. 1983. A note on the constituent structure of modifiers. *Linguistic Inquiry, 14*, 695-697.

Behaghel, O. 1930. Von deutscher Wortstellung. *Zeitschrift für Deutschkunde, 44*, 81-89.

Bloomfield, L. 1933. *Language*. Chicago, London: Chicago University Press.

Biber, D., S. Johansson, G. Leech, S. Conrad, & E. Finegan (Eds.) 1999. *Longman Grammar of Spoken and Written English*. London: Longman.

Bock, J. K. 1982. Toward a Cognitive Psychology of Syntax: Information Processing Contributions to Sentence Formation. *Psychological Review, 89*, 1-47.

Bolinger, Dwight. 1967. Adjectives in English: attribution and predication. *Lingua, 18*, 1-34.

Cinque, Guglielmo. 2010. *The syntax of adjectives: A comparative study*. Linguistic Inquiry Monographs 57. Cambridge, MA: MIT Press.

Deese, J. 1964. The Associative Structure of Some Common English Adjectives. *Journal of Verbal Learning and Verbal Behavior, 3*, 347-357.

Dixon, R. M. W. 1977. Where Have all the Adjectives Gone? *Studies in Language, 1*, 19-80.

Ertel, S. 1971. Pränominale Adjektivfolgen und semantische Tiefenstruktur. *Studia Psychologica, 13*, 127-137.

Goyvaerts, D. L. 1968. An Introductory Study on the Ordering of a String of Adjectives in Present-day English. *Philologica Pragensia, 11*, 12-28.

Hetzron, R. 1978. On the Relative Order of Adjectives. In H. Seiler (Ed.), *Language Universals* (pp. 165-184). Tübingen: Narr.

Kilgarriff, A. 1997. I don't believe in word senses. *Computers and the Humanities, 31*, 91-113.

Lapata, M., S. McDonald, & F. Keller 1999. Determinants of Adjective-Noun Plausibility. *Proceedings of the 9th Conference of the European Chapter of the Association for Computational Linguistics,* 30-36.

Lockhart, R. S., & J. E. Martin 1969. Adjective Order and the Recall of Adjective-Noun Triples. *Journal of Verbal Learning and Verbal Behavior, 8*, 272-275.

Martin, J. E. 1969. Semantic Determinants of Preferred Adjective Order. *Journal of Verbal Learning and Verbal Behavior, 8*, 697-704.

Ney, J. W. 1983. Optionality and Choice in the Selection of Order of Adjectives in English. *General Linguistics, 23*, 94-128.

Panayidou, Fryni. 2013. (In)flexibility in Adjective Ordering. Doctoral Dissertation, Queen Mary, University of London.

Posner, R. 1986. Iconicity in Syntax. The Natural Order of Attributes. In P. Bouissac, M. Herzfeld, & R. Posner (Eds.), *Iconicity. Essays on the Nature of Culture* (pp. 305-337). Tübingen: Stauffenburg Verlag.

Quirk, R., S. Greenbaum, G. Leech, & J. Svartvik (Eds.) 1985. *A Comprehensive Grammar of the English Language.* London: Longmans.

Richards, M. M. 1975. The Pragmatic Communication Rule of Adjective Ordering: A Critique. *American Journal of Psychology, 88*, 201-215.

Richards, M. M. 1977. Ordering Preferences for Congruent and Incongruent English Adjectives in Attributive and Predicative Contexts. *Journal of Verbal Learning and Verbal Behavior, 16*, 489-503.

Stubbs, M. 2001. *Words and Phrases: Corpus Studies of Lexical Semantics.* Cornwall: Blackwell.

Teodorescu, A. 2006. Adjective Ordering Restrictions Revisited. *Proceedings of the 25th West Coast Conference on Formal Linguistics*, 399-407. Somerville, MA: Cascadilla Proceedings Project.

Truswell, R. 2009. Attributive adjectives and nominal templates. *Linguistic Inquiry, 40*, 525-533.

Whorf, B. L. 1945. Grammatical Categories. *Language, 21*, 1-11.

Wulff, S. 2003. A multifactorial corpus analysis of adjective order in English. *International Journal of Corpus Linguistics, 8:2*, 245-282.