

Atomicity Revisited: Discrepancies in Logical Analyses of Plural Number

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In light of the count/mass distinction, plural number has received extensive attention in the literature of linguistics and philosophy, since it is often considered as one distinctive feature that divides count nouns from mass nouns. Chierchia (1998) introduces a functional theory by means of which singulars, plurals and mass terms receive an interpretation in the same domain. In an atomic semi-lattice for count or mass nouns, as Link (1983) and Rothstein (2010) propose, the individuals (or atoms) at the bottom represent singularities while the sets above, generated using supremum (\cup) - an operation of sum - represent pluralities. It follows that pluralities presuppose atomicity.¹ In grammar, pluralities are illustrated through the plural morphology and atomicity by the use of the indefinite determiner. These two phenomena have commonly been assumed to be the most notable characteristics of count nouns in the vast literature on the count and mass distinction.²

Count nouns can be combined with the indefinite determiner (*a book, a table, a condition*) and can be pluralized (*books, tables, conditions*). On the other side, mass nouns cannot occur with the indefinite determiner (**a sand, *a water, *a silverware*) and they lack plural morphology. Frequent observations of plurals from mass nouns equivalent to the following example from OANC where a mass term like *symmetry* occurs in the plural or with an indefinite determiner (*The universe (...) is breaking symmetries all the time by generating such novelties*) arguably do not present counter-evidence to this phenomenon as the plural leads to a meaning shift in these cases (cf. Kiss et al., 2016b), e.g. an interpretation as a sorting plural. But when there is no observed meaning shift, plural presupposes an atomic structure, correlating with the grammar where count nouns can be pluralized and individualized through the indefinite determiner.

In our proposal we argue against a uniform treatment of plural number and indefinite article and the dependent relationship between plural and atomicity. Our study of countability classes³ of BECL (Kiss et al., 2014, 2016a)⁴ presents evidence for that claim.

BECL 2.1 provides countability classes of English noun-sense pairs (not lemmata), which have been developed through a large-scale annotation process conducted by native speakers of Canadian English examining syntactic and semantic behaviour. Annotators were asked to insert a noun with a given sense description into a test pattern and to decide whether the resulting expression is grammatical or not. There were six such test patterns which are explained in full length in Kiss et al. (2014). In our study we focus on only two those annotations, namely the syntactic test patterns Syn2 and Syn3. In Syn2 annotators were asked to judge whether the noun-sense pair under consideration in its plural form can appear with *more*, e.g. while *John owns more cars* is grammatical, **John owns more furnitures* is not. Syn3 asks whether the noun-sense pair in its singular form can be combined with the indefinite article as the subject of a definition or characterization, e.g. *A car is a vehicle.* or **A*

¹ Chierchia's approach was criticized by Rothstein (2010) for the existence of atomic structures in fake mass nouns, such as *furniture* and *silverware*. She suggests a contextually related treatment of atoms, but even in her analysis, the dependency of plurals on atomic structure is retained.

² For an overview of different approaches to this topic we suggest Joosten (2003).

³ We excluded Pluralia Tantum from our analysis since they constitute separate countability classes.

⁴ The current release, BECL 2.1 is publicly available on www.count-and-mass.org

furniture is... ⁵ Due to presenting test patterns where the noun with its actual sense description was presented to the annotators, we were able to observe how different senses of nouns – even semantically similar ones – can get different results.

Among the 18 fine grained countability classes that are grouped in four major classes (regular count, regular mass, both mass and count and neither mass nor count) we find several classes whose values of Syn2 and Syn3 are not in agreement without an apparent meaning shift; in some cases, a plural is possible, but a singular indefinite is not; in other cases vice versa. Although it is commonly argued that plural morphology and the indefinite article are joint features of count nouns, a number of our observed countability classes do not verify this correlation. They include noun-sense pairs that either can be pluralized but cannot be combined with the indefinite article (classes 73, 510 and 513) or can be combined with the indefinite article but lack plural morphology (classes 190 and 199).⁶

- (1) plural +, indef. determiner –
alcohol#1, cancer#1, cotton#1, duty#1, honey#1, juice#1, science#1, steal#1, therapy#1, wallpaper#1
- (2) plural -, indef. determiner +
bitch#1, blush#1, evacuation#3, extent#1, racket#1

These classes comprise 414 noun-sense pairs, a few of which are listed in (1) and (2)⁷. The results imply that plural morphology does not entail that a noun can be combined with the indefinite article, and that the realization of the indefinite article does not entail that the noun can be pluralized. However, it might be possible that this case depends on the very specific sense of the noun, and so conducted a second study to investigate the distribution of a set of nouns in OANC (www.anc.org).⁸ We classified all occurrences of nouns into certain syntactic patterns, one of which contains the indefinite article and another one containing the plural form of the noun. We could observe that a group of nouns occurs in both contexts, singular indefinite and pluralized, which resembles count nouns. Another group behaves like mass nouns in that they never occur in these contexts. Nevertheless, there is a set of nouns that occur in plural but never with the indefinite article: *candy, snowfall, regret, melon, imperfection, yolk, bravery, vulgarity, recycling* and *ugliness*. We also found nouns that never occur in the plural form but can be combined with the indefinite determiner, e.g. *help, integrity, affect, finance, magic, brunch, mobilization* and *sweetness*. Indeed, a total of 283 out of 754 investigated nouns do not evidence the connection of plural and indefinite determiner.

Even though other factors can be responsible for this circumstance, we believe it strongly indicates that the two grammatical features of count nouns, i.e. plural form and the indefinite article, do not form the kind of entailment relation as proposed by Chierchia (1998) or Rothstein (2010). This would further imply that while division may be the main function of plural, it is not triggered by individuation (which is the main function of the indefinite article).

⁵ For a detailed description of the annotation process that lead to the development of countability classes we recommend Kiss et al. (2014, 2016a).

⁶ The full paper will discuss apparent cases where our examples seem not to verify these claims.

⁷ The senses in BECL are taken from WordNet, the numbering corresponds to the sense numbers in Wordnet (cf. <http://wordnetweb.princeton.edu/perl/webwn>). Hence, the listed nouns in (1) and (2) shall be understood in the context of the particular sense: *evacuation#3 (the bodily process of discharging waste matter)* is according to the annotators ungrammatical in plural form but can occur in singular accompanied by the indefinite article. On the contrary, *evacuation#1 (the act of removing the contents of something)* can occur in plural form as well as in singular with the indefinite article.

⁸ In order to avoid a possible effect of different senses, we limited our study to those nouns whose senses annotated in BECL fall in the same countability class.

References:

- Borer, H. (2005). *Structuring Sense. Vol. I: In Name Only*. Oxford: Oxford University Press.
- Chierchia, G. (1998). Plurality of mass nouns and the notion of 'semantic parameter'. *Events and Grammar*, 70, 53–103.
- Fellbaum, C. (ed.) (1998) *WordNet: An Electronic Lexical Database*. Cambridge, MA: MIT Press.
- Kiss, T., Pelletier, F.J., Husić, H., Poppek, J. M. and Simunic, R.N. (2016a). A Sense-based Lexicon of Count and Mass Expressions: The Bochum English Countability Lexicon. In *Proceedings of the Tenth International Conference on Language Resources and Evaluation LREC 2016*. Portorož, Slovenia.
- Kiss, T., Pelletier, F.J. and Poppek, J. M. (2016b). Kinds, Containers, Instances: Mass Nouns and Plurality. In *Proceedings of Grammar and Corpora 2016*, Mannheim, Germany (to appear)
- Kiss, T., Pelletier, F. J., Husić, H. and Poppek, J. M. (2017). Issues of Mass and Count: Dealing with "Dual Life" Nouns. In *Proceedings of the 6th Joint Conference on Lexical and Computational Semantics (ACL- *Sem 2017)*. 189-198. Vancouver, Canada.
- Link, G. (1983). The Logical Analysis of Plurals and Mass Terms: A Lattice Theoretic Approach. In R. Bauerle, C. Schwartze and A. von Stechow (Eds.), *Meaning, Use and Interpretation of Language*. Berlin: De Gruyter.
- Payne, J. and Huddleston, R. (2012). Nouns and Noun Phrases. In R. Huddleston and G.K. Pullum (eds.), *The Cambridge Grammar of the English Language* (5th ed.) (pp. 323-523). Cambridge: Cambridge University Press.
- Rothstein, S. (2010). Counting and the mass count distinction. *Journal of Semantics*, 27 (3), 343-397.