Attributive Quantity Words as Nonrestrictive Modifiers[*]

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1.   Introduction

The focus of this paper is the post-determiner or 'attributive' use of cardinal numerals and so-called 'vague quantifiers' (*many* and *few*), a class that I will call **quantity words**. Examples of the pattern of interest are given in (1):

(1)   a. <u>The three dogs</u> growled menacingly
         b. <u>The few people we met</u> were friendly
         c. <u>His many friends</u> supported him through his illness
         d. I bought <u>those four books</u> in Paris

        The possibility of sequencing a quantity word after a determiner has been cited as evidence that these words have the semantics of adjectives rather than quantifiers (see e.g. Hoeksema 1983; Partee 1989; Landman 2004). A typical implementation of this view is to treat the quantity word as a cardinality predicate (type $\langle et \rangle$), as in (2). Here, *three* is analyzed as the set of pluralities consisting of three atoms, on which definition it may compose intersectively with a plural noun:

(2) $[\![three]\!] = \lambda x. |x| = 3$
          $[\![three\ dogs]\!] = [\![dogs]\!] \cap [\![three]\!] = \lambda x.*dog(x) \wedge |x| = 3$

Defining *the* as a (partial) maximalization operator (Landman 2004), as in (3), yields (4) as the semantics for *the three dogs*:

(3) $[\![the]\!] = \lambda P_{\langle et \rangle}.sup(P)$ if defined; undefined otherwise,
                    where $sup(P) = \iota x[P(x) \wedge \forall y[P(y) \rightarrow y \sqsubseteq x]]$

(4)   ⟦the three dogs⟧ = sup(λx.*dog(x) ∧ |x| = 3) if defined; undefined otherwise

This paper does not challenge the basic insight that quantity words are modifiers of a sort, as opposed to quantifiers. But what has not (to my knowledge) been recognized is that (2)-(4) treats the quantity word as a <u>restrictive</u> modifier, parallel to an ordinary prenominal adjective on its restrictive reading:

(5)   ⟦red ball⟧ = ⟦ball⟧ ∩ ⟦red⟧ = λx.ball(x) ∧ red(x)

The central claim to be developed here is that attributive quantity words, at least in the typical cases, are in fact <u>nonrestrictive</u> modifiers, and should be analyzed as such.

To briefly preview the organization of the paper, I begin in Section 2 with a short overview of the restrictive/nonrestrictive distinction. Section 3 presents the evidence that attributive quantity words should be aligned to nonrestrictive, rather than restrictive, modifiers. Section 4 develops the analysis, drawing on two key building blocks: i) the degree-based analysis of quantity words developed in Solt (2009); ii) the multidimensional semantic framework of Potts (2005). Section 5 discusses some further rather nice consequences of the analysis. Finally, Section 6 treats some problematic cases, and Section 7 summarizes the conclusions.

2.   Restrictive versus Nonrestrictive

The restrictive versus nonrestrictive distinction is most familiar in the domain of relative clauses. For example, (6a) has a restrictive interpretation: it is the necklace that her mother gave her (as opposed to other necklaces) that is in the safe. Here, the content of the relative clause serves to restrict the denotation of the head noun. By contrast, (6b) has a nonrestrictive interpretation: the unique contextually relevant necklace (which, by the way, her mother gave her) is in the safe. In this case, the relative clause does not play a restrictive role, in that it could be removed without changing the overall meaning of the sentence (examples from Huddleston & Pullum 2002):

(6)   a. The necklace which her mother gave her is in the safe
        b. The necklace, which her mother gave her, is in the safe

Nonrestrictive relative clauses can be distinguished from their restrictive counterparts in several ways, including the presence of comma intonation (as in (6b)) and the requirement for a *wh*-word rather than *that* as a relativizer (cf. (7)).

(7)   The necklace that her mother gave her is in the safe   ***restrictive only***

A similar restrictive/nonrestrictive distinction is also found with prenominal adjectives. For example, *industrious* in (8a) could be read restrictively (it was the industrious Greeks as opposed to the lazy ones who did the monument building) or nonrestrictively (where Greeks as a whole are characterized as industrious). Similarly, (8b) can be read as asserting either that the unsuitable words, but not necessarily the

suitable ones, were deleted (restrictive), or that the totality of the words, all of which were unsuitable, were deleted (nonrestrictive):

(8)   a.   The industrious Greeks built beautiful monuments
        b.   Every unsuitable word was deleted

Huddleston & Pullum (2002) point out that the terms 'restrictive' and 'nonrestrictive' are somewhat misleading, in that what is (phonologically and syntactically) a 'restrictive' relative does not necessarily have a restrictive effect semantically, an example being '*the bachelors that are unmarried*'. They propose instead the terms 'integrated' and 'supplementary', arguing that '[t]he content of an integrated relative is presented as an integral part of the meaning of the clause containing it, whereas the content of a supplementary relative is presented as a separate unit of information, parenthetical or additional' (pp. 1058-1059). I take this to in fact be the crucial distinction, but I maintain the more familiar terms 'restrictive' and 'nonrestrictive'.

Turning to their semantics, while restrictive relative clauses and prenominal adjectives can be analyzed as intersective modifiers (as with *red* in (5)), nonrestrictive modifiers require a different treatment. A long-standing view (see e.g. Rodman 1976; Huddleston & Pullum 2002) is that nonrestrictive relative clauses introduce a separate proposition that is in some way appended to or conjoined with the primary content of the sentence. Thus (6b) might be paraphrased as in (9a). Morzycki (2008) similarly argues that sentences with prenominal adjectives interpreted nonrestrictively are essentially double assertions, such that (8b) on the nonrestrictive reading can be paraphrased as – and requires an analysis that renders it equivalent to – (9b):

(9)   a.   The necklace$_i$ is in the safe.   Her mother gave it$_i$ to her   (cf. 6b)
        b.   Every word$_i$ was deleted. They$_i$ were unsuitable   (cf. 9b)

As to the status of the information introduced by nonrestrictive modifiers, Levinson (1983) considers nonrestrictive relative clauses to be presupposition triggers. To be certain, they meet certain tests for presupposition, such as survival under negation; for example, (10) still entails that her mother gave her the necklace.

(10)   It's not the case that the necklace, which her mother gave her, is in the safe

But Chierchia & McConnell-Ginet (2000) point out that nonrestrictive relatives can readily be used to introduce new information into the discourse. For example, (11a) is perfectly felicitous in a context in which Jill's having lost something on the flight was not part of the prior discourse. Contrast this to what is observed with a true presupposition trigger such as a pseudocleft; (11b) is decidedly infelicitous in this context.

(11)   Let me tell you something about Jill, who I met on the flight from Ithaca to NY.
        a.   Jill, <u>who lost something on the flight,</u> likes to travel by train.
        b.   #<u>What Jill lost</u> on the flight was her new flute.

From this, Chierchia & McConnell-Ginet argue that the content of a nonrestrictive relative is not a presupposition, but rather a backgrounded component of what is asserted. Potts (2005) presents further evidence that supplements (including nonrestrictive relatives) are not presuppositions, but rather Conventional Implicatures, which are separate from the primary 'at issue' content of an utterance, but which nonetheless generate entailments. I build on Potts' proposals below.

3.   Evidence

Returning to attributive quantity words, there is diverse evidence that supports the view that they should be aligned to nonrestrictive, rather than restrictive, modifiers.

3.1   Status of Quantity Information

On the analysis represented in (2)-(4), the information contributed by the quantity word is a presupposition. Specifically, *the three dogs* is defined only if there <u>are</u> exactly three dogs. To see this, note that if there are fewer than three contextually relevant dogs, the set denoted by *three dogs* is empty; conversely, if there are more than three dogs, this set has multiple elements, but no supremum.

But here, we can make similar observations to those that were made in Section 2 concerning nonrestrictive relative clauses. Just as in that case, the content conveyed by attributive quantity words is not part of the primary asserted content of a sentence, as evidenced by the fact that it survives negation; thus (12) negates the barking, not the number of dogs:

(12)   It's not true that the three dogs barked menacingly

But on the other hand, like nonrestrictive relative clauses, attributive quantity words can clearly be used to introduce new information. This point is made particularly evident by examples such as the following, taken from recent newspaper articles (and representative of many similar examples that could be found):

(13)   a.   The <u>five</u> finalists for Wichita city manager will visit the city on Wednesday and Thursday to interview with city officials and meet with the public.
http://www.bizjournals.com/wichita/stories/2008/11/03/daily18.html?ana=from_rss

b.   Temescal Canyon and Will Rogers State Historic Park in Pacific Palisades are just two of the <u>many</u> units of parkland and open space that make up the sprawling Santa Monica Mountains National Recreation Area.
http://www.sandiegoreader.com/news/2008/nov/05/rivas-canyon/

c.   The <u>few</u> Winnipeggers who turned out for a public forum Monday night support a pilot project that will install 10 security cameras next year to watch over city streets.
http://www.winnipegfreepress.com/local/story/4245409p-4888571c.html

In each of these examples, the quantity word introduces information that is new in the context of the article – part of the news being reported, which although parenthetical to the main story line can in no way be taken to be part of the common ground.

In Section 2, it was suggested that nonrestrictive relative clauses are not presuppositional in nature, but rather 'backgrounded' components of what is asserted. It seems that we want to draw a similar conclusion about attributive quantity words. But this is not captured by the presuppositional representation in (4).

3.2 Parallels to Nonrestrictive Readings of Prenominal Adjectives

Attributive quantity words also exhibit striking parallels to ordinary prenominal adjectives on their nonrestrictive, rather than restrictive, interpretations.

First, as was noted in Section 2, sentences containing nonrestrictive prenominal adjectives can be viewed as double assertions. The very same point can be made about attributive quantity words: (14a) can be interpreted as expressing a double assertion equivalent to the paraphrase in (14b).

(14) a. The few people we met were friendly
      b. [The people we met]$_i$ were friendly. They$_i$ were few.

Secondly, when a nonrestrictive prenominal adjective is paraphrased with a relative clause, the latter must be formed with a *wh*-word and not *that*, in keeping with the generalization that nonrestrictive relative clauses must be formed with a *wh*-word (cf. Cinque 2007 for a proposal that nonrestrictive adjectives have a relative clause source).

(15)   The industrious$_{Nonrestrictive}$ Greeks $\equiv$ The Greeks, who were industrious,
                                                        $\not\equiv$ The Greeks that were industrious

Correspondingly, attributive quantity words can only be paraphrased with a relative clause introduced by a *wh*-word; a relative clause formed with *that* is ungrammatical.

(16)   The few people we met $\equiv$ The people we met, who were few,
                                                        *The people we met that were few

Thirdly, only certain determiners can be followed by a quantity word; this includes in particular the definite article and possessive pronouns; others, including (generally) indefinite *some* and quantificational *every* and *most*, cannot.

(17)   a. The three/many/few books that she owned were destroyed in the fire
        b. His three/many/few close friends supported him
        c. *Every three/many/few books were destroyed in the fire
        d. *Most three/many/few books were destroyed in the fire
        e. *Some many/few books were destroyed in the fire

The generalization is that the determiners that may occur are those that allow a referential interpretation for Det+NP (e.g. *the books*, *his friends*). This pattern to a large extent mirrors the availability of the nonrestrictive reading of prenominal adjectives. The restrictive versus nonrestrictive ambiguity is clearly evident in the case of the definite article (18a) and possessive pronouns (18b). But with *some* or *most*, the only reading available is the intersective one corresponding to restrictive interpretation. (In the case of *some*, it is not entirely clear what the nonrestrictive reading would be, but in any case there is not an interpretation that is distinct from the restrictive one.)

(18)   a. The valuable books were destroyed in the fire
           ✓Restrictive: the valuable books (but not necessarily the worthless ones)
           ✓Nonrestrictive: the totality of books (which as a whole were valuable)

       b. Her valuable books are were destroyed in the fire
           ✓Restrictive: her valuable books (but not necessarily her worthless ones)
           ✓Nonrestrictive: the totality of her books (which as a whole were valuable)

       c. Some valuable books were destroyed in the fire
           ✓Restrictive: Some of the things that were both valuable and books
           ✘Nonrestrictive: Some of the books (all?/some? of which were valuable)

       d. Most valuable books are expensive
           ✓Restrictive: Most of the things that are both valuable and books
           ✘Nonrestrictive: Most books (all of which are valuable)

Note that similar pattern can also be observed with nonrestrictive relative clauses, which as noted by Rodman (1976) must be anchored by a referential noun phrase, and cannot be part of a quantificational noun phrase (e.g. *#most dogs, which were barking*).

Finally, as pointed out by Umbach (2006), on their nonrestrictive readings prenominal adjectives are resistant to focus. Thus (19), with *industrious* focused, has only the restrictive interpretation. Attributive quantity words likewise resist focus (20), except on a distinct, and somewhat marginal, interpretation that I will discuss below.

(19)   The INDUSTRIOUS Greeks built beautiful monuments   ***Restrictive only***

(20)   #The THREE dogs barked menacingly
       #The FEW trees were stunted

To summarize, in each of the respects discussed here, attributive quantity words act like prenominal adjectives on their nonrestrictive readings, a parallel that is not captured by the approach in (2)-(4), where the quantity word is given the intersective analysis characteristic of restrictive modifiers. In the next section, I develop an analysis that captures this insight.

4. Analysis
4.1 Semantic Framework

Let me start by introducing the building blocks that will form the basis for my analysis.

4.1.1 Degree-based semantics for quantity words

I assume to start the degree-based semantics of quantity words developed in Solt (2009). Under this approach, quantity words are syntactically Quantity Phrases (QPs), which in their adnominal uses are located in the specifier position of a functional head Meas within the extended nominal projection. Semantically, quantity words denote either degrees (cardinal numerals) or quantifiers over degrees (*many* and *few*). Quantity words are linked semantically to predicates over individuals via Meas, whose role it is to introduce a degree argument and link it to an individual argument (an analysis that builds on proposals by Kayne 2005 and Schwarzschild 2006).[1] As defined in (22), Meas may compose intersectively with a plural noun, or take an expression of type *e* as argument.

(21)   a. $\llbracket \text{three}_d \rrbracket = 3$
        b. $\llbracket \text{many}_{\langle dt,t \rangle} \rrbracket = \lambda P_{\langle dt \rangle}.\max(P) > d_{Std}$
        c. $\llbracket \text{few}_{\langle dt,t \rangle} \rrbracket = \lambda P_{\langle dt \rangle}.\max(P) < d_{Std}$

(22) $\llbracket \text{Meas} \rrbracket = \lambda x_e \lambda d_d.\mu_{\#}(x) = d$, where $\mu_{\#}$ is a counting measure function

Putting aside for the moment the attributive use of quantity words, we derive (23) as the syntactic structure and resulting semantic interpretation for the canonical 'quantificational' use of a cardinal numeral, where there is no overt determiner present. (Here quantification over individuals is taken to arise via Existential Closure.)

(23)   Three dogs are barking
        [$_{IP}$ [$_{DP}$ [$_{MeasP}$ [$_{QP}$ three] Meas [$_{NP}$ dog]]] are barking]
        $\exists x[*\text{dog}(x) \wedge \mu_{\#}(x) = 3 \wedge \text{barking}(x)]$

The derivation proceeds similarly in the case of *many* and *few*, with the exception that being of quantificational type these terms cannot compose *in situ*, but rather must raise at LF for purposes of interpretability, taking as argument the set of degrees formed by lambda abstraction over the trace in surface position (cf. Heim 2006):

(24)   Many dogs are barking
        SS: [$_{IP}$ [$_{DP}$ [$_{MeasP}$ [$_{QP}$ many] Meas [$_{NP}$ dogs]]] are barking]
        LF: [$_{IP}$ [$_{QP}$ many]$_i$ [$_{IP}$ [$_{DP}$ [$_{MeasP}$ t$_i$ Meas [$_{NP}$ dogs]]] are barking]]
            $\max(\lambda d.\exists x[*\text{dog}(x) \wedge \mu_{\#}(x) = d \wedge \text{barking}(x)]) > d_{Std}$

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[1] In (21b,c), the denotations given for *many* and *few* reference a contextually determined standard degree d_{Std}. In fact, *many* and *few* are gradable expressions, as evidenced by the existence of modified forms such as *too many*, *so many*, *fewer than 20*, etc. I assume that the entries in (21b,c) are in fact derived via the composition of more basic gradable entries for *many/few* with a null positive morpheme POS (cf. Creswell 1976); but I abstract away from this detail as not relevant to the present discussion.
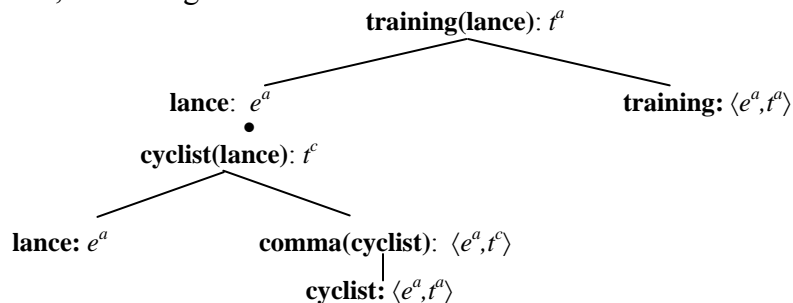
Space does not permit an in-depth discussion of the motivations for the degree-based analysis sketched out here, but let me briefly mention that it is able to overcome several shortcomings of alternate approaches, such as the cardinality predicate analysis represented in (2). In particular, it is able to accommodate the differential use of quantity words (e.g. *many fewer than 100 people*), where there is no plurality that a cardinality predicate could take as argument. The same approach also accounts for the operator-like behavior of *few* (cf. Heim 2006), and allows for the derivation of a quantificational interpretation for *few* via simple Existential Closure, without giving rise to a spurious 'at least' reading. The reader is referred to Solt (2009) for a more complete discussion.

4.1.2   Nonrestrictive modification

With regards to the semantics of nonrestrictive modification, the basic insight I build on is that nonrestrictive modifiers introduce a secondary proposition that is backgrounded to the primary asserted content of a sentence. The specific framework I adopt is that developed by Potts (2005) for the analysis of Conventional Implicatures, a class in which he groups 'supplements' such as nominal appositives and nonrestrictive relative clauses.

In Potts' system, natural language meaning is computed on two independent dimensions of interpretation: the 'at issue' level (the primary asserted content) and the Conventional Implicature (CI) level (which is independent of the at issue content, but nonetheless part of what is asserted). Potts implements this approach via a multidimensional framework whose key components are: i) an enriched theory of types, including 'at issue' types (e^a, t^a, etc.) and CI types (e^c, t^c, etc.); ii) a rule of CI functional application. Applying this system to an example with a nominal appositive, such as (25), yields a semantic 'parsetree' of the form shown below:

(25)   Lance, a cyclist, is training

$$\text{training(lance)}: t^a$$

lance: e^a training: $\langle e^a, t^a \rangle$
•
cyclist(lance): t^c

lance: e^a comma(cyclist): $\langle e^a, t^c \rangle$
cyclist: $\langle e^a, t^a \rangle$

Here the noun phrase *cyclist* is first marked as conveying CI content via a syntactic feature COMMA. *Cyclist* can then compose with the sentential subject *lance* in the CI dimension (below the dot •), yielding a fully saturated proposition of type t^c. At the same time, the subject remains available to saturate a sentential predicate in the at issue dimension (above the dot •). The resulting structure thus represents both at issue content (here, 'Lance is training') and supplementary CI content (here, 'Lance is a cyclist').

While Potts does not consider the nonrestrictive readings of ordinary prenominal adjectives, Morzycki (2008) shows that his framework can be extended to this case as well. In the next section, I apply it also to attributive quantity words.

4.2 Attributive Quantity Words

We face two issues in extending Potts' framework to attributive quantity words. First, quantity words, having degree-based semantics, cannot compose directly with a nominal expression (as *Lance* composes with *cyclist* in (25)); rather, this relationship must be mediated by Meas. Secondly, and more puzzlingly, the expression apparently modified by the quantity word is not a surface syntactic constituent. In (26a) it is 'his friends' that are characterized as many; in (26b) it is 'the dogs' that are described as numbering three.

(26)   a.   <u>His many friends</u> supported him   many+Meas(his friends)
   b.   <u>The three dogs</u> growled menacingly   three+Meas(the dogs)

Note that this issue is not limited to attributive quantity words, but is also found with expressive adjectives ((27a), from Potts 2005) and ordinary prenominal adjectives (27b):

(27)   a.   Chuck said I could have one of <u>his lovely vases</u>   lovely(his vases)
   b.   <u>The industrious Greeks</u>…   industrious(the Greeks)

We might seek to deal with this by proposing that at the level relevant to semantic interpretation the modified expression is in fact a syntactic constituent; but to avoid committing to any such particular syntactic framework, I will instead address this with the following compositional rule:

(28)   **Attributive quantity word composition:**
   A structure of the form in (a) is interpreted as in (b):

   a. $[_{DP} \, \alpha \, [_{MeasP} \, [_{QP} \, \beta] \, \text{Meas} \, [_{NP} \, \gamma]]]$

   b. $\llbracket DP - MeasP^{max} \rrbracket \; : \; e^a$
         $\bullet$
    $(\, \llbracket QP \rrbracket \,) \, (\, \llbracket Meas \rrbracket \, (\, \llbracket DP - MeasP^{max} \rrbracket \,)) : t^c$

      where $MeasP^{max} = \{MeasP, \text{Spec } MeasP, Meas, Meas'\}$

The effect of the rule in (28) is to pull the entire MeasP level aside from the calculation of the at issue content of the DP. On the CI level, the content of the MeasP layer is predicated of the remainder of the DP to create a fully saturated proposition of type t^c; on the at issue level, the remainder of the DP (an expression of type e^a) remains available for further composition. I assume the rule in (28) to be a specific case of a more general rule also able to accommodate the nonrestrictive readings of ordinary prenominal adjectives (cf. Morzycki 2008); but I do not consider the general case here. Applying (28) to our earlier examples, we have the following:

(29)   a.   his many friends   his friends: e^a
    $[_{DP} \text{ his } [_{MeasP} \, [_{QP} \text{ many}] \text{ Meas } [_{NP} \text{ friends}]]]$ $\bullet$
             $\text{many}(\lambda d.\mu_{\#}(\text{his friends}) = d): t^c$

b. the three dogs   the dogs: e^a

    [$_{DP}$ the [$_{MeasP}$ [$_{QP}$ three] Meas [$_{NP}$ dogs]]]

                                    •

                            $\mu_{\#}$(the dogs) = 3: t^c

In (29a), *many* is predicated in the CI dimension of the (singleton) set whose element is the number of his friends, specifying that this number is greater than some standard; the resulting expression (of type t^c) conveys the backgrounded proposition 'his friends are many'. At the same time, the referential expression *his friends* remains available to compose with a sentential predicate. (29b), featuring a cardinal numeral, is analyzed similarly with the exception that the function/argument structure in the CI dimension is reversed: *three* saturates the degree argument of the measure function.

      The analysis presented here thus aligns attributive quantity words to the treatment of other nonrestrictive modifiers. In the next section, I show that it also is superior to the intersective analysis in (2)-(4) in accounting for the relevant data.

5.   Further Consequences
5.1   Determiner Restrictions

In Section 3, it was noted that quantity words can only follow determiners that allow a referential reading for Det+NP (e.g. *the/his/those/*every/*some/*most few people*). On the cardinality predicate analysis, this pattern is somewhat puzzling. But on the present approach, it follows directly as a consequence of the way in which the content of the attributive quantity word enters the derivation. Per the rule in (28), Meas enters into a predicational relationship with Det+NP on the CI level; this is possible if Det+NP has a referential interpretation (30a), but not if it is necessarily quantificational (30b):

(30)   a. the few people

          <u>CI level</u>: (⟦few⟧) (⟦Meas⟧ (⟦the people⟧))

                 ⟨dt,t⟩   ⟨e,dt⟩   e

                                ⟨dt⟩

       b. *most few people

           CI level: (⟦few⟧) (⟦Meas⟧ (⟦most people⟧))

               ⟨dt,t⟩   ⟨e,dt⟩   ⟨et,t⟩

                              ✗

5.2   NPI Licensing

The analysis of attributive quantity words as nonrestrictive modifiers also explains a curious fact about NPI licensing. As is well known, 'quantificational' *few* licenses NPIs in both the sentential subject and the sentential predicate (31). What is less recognized is that while attributive *few* does not license NPIs in the predicate (32a), it does so in the subject position (32b):

(31) a. Few students <u>ever</u> read Plato
      b. Few students who had <u>ever</u> read Plato came to the lecture

(32) a. *The few students <u>ever</u> read Plato
      b. The few students who had <u>ever</u> read Plato came to the lecture

The grammaticality of (32b) is not predicted on the intersective analysis in (2)-(4), in that the NPI *ever* would not be in the semantic scope of *few* (33). But this is expected on the present analysis, where *ever* is in the scope of *few* on CI level (34).

(33) came-to-lecture(sup(λx.*students $\wedge$ ever-read-Plato(x) $\wedge$ $|$x$|$ = few))

(34)   the students who had ever read Plato: e^a
                              •
      few(λd.$\mu_{\#}$(the students who had ever read Plato) = d): t^c

Furthermore, the unavailability of NPI licensing in the sentential predicate is also explained, in that *few* does not have semantic scope over the predicate (which would compose with *the students who had ever read Plato* in the at issue dimension).

5.3 Predicative Quantity Words

The preceding two points support the analysis of attributive quantity words as nonrestrictive modifiers that compose on a separate dimension of interpretation from the main at issue content. But these facts do not necessarily favor the present degree-based approach, over one in which the quantity word is a cardinality predicate (as in (2)) that takes the remainder of the DP directly as argument on the CI level.

Here, it is relevant to consider a related construction. The cardinality predicate analysis predicts – incorrectly – that the following should be parallel, both involving a cardinality expression predicated of the sentential subject:

(35) a. The visitors were few   few(the visitors)
      b. ??The visitors were five   five(the visitors)

On the present account, the grammatical (35a) can be analyzed as involving a null MeasP layer above the subject DP:

(36) [[$_{\text{MeasP}}$ Meas [$_{\text{DP}}$ the visitors]] were few]

(37) $[\![$few$]\!]$ ($[\![$Meas$]\!]$ ($[\![$the visitors$]\!]$)) = max(λd.$\mu_{\#}$(sup(λx.*visitor(x))=d) < d$_{\text{Std}}$

As evidence that this is the correct analysis, note that we can observe the same determiner restrictions in the predicative case as in the attributive case: the (apparent) subject must have a referential interpretation in order to serve as argument to Meas (cf. *the/our/*some/ *most/*every visitor(s) were few*).

As shown in (38a), *few* here is the semantic predicate (type $\langle dt,t \rangle$); the MeasP provides its argument (of type $\langle dt \rangle$). But in the case of a numeral, the predicate/argument structure would be reversed: the semantic predicate would be in the sentential subject position, with its semantic argument in the canonical predicate position, as in (38b):

(38)   a. [[_{MeasP} [_{DP} the visitors]] were <u>few</u>]   b. *[[_{MeasP} [_{DP} the visitors]] were <u>five</u>]

$\qquad\qquad\quad \langle dt \rangle \qquad\qquad\qquad \langle dt,t \rangle \qquad\qquad\qquad\quad \langle dt \rangle \qquad\qquad\qquad d$

I propose that (38b) is ill-formed for the same reason that an example such as **rich were the visitors* is ill-formed: English does not like semantic predicates in the pre-copular position of a copular sentence. Here, then, the degree-based approach is able to capture a contrast not explained by the cardinality-predicate analysis.

6.   Problematic Cases

Before concluding, let me briefly discuss some apparently problematic cases for the analysis developed here. First, examples such as (39) would seem to represent an exception to the generalization that only determiners that allow a referential interpretation for Det+NP may be followed by a quantity word.

(39)   a. <u>Some thirty people</u> were injured in the accident
      b. The river floods <u>every three years</u>

But here, the quantity word is part of the primary asserted content of the sentence, as evidenced by the fact that its entailments do not survive under negation. For example, (40a) does not entail that there were thirty people (cf. (12), from which it follows that there were three dogs):

(40)   a. It's not true that some thirty people were injured in the accident
      b. It's not true that the river floods every three years

The examples in (39) thus do not represent the use of quantity words as nonrestrictive modifiers. Instead, I suggest that *some* in (39a) is an approximative modifier to the numeral (Sauerland & Stateva 2007), while *every three* in (39b) is in fact a complex determiner, as proposed by Landman (2004).

Every also presents an exception to the general correlation between the determiners that may be followed by a quantity word and those that allow a nonrestrictive reading for a prenominal adjective. Quantity words may follow *every* only in limited contexts (cf. (39b) vs. (41a)). But as noted earlier, *every* may readily be followed by an adjective with a nonrestrictive reading (e.g. *unruly* in (41b) may be read nonrestrictively).

(41)   a. *?Every twenty protestors were arrested
      b. Every unruly protestor was arrested

A full explanation of this difference would require a more in-depth investigation of the semantics of nonrestrictive prenominal adjectives. Provisionally, however, I hypothesize that the difference results from a distinction in the sort of predication that would be involved in the two cases: *unruly* distributes over protestors, but *twenty* could only be predicated collectively of a group.

Finally, the reader might have noticed that in the present framework, a cardinal numeral can in fact compose *in situ* with a nominal expression in the at issue dimension, yielding the equivalent of a restrictive interpretation, as in (42) (cf. (2)).

(42)   ⟦three dogs⟧ = ⟦Meas dogs⟧ (⟦three⟧) $= \lambda d \lambda x.{*}dog(x) \wedge \mu_{\#}(x) = d$ (3)
                                                              $= \lambda x.{*}dog(x) \wedge \mu_{\#}(x) = 3$

I propose that this mode of composition is responsible for examples such as these:

(43)   I didn't have one of the FIVE fastest times, but I had one of the TEN fastest times

(44)   *At the reception desk of a youth hostel:*
          We'll put the THREE Germans in Room 5, and the TWO Germans in Room 8

In both of these examples, the quantity word has a contrastive, and therefore necessarily restrictive, interpretation (note also that here the numeral is focused, hallmark of a restrictive interpretation).

Thus in certain cases, attributive cardinal numerals can in fact be read restrictively. Examples such as these are fairly atypical. What appears to be required for the felicitous occurrence of the definite article here is that there be a uniquely identifiable member of the set in question. This is satisfied semantically in (43) (there is necessarily only a single set of five fastest times) and pragmatically in (44) (which requires that there be contextually salient groups of three and two Germans). But importantly, note that *many* and *few* cannot compose as in (42), because they denote quantifiers over degrees, not degrees. And correspondingly, attributive *many* and *few* do not appear to allow a restrictive reading; for example, (45) is quite bad (with or without focus).

(45)   ??one of the FEW/MANY fastest times

7.   Conclusions

The main finding of this paper is that attributive quantity words are, in the typical cases, nonrestrictive modifiers. I have shown that they can be analyzed within a framework independently needed to address other types of nonrestrictive modification. This analysis accounts for some otherwise puzzling facts in the semantics of quantity words (e.g. NPI licensing), while at the same time further extending the empirical coverage of the multidimensional framework of Potts (2005). It is of interest to ask whether there are additional classes of lexical items that might lend themselves to a similar analysis.

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