Restrictiveness and the scope of adjectives[1]

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Abstract. I examine the compositional properties of nonrestrictive adjectives, those which are used not to identify referents but to provide additional information about them. By considering the interaction of nonrestrictive adjectives with non-intersective adjectives like *other*, I argue that some nonrestrictive adjectives must take scope over the DP they modify, following Potts (2005). I extend the analysis to account for nonrestrictively modified quantifier phrases, using an anaphoric semantics in line with recent approaches to nominal appositives (e.g. Nouwen 2014), whereby nonrestrictive modifiers are anaphoric to the entity they modify. I provide a compositional dynamic fragment based on Charlow (2014, 2015) that account for a variety of sentences with nonrestrictive adjectives.

Keywords: nonrestrictive adjectives, restrictiveness, scope, anaphora

1. Introduction

Canonical uses of adjectives are restrictive, where they help narrow down the set of potential referents by specifying a subset of the nouns they modify, as in (1). In this example, *my sick dogs* refers not to all of the speaker's dogs, but the subset of the speaker's dogs which are sick.

(1) I have five dogs, but two aren't feeling well. I need to take my sick dogs to the vet.

If adjectives were only used for identifying nominal referents, then uttering (2a), where all of the speaker's dogs are sick, would be using more words than necessary, a violation of the Gricean Maxim of Manner, since *my sick dogs* and *my dogs* are co-referential. But unnecessary uses of adjectives like in (2a) are commonly uttered, and they seem to be serving a different purpose. Rather than being used to identify referents, it contributes information about the referent, such as conveying that the speaker's dogs are sick, and that this is relevant to why they need to be taken to the vet. These uses are nonrestrictive, and there is no consensus on how nonrestrictive adjectives (NRAs) should be analyzed, or whether their compositional semantics differs from restrictive adjectives at all.

(2) I have five dogs, but they aren't feeling well.
   a. I need to take my sick dogs to the vet.
   b. I need to take my dogs, who are sick, to the vet.

Nonrestrictive adjectives are often paraphrased and felt to be synonymous with appositive relative clauses (ARCs) like (2b). Based on this similarity, some linguists have analyzed nonrestrictive adjectives as covert DP-level modifiers, in effect giving the adjectives scope over their hosting descriptions (e.g. Potts 2005, Leffel 2014). However, nonrestrictive adjectives can modify all kinds of quantificational DPs, while appositives are much more restricted. This

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led Morzycki (2008) to an alternate analysis leaving NRAs in-situ where they contribute information to a second, supplemental semantic dimension about the maximal set of referents satisfying the modified noun. There are yet other accounts which treat nonrestrictiveness as a pragmatic epiphenomenon, instead giving an ordinary intersective compositional semantics (e.g. Esipova 2019).

After briefly summarizing previous analyses of nonrestrictive adjectives, I argue that at least some nonrestrictive adjectives must take scope over the DP they modify, based on interactions with non-intersective adjectives like *other*. While (3) presupposes that at least some of the dogs washed yesterday were white, (4) does not. In addition, (4) entails all of the dogs that were not washed yesterday are white. On the other hand, in (3), the dogs that were not washed yesterday includes white dogs but could also include dogs of other colors.

(3) I washed some of the dogs yesterday, and today I'll wash the other white dogs.

(4) I washed some of the dogs yesterday, and today I'll wash the other, WHITE dogs.

I will show how interpreting a nonrestrictive adjective out of the scope of its host DP gives both the proper presupposition for *other* and the proper nonrestrictive interpretation of the adjective. While these data cannot be accounted for by most of the previous analyses I review, it is broadly consistent with Potts (2005). His analysis can be extended to account for additional cases, specifically modified quantifier phrases, using an anaphoric semantics more in line with recent approaches to nominal appositives (e.g. Nouwen 2014). After an informal presentation of my proposed analysis, I provide a compositional fragment analyzing nonrestrictive adjectives, based on Charlow's (2014) compositional dynamic semantics. Finally, I conclude by presenting open questions regarding nonrestrictive adjectives not addressed in this paper and areas that need further research.

2. Previous work

Previous research on nonrestrictive adjectives can be grouped into two broad groups: pragmatic accounts and semantic accounts. Pragmatic accounts attempt to derive nonrestrictive inferences via principles of conversational reasoning, whereas semantic accounts propose some conventionalized mechanism to derive such inferences.

2.1. Pragmatic accounts

In English, there is no obvious conventional way (morphological, syntactic, or prosodic) to mark the (non)restrictiveness of adjectives, unlike the prominent intonational break of nonrestrictive relative clauses.[2] In addition, in many cases like (5) below, the nonrestrictive reading entails the restrictive one. This has lead some to claim that nonrestrictive inferences are pragmatically derived, and that the semantic system only derives the restrictive reading.

(5) I just finished writing my long and tedious manuscript.
   a. restrictive: I just finished writing the manuscript of mine which is long and tedious.

[2]While I later discuss some intonational patterns which correlate with nonrestrictiveness in some cases, it is important to note that the intonation does not occur with *all* nonrestrictive adjectives.

b. nonrestrictive: I just finished writing my one and only (salient) manuscript; it is long and tedious.

Esipova (2019), following Schlenker (2005) claims there is no compositional semantic distinction between restrictive and nonrestrictive interpretations. Rather, she argues that what I have called the nonrestrictive inference of a sentence – e.g. in (5), that my manuscript is long and tedious – arises as a pragmatic inference whenever a speaker communicates that they have intentionally used an unnecessary modifier; that is, when a speaker uses a modifier knowing full well that it does not change the truth value of the sentence it is in.

An obvious question for accounts of this kind is how speakers manage to communicate such specific metalinguistic information. Presumably, by hypothesis, the process is not conventionalized, since this is intended to be an alternative to conventionalized implicature analyses. But at the same time, adjectives can be construed to be nonrestrictive even when listeners are a priori unaware of the semantic equivalence between the sentence and its modifier-removed alternative, as in (5). It is not clear what general principle of rational communication would lead an addressee to believe the speaker is being needlessly verbose if they do not already have enough information to know that the verbosity is needless. Of course, in these circumstances, ordinary Maxim of Manner reasoning would put an opposing pressure on the rational addressee to assume, absent contravening knowledge, that the speaker is not being intentionally wordy.

Esipova makes use of the fact that there are many reasons why a modifier might turn out to be vacuous in context. Faced with an utterance in which modifier-vacuity has been signaled, the addressee is presumably free to assume the speaker is conveying anything (or at least, the weakest inference) that would entail the truth-conditional equivalence of the modifier-containing and modifier-less versions of the uttered sentence. This is what leads to conditionalized nonrestrictive inferences in examples like (6). However, this freedom also overgenerates in ordinary cases such as (7).

(6) If all philosophers ask questions like this, I don't want any obnoxious philosophers at my talk next week. (Esipova 2019)
   a. correct inference: If all philosophers ask questions like this, they are all obnoxious.

(7) Paige didn't bring her cute puppy.
   a. correct nonrestrictive inference: Paige's puppy is cute.
   b. predicted (incorrect) possible inference: If Paige didn't bring her puppy, it is cute.

Nevertheless, Esipova (2019) provides a detailed and valuable study on the projection properties of nonrestrictive adjectives. She concludes that the behavior of nonrestrictive adjectives in discourse resembles gender presuppositions, and this holds even when we expand the range of nonrestrictive adjectives to be examined (Chang 2022).

2.2. Semantic analyses

In light of the systematic restrictive/nonrestrictive ambiguity in adjectives, several authors have sought semantic derivations of the contrasts, such as Potts (2005), Morzycki (2008), and Leffel (2014). I will describe and compare the first two, providing a rough sketch of each.

Potts (2005) treats nonrestrictive adjectives just like appositives, giving them scope over the DP they modify (see also Leffel 2014). Nonrestrictive modifiers (adjectives and relative clauses) then serve as functions from the modified entities to truth values in a secondary dimension of meaning, as shown in (8). However, he predicts that nonrestrictive adjectives, like appositives, cannot modify quantifier phrases, since nonrestrictive modifiers are only able to take type e arguments. This is not true for adjectives, as shown in Morzycki (2008) and later in Section 4.[3] Below is a rough sketch of Potts' analysis, using the bullet to separate at-issue from not-at-issue content, for both semantic content and types.

(8) Chuck's lovely vases
$\textsf{vases-of}(\textsf{chuck}) \bullet \textsf{lovely}(\textsf{vases-of}(\textsf{chuck})) : e \bullet t$

Morzycki (2008) focuses on quantifier phrases with nonrestrictive adjectives, which generate different inferences from nonrestrictively modified referential phrases. Nonrestrictive adjectives in quantifier phrases generate a "sum-level inference" (Leffel 2014), which means the entire set denoted by the noun is in the extension of the adjective, as shown in (9). For him, a nonrestrictive adjective modifies the noun directly (not the DP), in all cases predicated on the maximal set of entities which have the property of the noun, within the contextually relevant domain C. This is shown in (10), with an example in (11).

(9) Few lazy senators voted for the bill.
nonrestrictive inference: the senators are lazy

(10) Expressive Predicate Modification (Morzycki 2008)

$$\beta \bullet \alpha(\Sigma\beta) : (e \to t) \bullet t$$

$$\alpha : e \to t \qquad \beta : e \to t$$

where the modifier is α and the modified expression is β; $\Sigma\beta$ picks out the maximal plural individual in the extension of β.

(11) Every [unsuitable (= α) word$_C$ (= β)] was deleted.
$\textsf{every}(\lambda x.\, \textsf{word}\, x \wedge x \in C)(\textsf{deleted}) \bullet \textsf{unsuit}(\Sigma(\lambda x.\, \textsf{word}\, x \wedge x \in C)) : t \bullet t$
inference: every word is unsuitable

His analysis is able to handle nonrestrictively modified quantifier phrases with any quantifier. This is because the inference it generates does not depend on the quantificational force of the quantifier, which is in line with the data: all quantifier phrases can lead to sum-level inferences, which are predicated on the maximal restrictor set and ignore the quantificational force of the quantifier.

3. The scope of non-intersective adjectives

Many non-intersective adjectives display interesting scopal interactions with other adjectives in the same DP. If an adjective *Adj* is intersective, then *X is an Adj N* entails *X is Adj* and *X is an N*. On the other hand, non-intersective adjectives have meanings which are dependent on the

[3] In fact, this is not true for appositives either (Arnold 2004, Del Gobbo 2007).

noun they modify, and do not exhibit the entailment pattern shown by intersective adjectives (e.g. Siegel 1967).

In this section, I examine the interactions these non-intersective adjectives have with other adjectives in the same DP by looking at examples with *other*. I show that under certain readings, adjectives that follow *other* must be interpreted as nonrestrictive. While my examples use *other* for clarity, the properties I describe apply to other non-intersective adjectives as well, which I show at the end of this section.

Let us start by examining the properties of *other* to formulate a simple denotation. *Other* is often used to convey to listeners which entity or entities they are referring to from a given set by contrasting what the speaker is referring to with previously mentioned or contextually salient entities, which I call the antecedent of *other*. In the following examples, I give an explicit linguistic antecedent for *other* to create contrast with, but *other* can take its antecedent from the extralinguistic context.

As shown in (12), *other* requires an antecedent which bears the property denoted by its sister. In this example, the antecedent is *my little poodle*, which bears the property of *dog*, but not *cat*, explaining why it is infelicitous to say *my other cat* in this context.

(12) Over there is my little poodle. My other {dog/#cat} is with my parents right now.

I assume, following Kamp (2001), that *other* is anaphorically linked to this antecedent and presupposes that the antecedent has the property of its sister, P. *Other* also requires that its subject and antecedent are disjoint, which I represent with $\neq$.[4]

(13) $[\![\text{other}_i]\!]^g = \lambda P : P(g_i).\, \lambda x.\, P(x) \wedge g_i \neq x$

It follows from the denotation in (13) that if a restrictive adjective appears in the first argument of *other*, the antecedent will be presupposed to satisfy that adjective, as in (14). In this example, *the other small book* presupposes that the antecedent book is small, and this presupposition is satisfied by the information given in the first half of the sentence. On the other hand, because the antecedent is small, it is infelicitous to use *the other large book* here. This is explained if the first argument of *other* is *small/large book*, not just *book*, and thus the adjective contributes to the presupposition in addition to the noun.

(14) *(Scenario: I give you two small books and two large books, and point to a small book.)*
Leave that small book on the table, and put the other {small/#large} book on the shelf.

However, with the right intonation, cases like (15) or (16) are also felicitous, where an adjective (here, *larger* or *white*) modifying the noun modified by other does not describe the antecedent.

[4]The reason disjointness is asserted and not presupposed is clearer with indefinites, such as *two other dogs*. In (i), the discourse is felicitous even if there are only two dogs, not four. B's denial of A's assertion involves B denying that the dogs John washed were disjoint from the first group, and *two other dogs* does not presuppose the existence of a third or fourth dog.

(i) A: John washed these two dogs yesterday, and he washed two other dogs today.
B: No he didn't, today he washed the same dogs as he did yesterday!

The relevant intonational cues seem to involve a prosodic break before the relevant adjective, and stress on that adjective, which bring out the nonrestrictive interpretation of the adjective. I discuss the importance of this intonational pattern further in Chang (2022), but I leave a systematic study of the intonation of nonrestrictive adjectives for future work.

Because the examples are acceptable despite the antecedent not being the extension of the adjective, the adjective must not be part of the presupposed predicate. Specifically, in (15), *the other, larger book* does not presuppose that the antecedent book is a "larger book", but merely that it is a book.

(15) *(Scenario: I give you a small book and a large book, and point to the small book.)*
Leave that small book on the table, and put the other, LARGER book on the shelf.

(16) I washed the black dogs today, and I'll wash the other, WHITE dogs tomorrow.

I will call adjectives like this "contrasting", i.e. adjectives between *other* and the noun they modify, but which do not describe the antecedent and thus do not contribute to its presupposition. Examples include *larger* in (15) and *white* in (16). Note that nouns cannot be contrasting in this sense; in the infelicitous example (17), *the red umbrella* is not sufficient to satisfy the presupposition of *the other red book*, since (17) presupposes that there is a red book, not just any red object.

(17) # Leave the red umbrella on the table, and put the other(,) red(,) BOOK on the shelf.

Crucially, contrasting adjectives do not merely commute with *other*; they are necessarily interpreted nonrestrictively. In other words, they are taken to apply to the entire class of objects in the extension of the *other* NP. For instance, (18a) cannot be used to refer to those books which are both larger than and different from the antecedent; instead it commits the speaker, infelicitously here, to all of the other books in the office being larger than the one they picked up. Note that an ordinary restrictive reading like (18b) is also grammatical; however, it is also infelicitous because it is contradictory by assuming that the antecedent book is larger than itself.

(18) *(Scenario: You enter my office with books everywhere. I pick up an average-sized book. You notice there are only two books larger than the one I picked up but many smaller ones.)*

a. # Take this book home, and put the other, LARGER books on the shelf. NR

b. # Take this book home, and put the other larger books on the shelf. R

Similar patterns can be observed with other non-intersective adjectives whose semantic contributions are affected by the phrases they modify, such as superlatives, ordinals, and exclusives like *only*. Example (19) contains a minimal pair, differentiated only by intonation.[5] In the first example, with no pauses, *utterly useless* is restrictive and the VHS Pat bought was the last utterly useless one, with the possibility of some non-useless VHS tapes remaining at the sale. In the second example (with pauses), *utterly useless* is nonrestrictive and the VHS Pat bought was the last one overall.

[5]One can replace *last* with *only*, *oldest*, etc. to construct additional examples.

(19) a. Pat bought the last utterly useless VHS tape from the garage sale. R
≈ Pat bought the last VHS tape which was useless (perhaps there are more)
b. Pat bought the last, utterly USELESS, VHS tape from the garage sale. NR
≈ Pat bought the last VHS tape; it was useless (there are no more VHS tapes)

I have shown that some adjectives cannot be interpreted within the scope of their DP, and I will discuss how to handle this issue in the following sections. But first, I would like to comment on the relationship between these examples and pragmatic accounts of nonrestrictive adjectives.

Some of the examples I present display notable entailment patterns between the two readings. In (19), the nonrestrictive reading entails the restrictive one. That is, if it is true that Pat bought the last VHS tape at the garage sale (which happened to be useless), it is also true that Pat bought the last item which was both a VHS tape and useless. In these cases, it is possible to say that the adjective is always restrictive, and that the nonrestrictive reading happens to be true if the context is right (Esipova 2019) or that the nonrestrictive reading is the result of strengthening the restrictive reading in certain contexts.

However, there are cases in which such a pragmatic account is impossible due to the lack of entailment patterns. The examples with *other* (or *second*, *next*, etc.) crucially do not display the entailment patterns just described.

(20) a. I washed these dogs today, and I'll wash the other white dogs tomorrow. R
b. I washed these dogs today, and I'll wash the other, WHITE dogs tomorrow. NR

In (20), the restrictive interpretation commits the speaker to washing the intersection of dogs not washed today and white dogs, but says nothing about dogs of other colors. In addition, the dogs washed today are white. On the nonrestrictive interpretation, all the other dogs (all the dogs the speaker is not pointing to) are white and being washed tomorrow. In this example, neither the restrictive reading nor the nonrestrictive reading entail the other, so the nonrestrictive reading cannot be reduced to a special subcase of the restrictive reading. Thus, the nonrestrictive reading must be derived independently in the semantics.

There are two crucial properties of contrasting adjectives that need to be captured in any analysis. As shown in (18a), repeated below in (21), and similar examples, contrasting adjectives need to i) escape the semantic scope of *other*, and ii) be interpreted nonrestrictively. That is, *larger* does not and cannot describe the antecedent book, and *all* non-antecedent books must be larger than this antecedent.

(21) *(Scenario: You enter my office with books everywhere. I pick up an average-sized book. There are only two books larger than the one I picked up but many smaller ones.)*
Take this book home, and put the other, LARGER books on the shelf.

An analysis similar to Potts (2005) or Leffel (2014) can account for these two properties. In effect, nonrestrictive adjectives scope over their host DP and take it as an argument, and return a two-dimensional result: one dimension contains the DP argument unchanged, and the secondary component says the DP has the property of the adjective.[6]

[6]I make no specific claims about the discourse status of the secondary dimension. It is simply used to facilitate

While only some examples (e.g. those with *other*, *second*, etc. + a contrasting adjective) require a special analysis for deriving the nonrestrictive interpretation, this analysis in principle can apply to all nonrestrictive readings, even those in which there is an entailment relationship between the restrictive and nonrestrictive readings. Thus, I leave open whether *all* nonrestrictive adjectives should be treated specially as such, but there is no harm in supposing they do.

Interpreting the contrastive adjective *larger* out of the scope of the DP simultaneously accounts for i) how the nonrestrictive predication is generated, and ii) why *larger* does not describe the antecedent of *other*. This is illustrated in (23b), which is the intended meaning of (22b), and contrasts with an ordinary restrictive adjective in (23a), which corresponds to (22a).

(22) *(Scenario: There are two books on the table. I point to one of the books.)* Put this^i book on the shelf, and take home...
   a. the other$_i$ small book. (restrictive)
   b. the other$_i$, LARGER book. (nonrestrictive)

(23) a. $[\![[\text{the } [\text{other}_i\ [\text{small book}]]]]\!]^g$ presupposes $\mathbf{small}(g_i) \wedge \mathbf{book}(g_i)$
   foregrounds $\iota x.\mathbf{small}(x) \wedge \mathbf{book}(x) \wedge g_i \neq x$

   b. $[\![[\text{larger } [\text{the } [\text{other}_i\ \text{book}]]]]\!]^g$ presupposes $\mathbf{book}(g_i)$
   foregrounds $\iota x.\mathbf{book}(x) \wedge g(i) \neq x$
   backgrounds $\mathbf{larger}(\iota x.\mathbf{book}(x) \wedge g_i \neq x)$

Because contrasting adjectives need to be interpreted outside the scope of the DP, many of the analyses discussed in the previous section, such as Morzycki (2008) or Esipova (2019), are insufficient. This is because they interpret (all) nonrestrictive adjectives within the DP they modify, and thus generate incorrect presuppositions for *other*. That is not to say that their analyses do not capture the data they intended to explain well, but that their analyses cannot be extended to the data I introduce in this paper. In the next two sections, I will develop an analysis based on Potts (2005) to account for additional cases of nonrestrictive adjectives.

4. Modified quantifier phrases

In the previous section, I presented an argument for why nonrestrictive adjectives must be interpreted out of the scope of the DP they modify. It is easy to, following Potts, give a nonrestrictive adjective scope over a definite DP, because the adjective, being type $e \to t$, can be predicated on the referent of the definite DP. However, this analysis will not work for nonrestrictively modified quantifier phrases.

Quantifier phrases have type $(e \to t) \to t$, which is not compatible with the preliminary analysis presented above. Although nonrestrictive adjectives contribute similar backgrounded content as appositive relative clauses, the distribution of nonrestrictive adjectives in quantifier phrases is much less restricted. Nonrestrictive adjectives can modify essentially any kind of quantifier phrase, and they generate different kinds of inferences when compared to appositives. Thus, a Potts-style analysis is insufficient to explain the behavior of nonrestrictive adjectives in quantifier phrases, and it was this insufficiency that led to Morzycki's (2008) analysis, which can also handle modifier quantifier phrases.

composition, whereby a nonrestrictive adjective turns a DP into a DP with additional content (the nonrestrictive inference), allowing composition to continue as it would without the nonrestrictive adjective.

One major distinction between nonrestrictive adjectives and appositive relative clauses concerns their attachment properties. Appositives cannot attach to many quantifier phrases, as in (25), while nonrestrictive adjectives can do so freely (24). While there are examples of quantifier phrases with appositives (Arnold 2004, Del Gobbo 2007), there seem to be more restrictions on their occurrence.

(24) I deleted every embarrassing message.
   a. nonrestrictive: I deleted every message. They were embarrassing.
   b. restrictive: I deleted every message which is embarrassing (but not necessarily those that are not embarrassing).

(25) appositive relative clause: *I deleted every message, which is/are embarrassing.
intended meaning = (24a)

Not only are nonrestrictive adjectives able to modify a variety of DPs, they generate several kinds of inferences as well, which differ based on what the speaker intends to modify. There are three main kinds of nonrestrictive adjective inferences: individual, kind, and sum (Leffel 2014).

(26) I need to take my sick mother to the hospital.
   a. individual-level inference: my mother is sick

(27) Entitled millennials are ruining the economy.
   a. kind-level inference: millennials are entitled

(28) I deleted every unsuitable word.
   a. sum/subkind-level inference: the words in my paper were unsuitable

Individual-level inferences describe the referent of the DP, when there is one. *Sick* in (26) describes the referent of "my mother". Kind-level inferences describe the entire kind denoted by the noun, such as the kind "millennial" in (27) (Carlson 1977). Finally, sum-level inferences describe a group of entities, within a contextually domain-restricted set. Sum-level inferences comment on the maximal set, or "maxset" (Evans 1977), which is the set corresponding to the restrictor of the quantifier. This occurs regardless of whether the quantifier is universal (like *every*) or not; in other words, sum-level inferences ignore the quantificational force.

How do individual-level inferences work in the case of quantifier phrases, where there is no explicit referent? The closest notion of a referent for quantifier phrases would be the witness set, i.e. the intersection of the restrictor set and the scope set. However, this interpretation is generally not available. For example, (29) cannot be used to convey that the senators who voted for the bill are lazy, which would be the individual-level inference. Typically, (29) means that all of the relevant senators are lazy. Because the maximal set of relevant senators is modified, this is the sum-level inference. A kind-level inference is also available, but not as prevalent as the sum-level, and in practice it can be hard to distinguish between the two.

(29) Few lazy senators voted for the bill.
   a. # individual-level inference: the senators who voted for the bill are lazy

b. sum-level inference: the senators (in the US) are lazy

c. kind-level inference: senators in general are lazy

Thus, the form of the DP affects what kind of inferences nonrestrictive adjectives can lead to. Although the focus will be on deriving individual-level inferences from referential DPs and sum-level inferences from quantificational DPs, I will suggest some ways in which kind-level inferences can be derived at the end of this section.

4.1. An anaphoric analysis

I suggest that nonrestrictive adjectives mirror patterns seen with nominal appositives.[7] It has long been argued that appositives are linked anaphorically to their anchors (e.g. Sells 1985, Arnold 2004, Nouwen 2007) in that the felicity of an appositive closely corresponds to the felicity of downstream discourse anaphora. For instance, singular appositives cannot modify distributive quantifiers, just as singular pronouns cannot be bound outside of their scope (30). On the other hand, plural appositives can comment on the plurality of elements satisfying the distributive quantifier's restrictor, just as a subsequent plural pronoun can (31).

(30) a. * Every climber, an experienced adventurer, made it to the summit.

b. * Every climber made it to the summit; he was an experienced adventurer.

(31) a. Every climber, all experienced adventurers, made it to the summit.

b. Every climber made it to the summit; they were all experienced adventurers.

In this section, I informally show how nonrestrictive adjectives can be analyzed as anaphoric to the entity they modify, i.e. to the DP immediately containing them. This allows us to account the properties of contrasting adjectives described in the previous section, while also unifying the definite, indefinite, and quantificational cases. In the next section, I present a formal compositional dynamic fragment that captures the analysis informally described in this section.

I denote adjectives to be interpreted nonrestrictively as labeled with NR. A nonrestrictive adjective is anaphoric to a discourse referent u, written NR_u. NR_u converts adjectives which are restrictive by default into a nonrestrictive adjective which modifies the discourse referent denoted by u. Contrasting adjectives to the right of *other* still need to escape the semantic scope of *other*, so nonrestrictive adjectives are interpreted outside of the DP they modify. This also prevents an adjective anaphoric to u from being evaluated within the DP that introduces that same discourse referent.

In the informal analysis below, I use ιx or $\iota x.Px$ to pick out the unique x that satisfies P, and similarly Σx or $\Sigma x.Px$ to pick out the maximal set of x that satisfy P. Operators such as these and existential $\exists$ can introduce discourse referents as superscripts. When subscripted, these discourse referents are evaluated with respect to an assignment function g. Definite and indefinite DP cases are straightforward to account for.

[7] I chose to draw explicit comparisons between nonrestrictive adjectives and nominal appositives due to the fact that appositive relative clauses are more restricted in their usage, especially in quantifier phrases. However, it turns out that both nominal appositives (Nouwen 2014) and appositive relative clauses (Del Gobbo 2007, Schlenker 2022) have been analyzed as anaphoric, and my analysis of nonrestrictive adjectives follows the spirit of both.

(32) Definite DP: The^u lazy-NR$_u$ student slept.
$[\![$[[lazy-NR$_u$ [the^u student]] slept]$]\!]^g$ asserts $\mathsf{sleep}(\iota^u\,\mathsf{student})$
backgrounds $\mathsf{lazy}\,g_u$

(33) Definite DP with *other*: The^u other$_i$, blue-NR$_u$ book is missing.
$[\![$[[blue-NR$_u$ [the^u [other$_i$ book]]] is missing]$]\!]^g$ presupposes $\mathsf{book}\,g_i$
asserts $\mathsf{missing}(\iota^u x.\,\mathsf{book}\,x \wedge x \neq g_i)$
backgrounds $\mathsf{blue}\,g_u$

(34) Indefinite DP: Some^u annoying-NR$_u$ child attended.
$[\![$[[annoying-NR$_u$ [some^u child]] attended]$]\!]^g$ asserts $\exists^u x \in \mathsf{child}.\,\mathsf{attend}\,x$
backgrounds $\mathsf{annoying}\,g_u$

In (32), the backgrounded content is $\mathsf{lazy}\,g_u$. The discourse referent u refers to the individual denoted by *the student*, so the backgrounded content says that the student is lazy, as desired. Similarly, in (33), the backgrounded content $\mathsf{blue}\,g_u$ evaluates to "the other book is blue". Since *blue* is not evaluated in the scope of *other*, the correct presupposition is predicted as well: the antecedent is a book, not a blue book. Finally, discourse referents introduced by indefinites pose no problem; the backgrounded content in (34) states that the child that the speaker is describing as an attendee is annoying.

Examples like (35) show that non-intersective adjectives like *talented* can be used as a contrasting adjective in the scope of *other*.

(35) A beginner dancer was struggling in class, so the other, talented dancers helped him.

Adjectives like *talented (dancer)*, *possible (winner)*, or *recent (retiree)* are often analyzed as taking the noun they modify as an argument (e.g. Morzycki 2016). That is, they do not combine with the modified noun via set intersection, but via set subsection. An individual can be talented in one domain, but not talented in the other. If *talented* denoted a set of individuals who are talented, then a talented dancer and untalented singer would be predicted to also be a talented singer and untalented dancer. Because this inference should not hold, adjectives like *talented* are subsective adjectives, not intersective, and should take the noun as an argument.

Non-intersective contrasting adjectives can also be handled by this anaphoric analysis. Since the non-intersective adjective *talented* needs to take the noun *dancers* as an argument to determine the kind of talent to attribute to the dancers, I propose that the noun and adjective both scope out of the DP. The noun leaves a trace p, which is later filled in by the noun.[8]

(36) Non-intersective contrasting adjective: The^u other, talented-NR$_u$ dancers came.
$[\![$[[[talented-NR$_u$ dancers] [$\lambda\,p$ [the^u other p]]] came]$]\!]^g$ presupposes $\mathsf{dancers}\,g_i$
asserts $\mathsf{came}(\Sigma^u x.\,\mathsf{dancers}\,x \wedge x \neq g_i)$
backgrounds $\mathsf{talented\ dancer}\,g_u$

[8] In section 3, I claimed that (at least some) nonrestrictive adjectives must be interpreted outside of the DP they are in. This is the only kind of example that also requires the noun to be interpreted alongside the adjective, but for simplicity, I present similar derivations for all of the examples in section 5, where I scope both the adjective and noun outside of the DP in all nonrestrictive examples.

Finally, I illustrate how the anaphoric analysis derives sum-level inferences from modified quantifier phrases. In (37), *every*^{u} introduces a discourse referent that corresponds to the maximal set of entities which satisfy the restrictor (Evans 1977). Thus, the backgrounded content $\textbf{unsuitable}\,g_u$ evaluates to $\textbf{unsuitable}\,(\Sigma\,\textbf{word})$. Similarly, in (38), g_u evaluates to $\Sigma\,\textbf{senator}$, the maximal set of all relevant senators, and the backgrounded content states that all relevant senators are lazy.[9]

(37) Quantifier DP: Every^u unsuitable-NR$_u$ word was deleted.
$[\![$[unsuitable-NR$_u$ [[every^u word] was deleted]]$]\!]^g$ asserts $\forall^u x \in \textbf{word}.\,\textbf{deleted}\,x$
backgrounds $\textbf{unsuitable}\,g_u$

(38) Quantifier DP: Few^u lazy-NR$_u$ senators voted.
$[\![$[lazy-NR$_u$ [[few^u senators] voted]]$]\!]^g$ asserts $\text{FEW}^u x \in \textbf{senator}.\,\textbf{voted}\,x$
backgrounds $\textbf{lazy}\,g_u$

5. Formal semantic fragment

In this section, I show how nonrestrictive adjectives can be analyzed as anaphoric update modifiers using post-suppositional techniques that have recently been applied to other scope-taking adjectives like modified numerals (Brasoveanu 2013) and superlatives (Bumford 2017). To analyze anaphora compositionally, I use a compositional dynamic semantics based on Charlow (2014). Additionally, following Charlow (2015), any content that can be made dynamic will be enriched with additional secondary meaning when necessary, allowing for backgrounded or not-at-issue content to be written and passed up the tree without affecting the at-issue composition (Giorgolo & Asudeh 2012).[10]

Like above, DPs introduce discourse referents, as denoted by superscripts, and nonrestrictive adjectives are anaphoric to these discourse referents, as denoted by subscripts. A node with type $\mathtt{M}_\alpha := g \to \{\alpha \times g\}$ denotes a dynamic update; it is a function from (input) assignments to sets of pairs of semantic content with type α and (output) assignments. α itself may be a pair of type $\beta \times t$, where t is a truth value storing not-at-issue/backgrounded content, separated from at-issue content with a bullet $\bullet$. The following two type-shifters will be used as necessary to facilitate composition: $\Uparrow$ to raise an element to an enriched, dynamic type, and $\star$ to combine functions with arguments of an enriched type.

(39) a. $x^{\Uparrow} := \lambda g.\,\{\langle x \bullet \top, g\rangle\}$ $\qquad \Uparrow :: \alpha \to \mathtt{M}_{\alpha\times t}$

b. $\star mk := \lambda g.\,\{\langle y \bullet s \wedge t, i\rangle \,|\, \langle x \bullet s, h\rangle \in mg, \langle y \bullet t, i\rangle \in kxh\}$
$\qquad \star :: \mathtt{M}_{\alpha\times t} \to (\alpha \to \mathtt{M}_{\beta\times t}) \to \mathtt{M}_{\beta\times t}$

To make denotations more readable, I definite two helper functions. TRUE takes a dynamic truth value (type $\mathtt{M}_t$) and evaluates it at a given context (type g); it returns true if there is any

[9] As an aside, kind-level inferences can also be derived if we assume that nouns (or at least nouns used as kinds) introduce kind-type discourse referents (Carlson 1977). (i) contains an example of the kind "elephants". The pronoun *they*$_u$ in the following sentence can refer to the kind "elephants". If kind-denoting nouns introduce kind-type discourse referents, a nonrestrictive adjective can pick up this discourse referent and modify the kind.

(i) Elephants^u are mammals. They$_u$ do not lay eggs.

[10] Dynamic composition is facilitated by the StateSet monad, and multidimensionality by the Writer monad.

output context such that the dynamic truth value is true, i.e. for any value of an indefinite. TRUE is thus a way to lower dynamic truth values into ordinary ones. MAX takes a function from entities into dynamic truth values, and returns the maximal group of entities such that the entities value the function true at the given input context (for any value of an indefinite). If there is only one such individual, the maximal set is a singleton set and thus returns a unique entity. Additionally, I define one type shifter in (42) which turns ordinary predicates into dynamic restrictors, i.e. functions from ordinary entities to dynamic truth values.

(40) $\text{TRUE} = \lambda m.\lambda g.\exists h.\langle \top, h\rangle \in m\,g$ $\qquad \text{TRUE} :: \mathtt{M}_t \to g \to t$

(41) $\text{MAX} = \lambda P.\lambda g.\Sigma y.\text{TRUE}\,(P\,y)\,g$ $\qquad \text{MAX} :: (e \to \mathtt{M}_t) \to g \to e$

(42) $p^{\blacktriangle} := \lambda x.\lambda g.\{\langle p\,x, g\rangle\}$ $\qquad {}^{\blacktriangle} :: (e \to t) \to e \to \mathtt{M}_t$

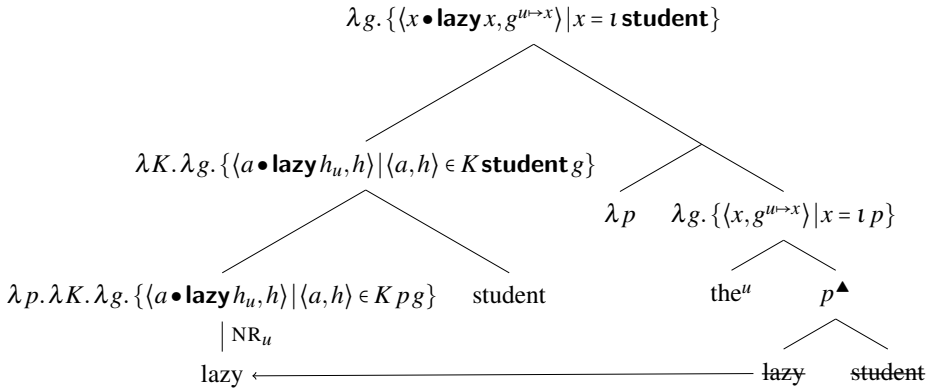
Table 1 shows all the lexical items needed for the examples in this section. NR_u is the nonrestrictive adjective type shifter for intersective adjectives, and NR-NI_u denotes the nonrestrictiveness type shifter for non-intersective adjectives. *et* abbreviates $(e \to t)$.

Item	Type	Denotation
blue	$e \to t$	$\lambda x.\mathbf{blue}\,x$
book	$e \to t$	$\lambda x.\mathbf{book}\,x$
talented	$(et) \to et$	$\lambda p.\lambda x.\mathbf{talented}\,p\,x$
other_i	$(e \to \mathtt{M}_t) \to e \to \mathtt{M}_t$	$\lambda P.\lambda x.\lambda g : [\text{TRUE}\,(P\,g_i)\,g].\{\langle p \wedge x \neq g_i, h\rangle \mid \langle p, h\rangle \in P\,x\,g\}$
some^u	$(e \to \mathtt{M}_t) \to \mathtt{M}_e$	$\lambda P.\lambda g.\{\langle x, g^{u \mapsto x}\rangle \mid \text{TRUE}\,(P\,x)\,g\}$
the^u_{PL}	$(e \to \mathtt{M}_t) \to \mathtt{M}_e$	$\lambda P.\lambda g.\{\langle x, g^{u \mapsto x}\rangle \mid x = \text{MAX}\,P\,g\}$
every^u	$(e \to \mathtt{M}_t) \to (e \to \mathtt{M}_t) \to \mathtt{M}_t$	$\lambda P.\lambda Q.\lambda g.\{\langle \forall x \forall h.\langle \top, h\rangle \in P\,x\,g \Rightarrow \text{TRUE}\,(Q\,x)\,h, g^{u \mapsto \text{MAX}\,P\,g}\rangle\}$
NR_u	$et \to et \to (et \to \mathtt{M}_\alpha) \to \mathtt{M}_{\alpha \bullet t}$	$\lambda q.\lambda p.\lambda K.\lambda g.\{\langle a \bullet q\,h_u, h\rangle \mid \langle a, h\rangle \in K\,p\,g\}$
NR-NI_u	$(et \to et) \to et \to (et \to \mathtt{M}_\alpha) \to \mathtt{M}_{\alpha \bullet t}$	$\lambda r.\lambda p.\lambda K.\lambda g.\{\langle a \bullet r\,p\,h_u, h\rangle \mid \langle a, h\rangle \in K\,p\,g\}$

Table 1: Example lexical items

First, I present a basic example without *other* or quantifiers, where the adjective *lazy* is interpreted nonrestrictively. While this simple example does not require scoping the adjective or treating it as anaphoric, I show it to demonstrate how it would look under the present analysis.

(43) the lazy_{NR} student



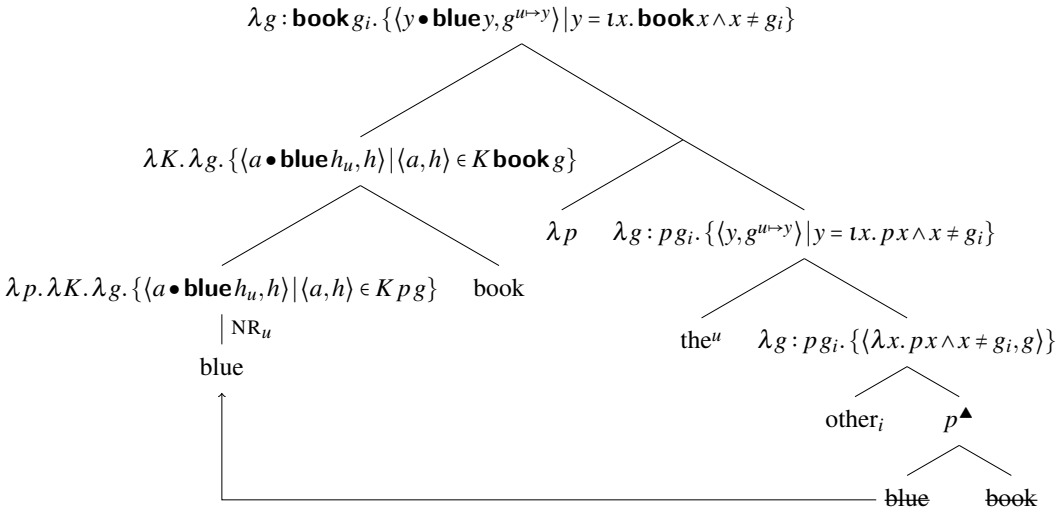
The nonrestrictive adjective *lazy* and the modified noun *student* are evaluated outside of the DP *the lazy student*. The trace left behind is type-shifted with ▲, and combines with the determiner. The trace p is then abstracted, and the denotation of *student* later fills in the abstracted

position. Meanwhile, the semantic contribution of *lazy* is forced by NR_u into a secondary dimension, written to the right of the bullet. The nonrestrictive adjective is anaphoric to the entity it modifies, the student, which has a discourse referent u. I show how this DP, which contains secondary meaning, can compose with the rest of a sentence in (44). The denotation of the sentence has primary content which says x slept and secondary content that says x is lazy, where x is the student in both cases.

(44) The lazy_{NR} student slept.
$[\![\star[\text{the lazy student}]\ [\lambda x\ [x\ \text{slept}]^{\Uparrow}]]\!] = \lambda g.\{\langle \textbf{slept}\, x \bullet \textbf{lazy}\, x, g^{u\mapsto x}\rangle \mid x = \iota\, \textbf{student}\}$

This analysis is able to handle contrasting adjectives in the scope of *other*. Below I contrast a nonrestrictive (contrasting) adjective in (45) with a restrictive one in (46). Since the adjective is anaphoric to the modified entity, the entity does not need to serve as the argument to the adjective. Thus, it is able to be interpreted outside the scope of *other* while contributing the nonrestrictive inference as desired.

(45) the other, blue_{NR} book NONRESTRICTIVE



The top-most node presupposes the existence of an antecedent book, g_i; the primary content is the unique book y which differs from the antecedent; and the secondary content states that y is blue. For comparison, below is *the other blue book*, where *blue* is restrictive.

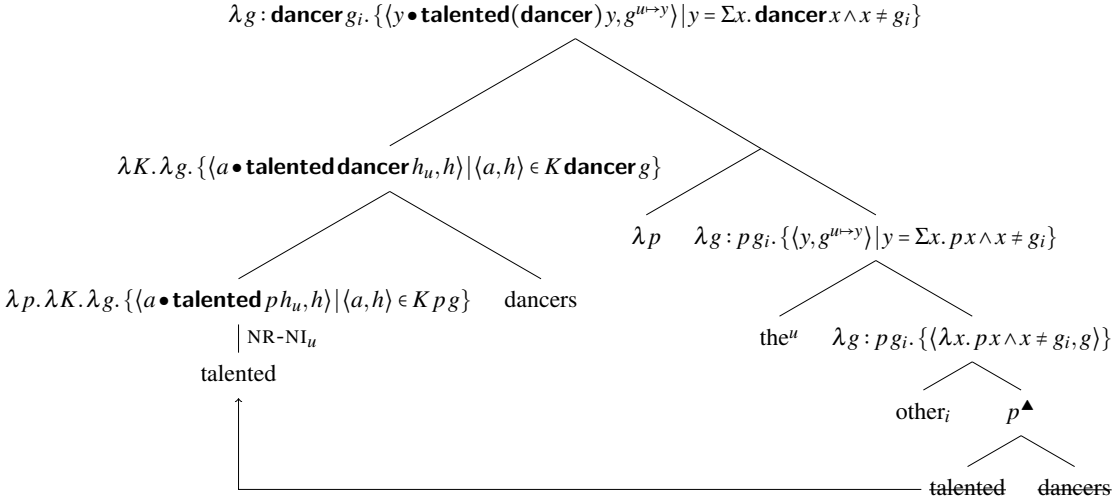
(46) the other blue_{R} book RESTRICTIVE
$[\![[\text{the}^u\ [\text{other}_i\ [\text{blue book}]]]]\!]$
$= \lambda g : \textbf{blue}\, g_i \wedge \textbf{book}\, g_i.\{\langle y, g^{u\mapsto y}\rangle \mid y = \iota x.\, \textbf{blue}\, x \wedge \textbf{book}\, x \wedge x \neq g_i\}$

In contrast with the nonrestrictive interpretation in (45), the restrictive *blue* in (46) contributes to the presupposition of *other*, such that the antecedent book is presupposed to be *blue* as well. Additionally, *blue* in fact has a restrictive role: it is presupposed (by *the*) that there is only one other blue book besides the antecedent, leaving open the possibility of existence of other books of other colors. There is no secondary or backgrounded content, unlike in (45).

Non-intersective contrasting adjectives like *talented* in *the other, talented dancers* can be analyzed in the same manner. Non-intersective contrasting adjectives require a slightly different

type-shifter to deal with the abstracted noun, which I call NR-NI. NR-NI differs from NR only in how the adjective combines with the noun; in this case, modification is set subsection, and thus, the adjective needs to take the noun as an argument. In the top-most node, the secondary content states not that *y* are talented, but that *y* are talented dancers.

(47) the other, talented dancers

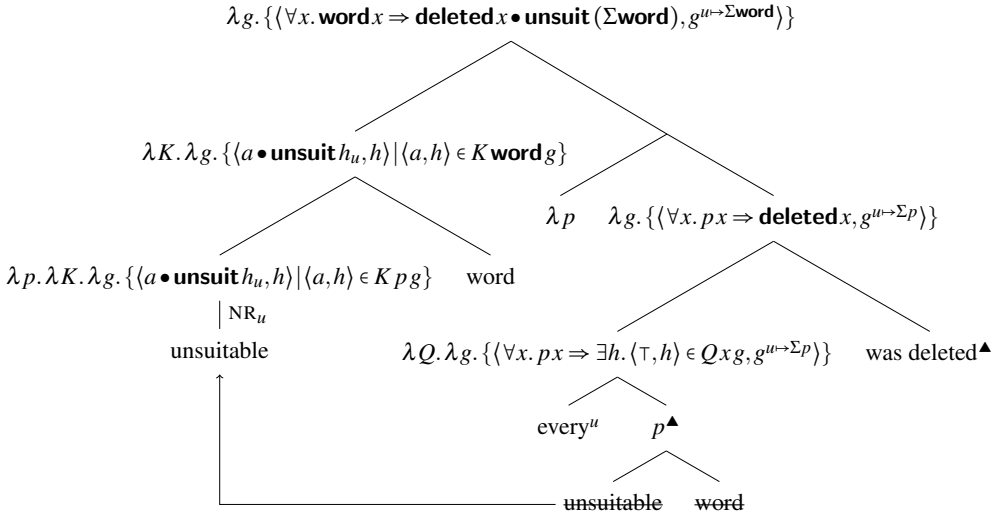


Example (48) contains an indefinite. Following Charlow (2014), indefinites are modeled as nondeterminism via sets of alternatives, so *some child* is a set of tuples whose first component is *x*, and *x* ranges over all the possible individuals who satisfy the property of "child". The indefinite *some* also introduces a discourse referent *u*, so g_u evaluates to whichever child the speaker referred to, and the background content says that that individual is annoying.

(48) some annoying child
$[\![[\text{annoying-NR}_u\ \text{child}]\ [\lambda p\ [\text{some}^u\ p^{\blacktriangle}]]]\!] = \lambda g.\, \{\langle x \bullet \mathbf{annoy}\, x, g^{u \mapsto x}\rangle \mid \mathbf{child}\, x\}$

Finally, the example below in (49) demonstrates how nonrestrictive adjectives in quantifiers work under an anaphoric analysis.

(49) every unsuitable word was deleted



The inference derived is, as desired, that all the words in the relevant context were unsuitable. Note that the quantificational force does not affect the inference generated by the nonrestrictive *unsuitable*; since all quantifiers make their restrictor set available as a discourse referent, the nonrestrictive adjective will be predicated on the same set regardless of the quantifier. Even with other quantifiers like *most* or *no*, we are still able to derive a nonrestrictive inference, since the entities described by the adjective correspond to the "maxset" discourse referent made available by quantifiers.

A careful reader might notice that the adjective is interpreted after the entire clause *every word was deleted*, as opposed to previous examples, where the adjective is interpreted immediately after the DP. This is possible because the adjective, after being type-shifted with NR and combining with the noun, has type $(et \to \mathtt{M}_\alpha) \to \mathtt{M}_\alpha$. After filling in the $e \to t$ gap in the argument with the noun, the adjective modifies an update (type $\mathtt{M}_\alpha$), in that it adds secondary content to it. NR is defined polymorphically so that the adjective can modify any update – anything with type $\mathtt{M}_\alpha$, such as $\mathtt{M}_e$ (like *the other book*) or $\mathtt{M}_t$ (like *every word was deleted*).

It is necessary for the adjective to be interpreted after the clause in (49) since *every p* does not denote an individual of type $\mathtt{M}_e$, but a function of type $(e \to \mathtt{M}_t) \to \mathtt{M}_t$. Since the nonrestrictive adjective cannot modify this type, it must take propositional-level scope in (49). In fact, a nonrestrictive adjective can always take scope at the propositional level, leading to an analysis reminiscent of Schlenker's (2022) proposal for appositives. It is worth noting that this is made possible by the anaphora-based analysis. Under the present anaphoric analysis, the adjective obtains the individual it modifies via anaphora, and this allows the nonrestrictive adjective can be interpreted more freely.

In summary, I have shown how basic examples of nonrestrictive adjectives, contrasting adjectives in *other* DPs, and nonrestrictively modified quantifier phrases can all be analyzed under a uniform approach, by treating nonrestrictive adjectives as anaphoric to the entity they modify.

6. Conclusion

In this paper, I have presented a case for nonrestrictiveness as a semantic phenomenon. Interpretation of contrasting adjectives within the syntactic scope of a non-intersective adjective like *other* often requires for the contrasting adjective to be interpreted in a nonrestrictive way: it is evaluated outside of the scope of *other*, and it is predicated on the entire class of objects it modifies, not just a subset. Additional data from modified quantifier DPs motivate an anaphoric analysis, since nonrestrictive adjectives are able to modify quantifier phrases and derive inferences on the entire restrictor set, which we know is made available for anaphora with any quantifier. Then, I presented a formal semantic fragment which is compositional and dynamic. I derive several examples to show how the fragment handles contrasting adjectives in *other* as well as modified quantifier phrases.

This paper focuses on the compositional properties of nonrestrictive adjectives, and largely ignores what kind of meaning nonrestrictive adjectives contribute and how they update the common ground. Though they are compositionally and intuitively similar to appositives, their meaning projects less strongly, and the contribution of nonrestrictive adjectives need not be new information. On the other hand, nonrestrictive adjective inferences project like presuppositions, and display many similarities to the gender presuppositions of pronouns (Esipova 2019, Chang

2022). I leave further research on the connection between nonrestrictive adjectives and gender presuppositions for further research.

Future work on this topic might also develop a formal update semantics for nonrestrictive adjectives that would capture its discourse and projection properties. Ideally, future research will lead to a theory of nonrestrictiveness that is compositionally united, but allows for nonrestrictive adjectives to update the common ground differently than appositives.

One final open question involves the intonation of nonrestrictive adjectives. Given that appositives require a special intonation, why don't nonrestrictive adjectives also require a special intonation in all cases? One might say that between *other* and a contrasting adjective is a prosodic break, which is true. But this break does not appear when there is only one adjective, for example in (50). A rigorous study into the intonational patterns of nonrestrictive adjectives – both with other (non-intersective) adjectives and alone – should be conducted to gain additional insights on the intonational cues of nonrestrictive adjectives, which are subtle, if any do exist at all.

(50) The lazy senators skipped the meeting.

The issue of intonation has larger implications for nonrestrictiveness in general. If there are no special intonational cues, then perhaps there is no way to distinguish between a nonrestrictive interpretation of (50), and a special case of a restrictive interpretation whereby the modifier does not do any restricting work. That is to say, while I have presented clear cases of nonrestrictive adjectives in the form of contrasting adjectives in the scope of *other* (or similar non-intersective adjectives), these data have no definitive bearing on adjectives which may seem nonrestrictive, but which are compatible with restrictive interpretations. But despite the differences among the kinds of nonrestrictive adjectives, the analysis in this paper provides a unified analysis for all kinds of nonrestrictive adjectives.

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