All **and** ***Every*** **as Quantity Superlatives**

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Summary An analysis is proposed that captures similarities between *most* and *all* in English by treating *all* as a quantity superlative term, on the model of current theories of *most*. While *most of the DP* describes a part of the denotation of DP that is greater in cardinality than any non-overlapping part, *all of the DP* describes a part that is greater in cardinality than any non-identical part. While the part that *most of the DP* describes must comprise more than half of the DP denotation for it to be the case that no non-overlapping part is greater, the part that *all of the DP* describes must be the totality of the DP denotation for it to be the case that no non-identical part is greater. *All* and *most* combine with an individual-denoting term—a definite or bare plural. I analyse *every* as a derivative of *all* whose type is lifted to combine with a set—the denotation of bare singulars in English.

Recent literature has pointed out similarities in the interpretation and distribution of *most* and *all* (Matthewson 2001, Crnič 2010). This literature takes both to be quantifiers. However, other literature analyzes the meaning of *most* as the regular composition of *much* (as a degree modifier) and the superlative morpheme *-st* (Hackl 2009). But if *most* is a superlative and *all* is a quantifier, any similarities are unexpected. Here I reconcile these views by analyzing *all* as a superlative term like *most*. Further, I claim that *every* is a type-lifted derivative of *all*. Similarities and differences between *most*, *all* and *every* emerge from this analysis.

Like indefinite quantifiers such as *three* and *several*, *most* and *all* may combine with a definite DP in an *of*-phrase (1a). The latter are unique, though, in that when they combine with a bare plural, they receive a generic interpretation, while other indefinite quantifiers are existential (1b). As a result, they are awkward in non-generic contexts (1c) (Cooper 1996).

(1) a. John rode most/all/three/several of the horses.
  b. John loves most/all/three/several horses.
  c. John rode ??most/??all/three/several horses.

Matthewson and Crnič claim that *most* and *all* are proportional quantifiers that combine with an individual—the plural individual *the horses* in (1a) (where *of* is vacuous), and the kind *horses* in (1b). *Three* and *several* combine with a (plural marked) predicate of individuals. The kind-level reading of the bare plural in (1b) results in a generic interpretation for *most/all* not available to *three/several* because of their different combinatorial requirements.

In a different vein, Hackl (2009) claims the meaning of *most* derives from the meaning of the superlative morpheme *-st* in (2a) (Heim 1999), and an operator that derives a degree relation from its complement DP denotation. I borrow Solt's (2015) MEAS for this purpose (2b), which measures out an entity x on a contextually specified scale S (d notates a degree). Here, the superlative compares parts of the DP denotation, derived by the operator PART (2c). The DP *most (of the) horses* has the syntactic composition in (2d), which composes by function application and the 'restrict' operation (Chung & Ladusaw 2004) to yield the denotation in (2e). The constant **h** represents either the specific plural individual *the horses* (the maximal sum of individuals in the set that *horse* denotes) or the kind *horses*; both are individuals. (2e) holds of a part x of **h** that has a greater cardinality ($\mu_S(x)$) than any part of **h** that does not overlap with x. As Hackl shows, now x must constitute at least half of **h**, since if it didn't, the rest would constitute a larger part, falsifying the assertion. I assume that the expression in (2e) restricts the internal argument variable of *rode* in (1a), which is closed by default existential quantification (Heim 1983), so that (1a) with *most* asserts that John rode something with the description in (2e). Distributivity of horses over riding events comes from the main predicate (Link 1983). Per Heim (1999), the superlative compares alternatives in a contrast set C.

(2) a. $[\![\text{-st}_C]\!] = \lambda R_{\langle d,\langle e,t\rangle\rangle}\lambda x_e \exists d\ [R(x,d)\ \&\ \forall x'\ [[x' \in C\ \&\ \neg x \circ x'] \rightarrow \neg R(x',d)]]$

b. $[\![\text{MEAS}]\!] = \lambda d_d \lambda x_e\ [\mu_S(x) \geq d]$

c. $[\![\text{PART}]\!] = \lambda y_e \lambda x_e\ [x \sqsubseteq y]$

d. $[_{\text{DP}}$ most (of the) horses $] = [$ -st $[$ MEAS $[$ PART $[$ (the) horses $]]]]$

e. $\lambda x_e \exists d\ [x \sqsubseteq \mathbf{h}\ \&\ \mu_S(x) \geq d\ \&\ \forall x'\ [[x' \in C\ \&\ \neg x \circ x'] \rightarrow \neg[x' \sqsubseteq \mathbf{h}\ \&\ \mu_S(x') \geq d]]]$

If *most* is a superlative and *all* is a quantifier, the similarities in (1) seem coincidental. Abandoning the superlative analysis of *most* seems ill-advised; Hackl shows, among other things, that it explains the ungrammaticality of examples like (3a), where *least* is the inverse of *-st* (3b). If John rode even a single horse, every other single horse is an alternative that fails to have a higher cardinality. (3a) is then blocked by a restriction against logical triviality.

(3) a. *John rode least of the horses.

b. $[\![\text{least}_C]\!] = \lambda R_{\langle d,\langle e,t\rangle\rangle}\lambda x_e \exists d\ [\neg R(x,d)\ \&\ \forall x'\ [[x' \in C\ \&\ \neg x \circ x'] \rightarrow R(x',d)]]$

I propose instead that *all* is a superlative with the meaning in (4a), which is identical to *-st* in (2a) except that the non-overlap condition ($\neg x \circ x'$) is replaced with a non-identity condition ($x \neq x'$). On this view, *all (of the) horses* (4c) holds of a part of the plurality/kind *(the) horses* if it has a greater cardinality than all other non-identical parts. If $\mathbf{h}$ consists of ten horses and x consists of nine of them, the larger part containing ten horses would be an (overlapping but not identical) alternative with greater cardinality. The only part that (4c) can truthfully hold of is the maximal part containing all of the horses that constitute $\mathbf{h}$. (1a) with *all* asserts that John rode something with this description (4c). This analysis makes *all* a small variation on *most*, explaining the similarity that Matthewson, Crnič and others observe.

(4) a. $[\![\text{all}_C]\!] = \lambda R_{\langle d,\langle e,t\rangle\rangle}\lambda x_e \exists d\ [R(x,d)\ \&\ \forall x'\ [[x' \in C\ \&\ x \neq x'] \rightarrow \neg R(x',d)]]$

b. $[_{\text{DP}}$ all (of the) horses $] = [$ all $[$ MEAS $[$ PART $[$ (the) horses $]]]]$

c. $\lambda x_e \exists d\ [x \sqsubseteq \mathbf{h}\ \&\ \mu_S(x) \geq d\ \&\ \forall x'\ [[x' \in C\ \&\ x \neq x'] \rightarrow \neg[x' \sqsubseteq \mathbf{h}\ \&\ \mu_S(x') \geq d]]]$

Matthewson mentions that the idea that *most* and *all* combine with individual-denoting terms makes *every* unusual, since it combines with a set (or its characteristic function, the denotation of bare singulars, as in (5a)). This is a disadvantage of her theory vis a vis generalized quantifier theory, where *all* and *every* have been analyzed as number-conditioned allomorphs of a single universal quantifier; *all* goes with plurals and *every* with singulars (Winter 2001). This raises the question of whether the superlative analysis of *all* has anything to say about *every*. I propose that in fact *every* is *all* lifted to apply to sets (bare singular denotations), as shown in (5b). For this to work we must lift MEAS and PART accordingly, as shown in (5c) and (5d). The composition of *every horse* on this view is shown in (5e) and its denotation in (5f), where *horse* denotes the set of horses $\mathbf{H}$. According to (5f) *every* *horse* holds of a set X if X is a subset of the set of horses $\mathbf{H}$ and no subset of $\mathbf{H}$ distinct from to X exceeds X in size. X must then be $\mathbf{H}$ itself.

(5) a. John rode every horse.

b. $[\![\text{L}(\text{all}_{\mathscr{C}})]\!] = \lambda\mathscr{R}_{\langle d,\langle\langle e,t\rangle,t\rangle\rangle}\lambda X_{\langle e,t\rangle}\exists d\ [\mathscr{R}(X,d)\ \&\ \forall X'_{\langle e,t\rangle}\ [[X' \in \mathscr{C}\ \&\ X \neq X'] \rightarrow \neg\mathscr{R}(X',d)]]$

c. $[\![\text{L}(\textsc{meas})]\!] = \lambda d_d \lambda X_{\langle e,t\rangle}\ [\mu_S(X) \geq d]$

d. $[\![\text{L}(\textsc{part})]\!] = \lambda Y_{\langle e,t\rangle}\lambda X_{\langle e,t\rangle}\ [X \subseteq Y]$

e. $[_{\text{DP}}$ every horse $]$ = $[$ L(all) $[$ L(MEAS) $[$ L(PART) $[$ horse $]]]]$

f. $\lambda X_{\langle e,t\rangle}\exists d_d\ [X \subseteq\mathbf{H}\ \&\ \mu_S(X) \geq d\ \&\ \forall X'\ [[X' \in \mathscr{C}\ \&\ X \neq X'] \rightarrow \neg[X' \subseteq\mathbf{H}\ \&\ \mu_S(X') \geq d]]]$

I assume here again that the expression in (5f) restricts a (set denoting) argument variable in the main predicate and is closed by default existential quantification. On this view, the difference between *all* and *every* is that *all* describes a plural individual while *every* describes a set. For this reason, this analysis dovetails nicely with Szabolcsi's (1997) and Beghelli and Stowell's (1997) analysis of the origin of strong distributivity—that property of *every* that licenses the bound reading of *different* (6a) that *all* does not have (6b).

(6) a. Every/each boy rode a different horse. (=different from what the others rode)

b. All/three of the boys rode a different horse. (=different from a specific horse)

Using the Discourse Representation Theory (DRT) framework, Szabolcsi (1997) claims that *every* and *each* introduce a set-denoting discourse referent corresponding to their restriction set, while other quantifiers introduce a plural individual-denoting discourse referent corresponding to a witness set of their restriction. That is, *every/each horse* introduces a set of horses to the discourse, while *all/three horses* introduces a plural individual comprising all or three specific horses respectively. According to Beghelli and Stowell, the anaphoric interpretation of *different* in (6a) requires a set-denoting antecedent in its discourse representation structure (the difference between *every* and *each* is only that the latter has a definiteness feature the former lacks). Szabolcsi treats all of these terms as generalized quantifiers, so the difference in the type of discourse referent they introduce is stipulated. But on the analysis of the difference between *every* and *all* that I have presented here, the type of discourse referent a term introduces corresponds to the type of its argument, as usual in DRT. An individual-description (*all*) introduces an individual, and a set-description (*every*) introduces a set. This analysis therefore derives the difference between *every* and *all* that others have claimed to underly the contrast in (6).

This analysis extends a variation of the superlative analysis of *most* to *all*, capturing parallels in their distribution and interpretation that escape a quantificational analysis of *all*, if *most* is a superlative. And it characterizes *every* as a derivative of *all* with a higher logical type, which in turn predicts its strong distributivity.

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