

Plural definite NPs presuppose multiplicity via embedded exhaustification

Overview Bare plurals suggest that contra Link (1983) the meaning of the plural includes that of the singular, as the typical multiplicity inference disappears under negation. Problematically, this allows plural definite NPs to refer to singularities under certain conditions. Novel data show that the account by Sauerland (2003), Sauerland et al. (2005) – although at first promising – does not solve the puzzle. I conclude that the multiplicity inference is a scalar implicature. In the case of plural definite NPs the implicature necessarily appears at the level of the NP.

The problem The bare plural in (1) gives rise to the multiplicity inference that Paul wrote more than one song. When embedded under negation in (2), however, the meaning is not that Paul did not write more than one song, but that he did not write any songs. (Krifka 1989, Sauerland et al. 2005, Spector 2007, Zweig 2009). Thus plural on NPs does not assert multiplicity.

- (1) Paul wrote songs. (2) Paul didn't write songs.

With the definite article in (3) presupposing the existence of a maximal song entity and denoting it (Sharvy 1980), (3) should be acceptable if Paul wrote exactly one song. Since the meaning of plural includes that of singular, the definite NP refers to the single song written. That is, (3) and (4) should incorrectly be both appropriate in the situation described.

- (3) Paul wrote the songs. (4) Paul wrote the song.

One might adopt Sauerland's 2003 analysis, where number is not marked on the NP but the definite as a whole. The singular denotes the restricted identity function applying to an individual and returning that individual only if it is a singularity. The plural applies to singularities and pluralities alike. (3) and (4) are still contextually equivalent if there is only one song, but *Maximize Presupposition* MP prefers (4) with the stronger singularity presupposition and blocks (3).

A new observation Given such an MP-based account, use of a plural definite NP is expected whenever the context does not satisfy the presupposition of the singular. (5a) is predicted to be unacceptable given that due to the first sentence the presupposition of the singular definite NP that there is exactly one song is not satisfied. This should make use of the plural definite NP in (5b) acceptable as MP does not dictate the use of the singular anymore, contrary to fact.

- (5) a. #Paul wrote either several songs or just one. I am not sure, but the song is good.
b. #Paul wrote either several songs or just one. I am not sure, but the songs are good.

MP also applies at the level of the local context of the constituent embedding plural (Singh 2011). The local context of a second disjunct is the global context conjoined with the negation of the first one (Beaver 2001, Schlenker 2009). This is supported by the pattern in (6), as the local context of the second disjunct satisfies the presupposition of the definite NP only in (6a).

- (6) a. Either Paul did not write a new song, or the new song is terrible.
b. #Either Paul did not write a new song, or the new songs are terrible.

Now, the local context for the second disjuncts in (7a) and (7b) entails that Paul either wrote exactly one new song or several ones. The presupposition of the singular definite is not satisfied making (7a) deviant. But with MP not preferring (7a), the account incorrectly allows for (7b).

- (7) Either Paul did not write several new songs and he also did not write exactly one, ...
a. #or the new song is too bad to be recorded.
b. #or the new songs are too bad to be recorded.

The proposal in a nutshell We conclude that while plural-marking on NPs does not assert multiplicity, plural definite NPs do presuppose the existence of a maximal plurality and denote that plurality. Both the plural definite NPs in (5b) and (7b) presuppose that there is a maximal

plurality of songs, which the (local) context does not satisfy, rendering them degraded. In order to account for both the bare plural and the definite NP data, I propose to extend the implicature-based account of the multiplicity inference associated with unembedded bare plurals (Spector 2007, Zweig 2009, Ivlieva 2013) to plural definite NPs. That the inference in the former case is an implicature is supported by the observation that it is also suspended when the bare plural is embedded in DE environments other than negation, such as the antecedent of a conditional. (8) suggests that even if Paul wrote only one new song, we should attend the concert.

(8) If Paul wrote new songs, we should go to the concert.

In contrast to bare plurals, the implicature of plural in definite NPs is necessarily embedded.

The proposal in more detail The domain of individuals contains both atomic individuals and collections thereof, the pluralities. Atomic individuals are singletons which are equated with their single elements (Schwarzschild 1994). Plural is marked on NPs and defined as in (9). When applied to a predicate, (9) returns a function defined for atomic and non-atomic individuals X , which delivers 1 if and only if all atoms x in X make the predicate true. The NP in (3) thus denotes (10), a function defined for both atomic and non-atomic song-individuals.

(9) $\llbracket \text{pl} \rrbracket = \lambda f_{\langle e,t \rangle} . \lambda X_e . \forall x \in X . f(x) = 1$ (10) $\llbracket \text{song-pl} \rrbracket = \lambda X . \forall x \in X . x \text{ is a song}$

The definite article in (11) presupposes the existence of a maximal individual making the denotation of the NP true and denotes that individual. If (11) were directly applied to (10), we would predict that (3) should be usable in case there is exactly one song, which is incorrect.

(11) $\llbracket \text{the} \rrbracket = \lambda f_{\langle e,t \rangle} : \exists ! X [f(X) \wedge \forall x [f(x) \rightarrow x \in X]] . \iota X [f(X) \wedge \forall x [f(x) \rightarrow x \in X]]$

Singular is the scalar alternative to plural. It is the identity-function on predicates, (12). The singular NP in (4) has the denotation in (13) which is only defined for atoms. Notice that the set characterized by (13) is a (proper) subset of the one characterized by (10).

(12) $\llbracket \text{sg} \rrbracket = \lambda f_{\langle e,t \rangle} . f$ (13) $\llbracket \text{song-sg} \rrbracket = \lambda x . x \text{ is a song}$

Following Ivlieva the plural must be exhaustified by the exhaustive operator thereby excluding the alternative with singular. For (4) to be defined, however, there must be a unique atomic song, given (11) and (13). It follows that whenever (4) is defined, there is a unique song and (3) and (4) become equivalent as both definite NPs refer to that unique song. Therefore exhaustification cannot assert (3) and negate (4). Since exhaustification is obligatory by assumption, it must apply inside the definite. The predicate-level exhaustive operator in (14) yields a function that gives 1 for individuals which make the weaker scalar alternative true but not the stronger one (with C being the set of alternatives). Thus exhaustifying (10), the resulting function returns 1 for individuals that make (10) true but not (13), as in (15). This is the function that returns 1 only for song pluralities. *the* in (11) applying to (15) presupposes that there is a maximal song plurality and denotes it. As a consequence (3) can only be used if there is a plurality of songs.

(14) $\llbracket \text{Exh}_C \rrbracket^w = \lambda f_{\langle s,et \rangle} . \lambda X . f(w)(X) = 1 \wedge \forall g \in C [f \not\subseteq g \rightarrow g(w)(X) \neq 1]$

(15) $\llbracket \text{Exh}_C [\text{song-pl}] \rrbracket^w = \lambda X . [\lambda Y . \forall y \in Y . y \text{ is a song in } w](X) = 1 \wedge [\lambda y . y \text{ is a song in } w](X) \neq 1$

A prediction This approach predicts that embedded scalar implicatures should be generally possible with scalar terms embedded in definite NPs. This is confirmed by (16), which can easily mean that the musician who played some but not all of Paul's songs smiled.

(16) The musician who played some of Paul's songs smiled.

Beaver, D. 2001. *Presupposition and Assertion in Dynamic Semantics*. CSLI Publications. Ivlieva, N. 2013. *Scalar Implicatures and the Grammar of Plurality and Disjunction*. PhD. Krifka, M. 1989. Nominal reference, temporal constitution and quantification in event semantics. *Semantics and Contextual Expression*. Foris. Link, G. 1983. The logical analysis of plurals and mass terms: A lattice-theoretical approach. *Meaning, Use and Interpretation of Language*. de Gruyter. Sauerland, U. 2003. A new semantics for number. *SALT* 13, 258-275. Sauerland, U., J. Anderssen, and K. Yatsushiro. 2005. The plural is semantically unmarked. *Linguistic evidence*. Schlenker, P. 2009. Local contexts. *S&P*. Schwarzschild, R. 1994. Plurals, presuppositions and the sources of distributivity. *NALS*. Sharvy, R. 1980. A more general theory of definite descriptions. *The Philosophical Review* 89. Singh, R. 2011. Maximize Presupposition! and local contexts. *NALS*. Spector, B. 2007. Aspects of the pragmatics of plural morphology: On higher-order implicatures. *Presupposition and Implicature in Compositional Semantics*. Zweig, E. 2009. Number-neutral bare plurals and the multiplicity implicature. *L&P*.