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NUMBER: COGNITIVE, SEMANTIC AND CROSSLINGUISTIC APPROACHES

This volume contains a selection of the papers presented at the 11th International Symposium on Cognition, Logic and Communication which took place in Riga, at the University of Latvia on December 10-11 2015. The choice of topic reflected a growing understanding in the community of linguists and cognitive scientists that fundamental grammatical features of language, in particular the mass/count distinction, use of number words, and plurality, reflect our grasp of non-linguistic numerical operations, in particular individuation and measurement. Since individuation is in part related to our visuo-spatial abilities, this led to a pleasing continuity between this symposium on number, more precisely, *Number: Cognitive Semantics and Crosslinguistic Approaches*, and the previous symposium, held in 2014, *Perspectives on Spatial Cognition*, which focussed on cognitive and formal representations of space and its linguistic encoding. There was also a methodological continuity as both symposia had as a goal to integrate linguistic, psycholinguistic and psychological approaches to the topic, embracing experimental as well as theoretical methodologies, and incorporating crosslinguistic research.

The 11th Symposium also traces its roots back to the 6th Symposium on Formal Semantics co-organized by Barbara H. Partee, Michael Glanzberg, and Jurģis Šķilters, which took place in November 2010,

and which, as well as Volume 6 of the Yearbook, also launched collaborations that resulted in several symposia and research projects including the current one.

The papers presented at the 11th Symposium reflect a growing interest among language researchers, in particular theoretical linguists, psycholinguists and psychologists of language, in the grammatical expression of number and in the use of numeral expressions in natural language. Rather than discussing ontological questions such as "What is a number?" or "How should numbers be defined?", linguists have focussed on questions such as "What kind of constructions in this language use numeral expressions?", "What grammatical properties do numeral expressions in this language have?" and "How do we use numerals to express counting?", while psychologists and psycholinguists have been particularly interested in the process of acquisition of numeral expressions in natural language and the relationship between acquiring numerical concepts and numerical language, including the semantics of counting. Our deepening understanding of these issues has shown that answers to these questions are related to the grammar of countability, while widening crosslinguistic research has shown that there is considerable crosslinguistic variation in how they are to be answered. As editors, we are happy that the selection of papers in this volume reflects this.

There are various kinds of numeral expressions, but the most basic are cardinal expressions, and these have been the topic of much linguistic research. As can be seen from the contents of this volume, a number of central issues have emerged as topics for investigation. These include the basis of the mass/count distinction, i.e the role of N in encoding countability; the role of classifiers in expressing countability; the linguistic expression of the count/measure contrast; countability in the verbal domain; and the question of crosslinguistic variation.

The first issue concerns the question of what nominal denotations are countable and what grammatical mechanisms mark them as such. In many languages, such as English, nominal predicates are divided into countable, or count predicates, as in *three cats, four dogs*, and non-countable or mass predicates such as *mud* and *steam* which cannot be modified by cardinal numeral predicates, hence the ungrammaticality of **three muds, *four steams*. There has been a great deal of

discussion in the literature about how to model this distinction seman-
tically, and what is the relation between the grammatical count/mass
distinction on the one hand and the cognitive distinction between in-
herently individuable entities (such as cats) and stuff (such as mud or
steam) which we do not (usually) consider as coming in individuable
units. Link (1983) proposed capturing the atom/stuff distinction us-
ing Boolean structures: he suggested that plural count nouns such as
cats denote atomic Boolean semi-lattices, while mass nouns denote non-
atomic Boolean semi-lattices. The move to Boolean semantics for noun-
interpretations has proved extraordinarily fruitful, however, the sugges-
tion that count and mass nouns have their interpretation in two differ-
ent domains, an atomic and a non-atomic domain, has come under a
lot of criticism, originally from Gillon (1992) and Chierchia (1998).
As Chierchia (1998) argued, the idea that *carpets* and *carpeting* denote
two sums of two different kinds of objects is not intuitively plausible, es-
pecially since a single collection of carpet-pieces can be referred to by
both *that carpeting* and *those carpets*. In the last two decades, there
have been a number of attempts to ground the mass/count distinc-
tion semantically without adopting Link's proposal to treat mass and
count denotations as denoting different kinds of entities. These include
among others Krifka (1989, 1995); Chierchia (1998, 2010); Rothstein
(2010); Landman (2011), and several contributions to this debate are
included in this volume, in particular the papers by Landman, Sutton
& Filip, Grimm, and Beviláqua, Lima and Pires de Oliveira.

Landman develops 'iceberg semantics', a framework in which mass
and count domains are not sorted, and in which the mass/count dis-
tinction is not analysed in terms of atomicity but in terms of disjoint-
ness. He uses this to give an analysis of the mass/count distinction for
complex NPs, giving, in particular, a compositional semantics for por-
tion and measure interpretations of pseudopartitives. *Sutton and Filip*
develop a theory of the mass/count distinction grounded on the idea
common to both Rothstein (2010) and Landman (2011), that count-
ability is determined by non-overlap in context. They are interested in
particular in explaining crosslinguistic variation in the expression of the
mass/count distinction. *Grimm* gives a case study of the lexical seman-
tics of the noun *crime* which can be used as both a mass and a count
noun, and uses this to explore properties of mass/count denotations.

Beviláqua, Lima and Pires de Oliveira report on experimental research
into the semantics of object noun phrases in Brazilian Portuguese. Pires
de Oliveira & Rothstein (2011) argue that Brazilian Portuguese bare sin-
gulars are object mass nouns, showing that non-cardinal comparisons
of object mass nouns are available. Beviláqua et al show that these
'volume comparisons' of bare singulars cannot be explained as cases
of grinding, bringing experimental evidence in support of their being
object mass nouns.

The second major general theme of the papers in this volume is the
relation between counting and measuring. Rothstein (2011), devel-
oping ideas in work by Krifka (1989); Chierchia (1998) and Landman
(2004), showed that the count/measure contrast is a grammatically
relevant contrast, which is intimately linked to the mass/count distinc-
tion. A number of papers in this volume deal with this issue. As already
mentioned, Landman's paper shows how iceberg semantics can account
for measure and counting readings of pseudopartitives. *Rothstein's* pa-
per discusses the relation between syntax and semantics of expressions
like *two glasses of wine*, which are ambiguous between counting and
measuring interpretations, arguing that each interpretation is associ-
ated with a different semantic representation, as well as with different
syntactic structures. Drawing on data from Modern Hebrew and Man-
darin, the paper argues that counting NPs are right-branching with *two*
modifying *glasses of wine*, while in measure expressions the numeral
and the measure head combine to form a measure predicate *two glasses*
which modifies the N. *Lima*'s paper explores the interpretation of con-
tainer phrases in Yudja, a language where numerals can directly modify
notional mass nouns, and where container phrases are optional. Lima
argues, based on experimental studies with Yudja children and adults,
that when container expressions are used, they are ambiguous in at
least three ways, and may have either a locative, an individuating or a
measure interpretation. Crucially, a locative reading may emerge even
in scenarios where the verb and the context favour a measure inter-
pretation. Lima shows that this supports Partee and Borschev's (2012)
hypothesis that individuating, possibly via container phrases, precedes
measuring in language acquisition.

A third issue concerning countability is the semantics of classifiers.
While count nouns are used to encode countability in languages with

a mass/count distinction, countability can also be expressed by using classifiers. This is a common mechanism for expressing countability in languages which apparently lack a mass/count distinction and Chierchia (1998) hypothesises that the classifier+NP phrase was a count phrase semantically equivalent to a count noun in English. While there is considerable support in favour of this (see, e.g. Li 2013), continued work into the syntax and semantics of classifiers has shown that the situation must be must more complex than this. Cheng & Rint (1998) argued that there is a distinction between classifiers which take notional mass noun and notional count noun classifiers in Mandarin, while Li (2013); Li & Rothstein (2012) have argued that the distinction is better analysed as a distinction between classifiers which combine with a noun to form a countable predicate which can be modified by a numeral, and classifiers which combine with a numeral to form a measure predicate. Bale & Coon (2014), based on data from Mi'gmaq (Algonquian) and Chol (Mayan), suggest that in some languages, individuating classifiers compose with the numeral, as originally suggested in Krifka (1989, 1995). A number of papers in this volume contribute to this discussion. *Sudo* explores countability in Japanese, a language in which classifiers are obligatory in counting. He suggests that the contrast between Japanese and English lies in the properties of the numeral. In English, numerals are ambiguous between singular terms and cardinal predicates (Rothstein 2013), and, as predicates, can modify count nouns directly. He suggests that in contrast, in Japanese, all numerals denote singular terms and therefore they cannot be used as modifiers. Classifiers apply to numeral denotations and yield a predicate which can then modify a countable noun. *Sandalo & Michelioudakis*'s paper investigates the grammar and interpretation of classifiers and number in a so-called deictic classifier language, Kadiwéu, a Waikurúan language spoken in the South of Brazil. Since in Kadiwéu classifiers are compatible with plural morphology, their study leads to a reevaluation of the relation between classifiers and plurality. *Khrizman*'s paper also requires a reevaluation of assumptions about the role of classifiers. She shows that in Russian, there are apparently individuating classifiers which optionally occur in numeral constructions with plural nouns and look very much like functional individuating classifiers. She argues that the apparently count constructions using these optional classifiers have properties of

measure constructions such as *five liters of water*, and argues that these classifiers are measure words denoting measure operations.

Finally, *Gepner*'s paper extends the study of countability to the verbal domain, tackling a well-known problem in the verbal system of Russian, the division of imperfective verbs of motion into so called determinate and indeterminate verbs. Following Kagan's (2007) assumption that in the normal case, imperfective verbs are plural predicates which include singular and plural events in their denotations, while perfective predicates denote sets of singular events, Gepner argues that in the case of motion verbs, imperfective denotations are subdivided into singular (determinate) and pluractional (indeterminate) predicates.

There has been a growing awareness in the linguistics community of the importance of crosslinguistic research, including fieldwork and language documentation, and this is reflected in the papers in this volume. As well as English, the languages discussed in this volume include Dutch (Landman), Russian (Gepner, Khrizman), Modern Hebrew, Mandarin and Hungarian (Rothstein), Japanese (Sudo), Brazilian Portuguese (Beviláqua et al) Yudja (Lima) and Kadiwéu (Sandalo and Michelioudakis).

References

Bale, Alan & Coon, Jessica. 2014. 'Classifiers are for numerals, not nouns: Consequences for the mass-count distinction'. *Linguistic Inquiry* 45, no. 4: 695–705.

Cheng, Lisa L.-S. & Rint, Sybesma. 1998. 'Yi-wan Tang, yi-ge Tang: classifiers and massifiers'. *Tsing Hua Journal of Chinese Studies, New Series* 28, no. 3: 385–412.

Chierchia, Gennaro. 1998. 'Plurality of mass nouns and the notion of 'semantic parameter''. In S. Rothstein (ed.) 'Events and Grammar, Dordrecht: Kluwer', Dordrecht: Kluwer.

——. 2010. 'Mass nouns, vagueness and semantic variation'. *Synthese* 174, no. 1: 99–149.

Gillon, Brendan. 1992. 'Towards a common semantics for English count and mass nouns'. *Linguistics and Philosophy* 15, no. 6: 597–640.

Kagan, O. 2007. 'On the Semantics of Verbs of Motion in Russian'. In Yehuda Falk (ed.) 'Proceedings of IATL 23', 1–15.

Krifka, Manfred. 1989. 'Nominal reference, temporal constitution and quantification in event semantics'. In Renate Bartsch, Johan van Benthem & Peter van Emde Boas (eds.) 'Semantics and Contextual Expression', 75–115. Dordrecht: Foris.

——. 1995. 'Common nouns: a contrastive analysis of English and Chinese'. In G. N. Carlson & F. J. Pelletier (eds.) 'The Generic Book', 398–411. Chicago: Chicago University Press.

Landman, Fred. 2004. *Indefinites and the Type of Sets*. Oxford: Blackwell.

——. 2011. 'Count nouns – mass nouns – neat nouns – mess nouns'. *Formal Semantics and Pragmatics: Discourse, Context and Models. The Baltic International Yearbook of Cognition, Logic and Communication* 6. http://newprairiepress.org/biyclc/vol6/iss1/12/.

Li, XuPing. 2013. *Numeral classifiers in Chinese: the Syntax-Semantics Interface*. Berlin/New York: Mouton de Gruyter.

Li, XuPing & Rothstein, Susan. 2012. 'Measure readings of Mandarin classifier phrases and the particle *de*'. *Language and Linguistics* 13, no. 4: 693–741.

Link, Godehard. 1983. 'The logical analysis of plurals and mass terms: a lattice-theoretical approach'. In R. Bauerle, C. Schwartze & A. von Stechow (eds.) 'Meaning, Use and the Interpretation of Language', 302–323. Berlin: Mouton de Gruyter.

Partee, Barbara & Borschev, Vladimir. 2012. 'Sortal, relational, and functional interpretations of nouns and Russian container constructions'. *Journal of Semantics* 29, no. 4: 445–486.

Pires de Oliveira, R. & Rothstein, S. 2011. 'Bare singular noun phrases are mass in Brazilian Portugese'. *Lingua* 121: 2153–2175.

Rothstein, Susan. 2010. 'Counting and the mass-count distinction'. *Journal of Semantics* 27, no. 3: 343–397.

——. 2011. 'Counting, measuring and the semantics of classifiers'. *The Baltic International Yearbook of Cognition, Logic and Communication* 6. http://newprairiepress.org/biyclc/vol6/iss1/15/.

——. 2013. 'A Fregean semantics for number words'. In Maria Aloni, Michael Franke & Floris Roelofsen (eds.) 'Proceedings of the 19th Amsterdam Colloquium', 179–186. http://www.illc.uva.nl/AC/AC2013/uploaded_files/inlineitem/23_Rothstein.pdf.